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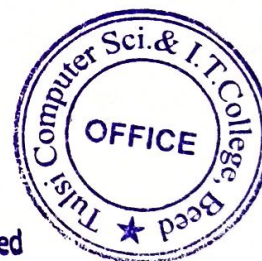
er of books and chapters in edited volumes/books published and papers published in national/ international conference proceedings per teacher during last five year

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Dr. Vikas M. Waghmare	Pratap College (Autonomous), Amalner (Issue 333 - Innovative & Sustainable Chemistry)	"Exploring the Challenges and Prospects of NEP - 2020 in Commerce and Management Stream	International Research Fellows Association's. Research Journey International E-Research Journal Peer Reviewed, Referred & Indexed Journal	RUSA Sponsored National Conference on Role of Commerce, Management and Technology in Modern Era.	National	28th Oct 2023	E-SSN-2348-7143	Tulsi College of Computer Science & Information Technology, Beed	Swatidha International Publications Nashik
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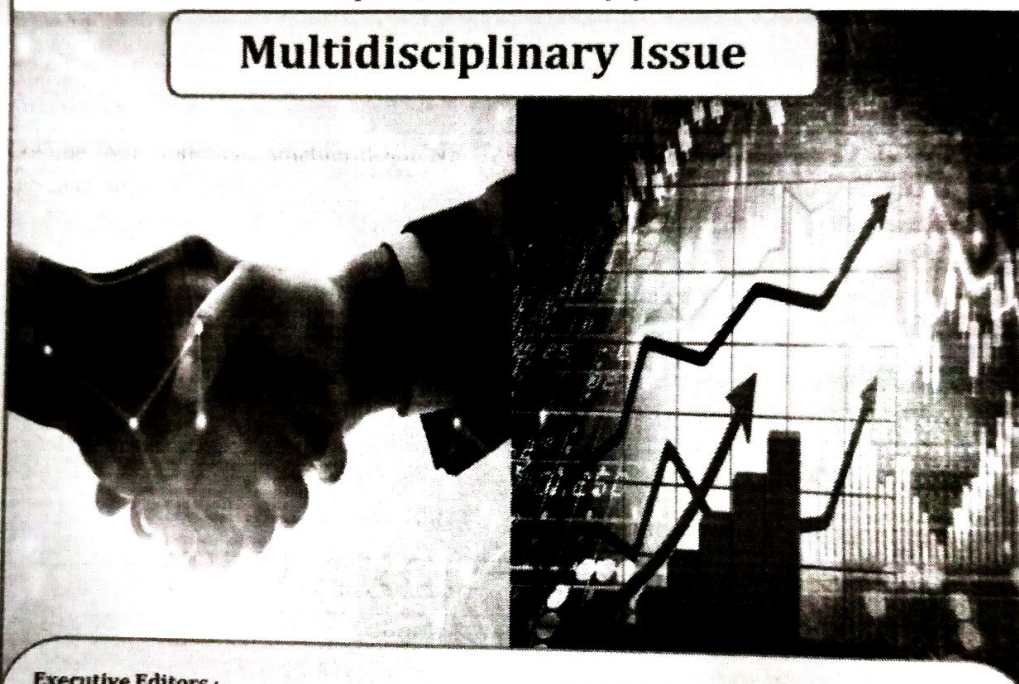
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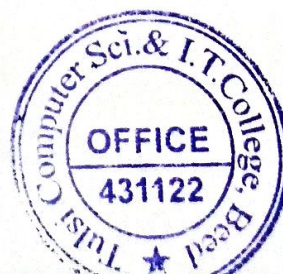
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NEED OF ANTHROPOGENIC INTERVENTION IN ACHIEVING SUSTAINABLE DEVELOPMENT (IC-NAIASD-2023)

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THE CHALLENGES AND ANTHROPOGENIC INTERVENTION IN ACHIEVING SUSTAINABLE DEVELOPMENT

Dr. Rachana Dashore

Professor, Sandip Institute of Technology & Research Centre, Nasik

Dr. Pankaj Dashore

Professor, Sandip University, Nasik

Abstract- Sustainable development has emerged as a global priority in response to the challenges comes through population growth, environmental degradation, and resource depletion. Achieving sustainable development requires a proactive approach that acknowledges the significant role of human activities in shaping our planet's future. This study article examines the links between human behaviours, environmental impact, and socioeconomic advancement to determine the need for anthropogenic intervention in achieving sustainable development. It also highlights crucial areas where anthropogenic intervention can make a significant difference, such as sustainable resource management, the adoption of renewable energy, conservation initiatives, and social equity. This work intends to develop a deeper awareness of the challenging role that individuals, communities, and policymakers play in crafting a sustainable future by emphasizing the importance of human agency.

Keywords: Anthropogenic intervention, Sustainable development, Social, Environment and Economic challenges.

1. INTRODUCTION

Sustainable development has arisen as a crucial idea and objective for tackling the pressing global challenges of the twenty-first century. The rapid speed of industrialization, urbanization, and population growth has resulted in increased environmental degradation, resource depletion, and social inequality. Recognizing these interconnected challenges has resulted in the adoption of sustainable development as a guiding principle to balance economic progress, social well-being environmental conservation. Fig1 Shows the sustainability as three intersection circle of Social, Environment and Economic challenges.

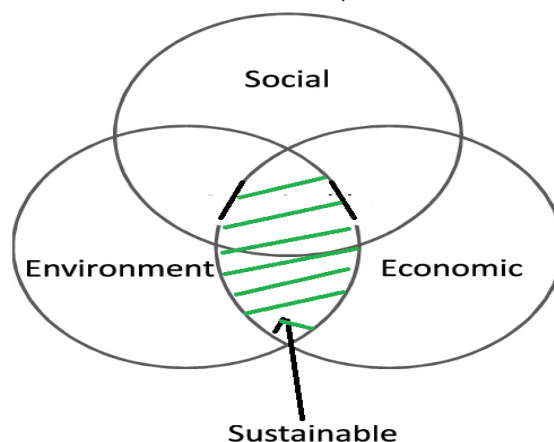


Fig. 1 Sustainability as three intersection circle

The purpose of this work is to investigate the role and challenges of anthropogenic intervention in achieving sustainable development. Its specific goals to identify important areas where anthropogenic intervention is critical for attaining sustainable development, such as sustainable resource management, renewable energy adoption, conservation initiatives, and social equity.

2. ANTHROPOGENIC IMPACT ON THE ENVIRONMENT

2.1 Human Activity and Degradation of the Environment

Human actions have contributed greatly to worldwide environmental degradation. Pollution, habitat damage, deforestation, and species extinction have all increased as a result of industrialization, urbanization, and agricultural activities. Pollutants released into the atmosphere, water, and soil have caused air pollution, water contamination, and soil deterioration. Deforestation has reduced biodiversity while also disrupting ecosystems and contributing to climate change.

2.2 Depletion of Resources and Climate Change

Anthropogenic activities have resulted in an unsustainable depletion of natural resources. The extraction of fossil fuels for energy production, such as coal, oil, and natural gas, has resulted in increased greenhouse gas emissions, especially carbon dioxide (CO₂). These emissions have contributed considerably to climate change and global warming. Furthermore, unsustainable farming methods and overfishing have resulted in soil fertility, freshwater resources, and marine biodiversity depletion.

2.3 Unsustainable Production and Consumption Patterns

Current patterns of production and consumption, characterized by excessive resource extraction, waste generation, and overconsumption, are not compatible with sustainable development. The linear "take-make-dispose" model of production, which relies heavily on the extraction of finite resources, has resulted in resource depletion and increased waste generation. Moreover, the culture of overconsumption and planned obsolescence has led to the generation of vast amounts of non-biodegradable waste, contributing to pollution and environmental degradation.

The anthropogenic impact on the environment is undeniable, and urgent action is required to mitigate further damage. Recognizing the role of human activities in environmental degradation is crucial in understanding the need for anthropogenic intervention to achieve sustainable development. By adopting sustainable practices and modifying production and consumption patterns, it is possible to reduce the negative impact on the environment and pave the way for a more sustainable future.

3. CONCEPT OF SUSTAINABLE DEVELOPMENT

3.1 Definition of Sustainable Development

Sustainable development is defined as development that meets the requirements of the present without jeopardizing future generations' ability to satisfy their own needs. It incorporates economic, social, and environmental components to provide long-term well-being and harmony.

3.2 Interdependence of Social, Economic, and Environmental Factors

Sustainable development acknowledges the intrinsic interdependence of social, economic, and environmental concerns. These factors are interconnected and mutually reinforcing, necessitating a comprehensive and integrated strategy. Figure 2 depicts the influence of globalization on the environment, economy, and society.

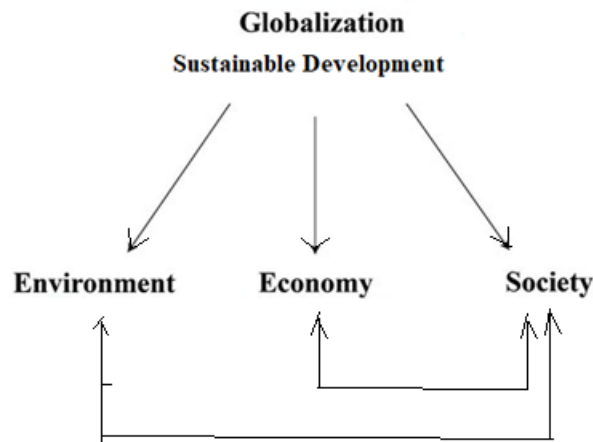


Fig. 2 The impact of Globalization on Environment, Economy and Society

Social factors play a crucial role in sustainable development as they encompass issues of social equity, human rights, and well-being. Addressing poverty, ensuring access to education and healthcare, promoting gender equality, and fostering inclusive societies are essential for sustainable development.

Economic factors are essential in supporting sustainable development goals. Sustainable economic growth, innovation, and the promotion of green industries can contribute to the well-being of societies while minimizing environmental impact. The integration of sustainable business practices, responsible investment, and the adoption of circular economy models are key aspects of sustainable economic development.

The environment is crucial to sustainable development. Protecting and protecting ecosystems, decreasing pollution, supporting biodiversity conservation, and limiting climate change are all crucial to achieving sustainability. Sustainable resource management, the utilization of renewable energy, and the promotion of sustainable land use are all essential components of environmental sustainability.

Recognizing the interconnectivity of these issues is critical for comprehending the complexities of sustainable development. Addressing one component without addressing the others can have unforeseen repercussions and impede overall growth. To achieve sustainable development, a holistic and integrated approach that balances social, economic, and environmental concerns is required.

4. ANTHROPOGENIC INTERVENTION FOR SUSTAINABLE DEVELOPMENT

4.1 Sustainable Resource Management

Sustainable resource management is critical for attaining long-term development. In this domain, anthropogenic interventions include:

Responsible Consumption and Production, Circular Economy and Biodiversity Conservation.

4.2 Renewable Energy Adoption

The utilization of renewable energy is critical for lowering greenhouse gas emissions and mitigating climate change. Among the anthropogenic interventions in this area are Transition to Clean Energy Sources, Energy Efficiency and Conservation, Conservation Efforts and Social Equity and Inclusive Development.

5. THE ADVANTAGES AND DIFFICULTIES OF ANTHROPOGENIC INTERVENTION

5.1 Environmental Advantages

Anthropogenic intervention for sustainable development improves the environment in numerous ways, including **Ecosystem** Conservation, Pollution and Emissions Reduction, Efficient Resource Management.

5.2 Socioeconomic Advantages

Anthropogenic intervention for sustainable development provides socioeconomic benefits such as Economic Growth and Job Creation, Better Quality of Life and Improved Resilience & Adaptation.

5.3 Anthropogenic Intervention Obstacles

Despite the benefits, effective anthropogenic intervention faces various obstacles and barriers such as Limited Awareness and Behavioural Change, Economic Considerations for the Short Term, Institutional and Policy Difficulties, Resource Constraints, Competing Interests and Trade-offs and Policy Framework and International Cooperation.

6. POLICY FRAMEWORK AND GLOBAL COOPERATION

6.1 International Treaties and Initiatives

International treaties and initiatives are critical in building a policy framework and encouraging global cooperation for sustainable development. Some significant examples are The European Union's Action Plan for Circular Economy, Climate Change Agreement of Paris.

6.2 National Policies and Strategies

Governments must design and implement national policies, strategies, and action plans that are consistent with sustainable development principles. This entails incorporating economic, social, and environmental issues into policy-making processes, defining targets and indicators, and establishing regulatory frameworks that encourage sustainable activities.

6.3 Evaluation and monitoring:

To assess the success of anthropogenic interventions and track the attainment of sustainable development goals, robust monitoring and evaluation procedures are required. Policymakers may make educated decisions, discover gaps, and alter plans with regular reporting, data gathering, and performance indicators.

7. CONCLUSION

Anthropogenic intervention can have a significant impact on sustainable resource management, renewable energy uptake, conservation initiatives, and social equity. This research paper has explored the need for anthropogenic intervention in achieving sustainable development.

To solve the issues of sustainable development and create a balance between economic growth, social fairness, and environmental protection, anthropogenic intervention is required.

Human activity has contributed greatly to environmental degradation, resource depletion, and climate change. Environmental benefits of anthropogenic intervention include ecosystem conservation, pollution reduction, and effective resource management. It also has socioeconomic benefits, such as employment creation and enhanced quality of life. Anthropogenic intervention plays a critical role in achieving sustainable development. To encourage and incentivize sustainable behaviours, strengthen policy frameworks and integrate sustainability considerations across industries is necessary.

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LOCATION DEPENDENT SERVICES: A DETAILED REVIEW**Chitrangada Chaubey¹, Aasheesh Raizada²**¹Research Scholar, Sanskriti University, Mathura, India²Assistant Professor, Sanskriti University, Mathura, India

Abstract - With the escalating accessibility of mobile devices, there is a growing need for location-based applications. As a result, various location based services have been implemented in recent times. The presented paper incorporates the complete review of Location-Based Service (LDS) with its components, architecture, application areas and various QoS enhancement possibilities. In addition, the article provides a vast discussion over different routing techniques in mobile communication and the positioning systems being used nowadays. This paper could be beneficial for the research scholars and stakeholders who are planning to work in the field of enhancing the quality of Location Based Services.

Index Words: Mobile networks, Location, QoS, Mobility, Positioning systems.

1. INTRODUCTION TO MOBILE NETWORKS

The mobile network is a form of wireless communication[1]. The connections are dispersed across land areas known as cells, with each cell having at least one fixed-location transceiver known as a cell spot or base station. This base station endow with the cell with the set-up coverage which can be cast off for transmission of voice, information and others. A cell might make use of a diverse set of frequencies commencing from neighboring cells, to evade obstruction and offer definite service quality inside every single cell. In this segment the mobile system concise elucidation was specified. The typologies of wireless mobile networks are constantly evolving and are mostly made up of wireless links with limited bandwidth. It has wireless receivers and transmitters, and occasionally a platform like a router. Mobile devices alike as smart phones and private digital associates have attained novel height of usability, recital, and computing power. Progressively, these devices are prepared with wireless-connections competences and site expertise[2]. In mobile system there is a device similar to wireless phone and the description is recorded in a unit by the name of card subscriber identity module (SIM) card. Consequently after placing the card in the mobile phone, system initiates to verify the strength of the (SIM) card by confirmation modus operandi which joins to a verification center[3]. Mobile phones are transferable and their dimension, weight and battery existence are the added recital factors of mobile phones and current expertise that builds these phones to be less significant. At current days, the location grounded mobile networking is primarily paying attention in the mobile networking region.

In a personal communication services (PCS) system, the service region is divided into quite a lot of location areas. Every single location area (LA) comprises of numerous base stations[4]. The coverage region of a base station (BS) is recognized as cell. The location data of mobile terminals (MTs) is sustained in databases of two kinds: Visitor location register (VLR), and home location register (HLR). The method of trailing the

location of a MT is identified as location management. Location management is made of two foremost procedures: the primary one is location registration and the subsequent one is paging[5].

1.1 Mobile Technologies

A mobile system, also specified to as a cellular system, make use of the radio frequencies that can be cast off concurrently by quite a few callers at one and the identical time. Cell-sites and mobile strategies influence the frequency, consequently that they can formulate the utilization of low-power transmitters to provide their services with the smallest amount probable interference. Mobile carriers exploit these mobile systems to propose extensive network coverage to their subscribers. Bigger areas are divided into lesser cells; every one of cell is associated to telephone switches or telephone exchanges, which yet again assist in public telecommunication whilst be in motion[6]. Diverse kinds of mobile technologies are cast off to offer mobile set-up services to users. For the most general part amongst them are Global System for Mobile Communication (GSM), General Packet Radio Service (GPRS), Code Division Multiple Access (CDMA), Enhanced Data Rates for GSM Evolution (EDGE), integrated Digital Enhanced Network (iDEN) and Evolution-Data Optimized (EV-DO). Context aware computing frequently engrosses tracking people's spot. The majority of the applications emphasize the significance of observing people's position information private. There are two sorts of location grounded services[7]. Location - tracking services that are grounded on further parties trail the user's position and spot - aware services that based on the device's understanding of its individual location. Location - tracking services are functions that relying on the trail of peoples' position by supplementary parties alike as mobile telephony service contributors, while location - aware services are grounded on the device's possess information of its location. Instances of the two services embrace on positioning friends or family members and keep informed the time at what time incoming a novel time zone, correspondingly[8].

1.2 Location Updates Method in the Mobile Network

There are three techniques cast off to keep posted the position in the mobile. These three kinds are illustrated in the subsequent sub segments.

- a. **Send location update on every cell update:** Each time a MT shifts into a diverse cell region, a location revise is achieved. This method has the subsequent benefit and drawback: a. Benefit: No paging requisite, b. Drawback: extreme signaling traffic load.
- b. **Page every cell in the network:** Each time an incoming call is to be directed to a MT, all cells of the system are paged to recognize the cell possessing the MT. It has the subsequent benefits and drawback: a. Benefit: No position update requisite, b. Drawback: Extreme signaling traffic load.
- c. **Subdivide network into paging sub-regions:** Each time a MT shifts to a novel paging sub-region, it notifies the distinctiveness of that sub-region to the system. When an inward call turns up to that MT, merely the cells of the present sub-region are investigated to recognize the cell possessing the MT. It has the subsequent

necessities: a. Needs paging modus operandi with abridged traffic load, b. Needs position updating method with abridged traffic load.

2. LOCATION DEPENDENT SERVICES

Location-dependent service (LDS)[9] management strategy using location information is a software-level feature. LDS is a data service that today has a combination of users and social networks in the form of data, entertainment or security, which are available on mobile devices during the mobile process and use data in local conditions of mobile devices. LDS can be used in a variety of situations such as health, interior design, entertainment, work, personal life, etc. somewhere. The open system of information and services related to the situation can provide is one of its characteristics that often work since the situation is common in all these actions and can be used to improve the identification of values and associations[10].

LDS includes functions to identify the location of a person or object, such as finding a nearby ATM or the location of a friend or co-worker. LDS includes package tracking and vehicle tracking services. LDS can have a mobile transaction when it activates coupons or promotions for customers based on their current location. They combine customized weather functions with regular mode-based gameplay. They are examples of communication integration[11]. This concept of location-based planning does not agree with the evolving concept of real-time location systems (RTLS) and related field services, as defined in ISO/IEC 19762-5 and ISO/IEC 24730-1. Although network computing systems are often successful in communicating old information to consumers, computer devices themselves can also be found, even in real time.

2.1 Role of LDSs

Mobile messaging acts an important responsibility in LDS. Messaging, particularly SMS, has been cast off in amalgamation with a variety of LDS applications, like location-grounded mobile advertising[12]. SMS is tranquil of the chief technology hauling mobile advertising/marketing campaigns to mobile phones. A classic instance of LDS applications by means of SMS is the release of mobile coupons or reduction to mobile subscribers who are next to promoting restaurants, cafes, movie theaters. The Singaporean mobile operator Mobile One carried out like an initiative in 2007 that concerned numerous local marketers, what was description to be an enormous achievement in terms of subscriber recognition[13].

2.2 Components of Location Based Services

Creating and promoting context-based services is a demanding task. There are many parts, actors and parameters. Creating and maintaining collaboration and collaboration of LDS resources requires developers to work through a number of principles detailed below. The LDS structure is only one facet, the most giving service, which will modify the needs of the user or create rules for such needs, and allow the donor to create a return on their assessment. Or, the business won't last. The needs of the end users should be defined by paying close attention to all stages of the design process. In most research, the user of the mobile device measures the user[14]. As the driving force behind the

expansion and income of the service depends on the situation, the employee's wages cannot be reduced. Aggregation with user names replicates the value of location-based services and is one of the main strengths of LDS providers. It creates marketing potential and opportunity that, if used properly, brings value to the customer and revisits the investment[15]. An example of the basic structure of the elements in the site plan is shown in Figure 1.

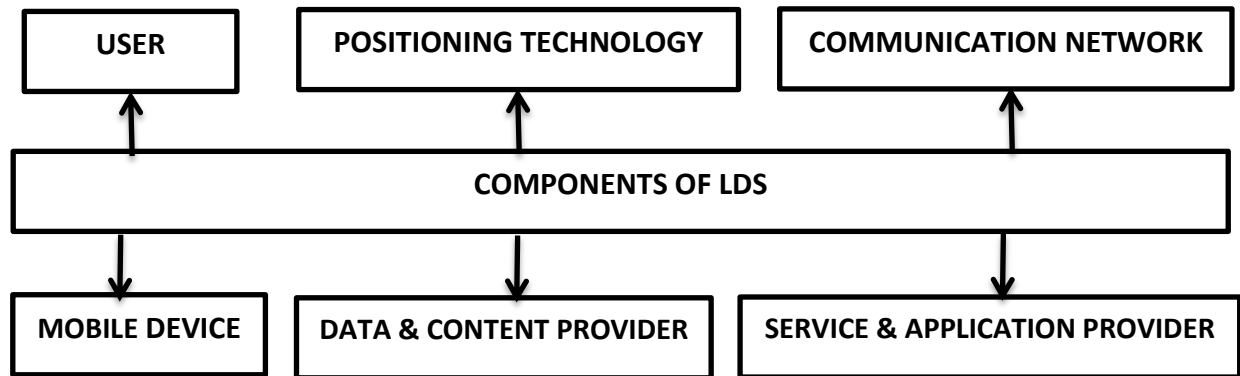


Figure 1 Components of LDSs

Attracting employees to perform or contribute to the work area is one of the most difficult tasks. An example of one of the leading LDS distribution providers[16] - Loopt - shows how a seemingly small problem can make the project ineffective. Loopt seems to be thinking about the introduction of its system for new users to use SMS text messaging. By reviewing services, users automatically enable Loopt to upload review requests to anyone in the user's address book via SMS. The public doesn't understand the process and Loopt admits that the thinking process is flawed. Many context-based tasks require multiple resources.

Positioning systems: Permit geographically localizing the mobile device both outdoor and indoor by means of: satellite-grounded schemes, Bluetooth, Cell-ID, WiMax, RFID, Wireless LANs.

Communication Network: Wireless systems that currently allow the data transfer between a user and a server are primarily wireless Internet (eg GPRS, 3G, 4G).

Service and Application Provider: The LDS supplier[17], as well as the software (e.g. GIS) and other disseminated services and elements that are cast off to determine the query and offer the modified response to the user.

Content and Data Provider: Service suppliers will typically not accumulate and uphold all the data, which can be demanded by users. Consequently geographic base information and location information data will be typically demanded from the upholding authority (e.g. mapping agencies) or business and industry partners (e.g. yellow pages, traffic companies).

Mobile Devices Some portable device that has ability to exploit affirmed above elements of LDS, for instance: mobile phones (as well as smart phones), tablets, palmtops, individual navigation devices, laptops etc[18].

User Operator of the mobile appliance and the person that is exploiting probable of modern mobile device and infrastructures so as to get value added data or entertainment.

2.3 Architecture of LDSs

The LDS architecture has the following key features:

- Implementation plan.
- Wireless network, which distributes users. Their job is to apply the planning and design of air systems and LDS equipment.
- The application itself. This includes the application server and access registration.
- LDS middleware,[19] which helps in the expansion and consumption of LDS applications in different network environments. The application server, which is the distribution point of the LDS scheme, holds the user interface functions and dialogs in the open directory.

Most LDS applications have a client/server configuration and can be grouped into three parts: the client, the server, and the wireless communication to connect the client to the server. The client is responsible for distributing user requests and the mobile device's geographic location[20] to the server, and the server is responsible for providing services based on the mobile device's geographic location. The client can help with data acquisition by collecting information in the field. The server will put the data collected in the field into the database and provide services for all clients based on the database. The architecture of the LDS is revealed in Figure 2.

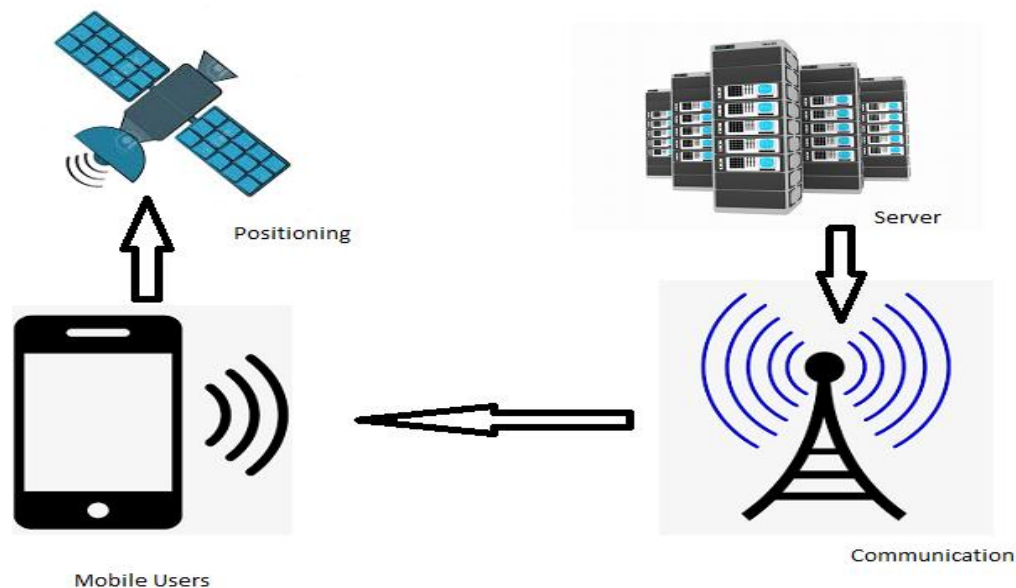


Figure 2 Architecture of LDSs

LDS clients, servers, and wireless communications can be divided into service pools that, for a given application, will fit within the scope of these service pools.

- **Customer Services** - disclosure, data collection, environment management, computing, wireless connectivity, backup and communications.
- **Server services** - Connectivity settings: database, computing, multimedia, business logic and wireless connectivity.

- **Wireless Communication Features** - Receive, Propel, Realtime, Print, Read, Encrypt and Security Information. The above configuration is the main step for the client, server and wireless communication to follow the restoration. On the other hand, the process and activities used to understand reusability[21] for each of them are different in each one. On the consumer side, hardware compatibility which is the main difficulty for application developers to realize reusability is present. Considering power usage, computing power, dimensions, hardware, and screen size, there is no one-size-fits-all solution to meet the needs of all users. In the server area, an important problem is in system compatibility.
- A server-side operating system will support multiple operating systems, web browsers, and systems that are rapidly expanding over the Internet and the Internet. Most of the dominant wireless communication systems today are commercial cell phone plans. Unlike a server, the wireless communication system is small.

2.4 Use of LDSs

There are added numeral of practice is obtainable in LDSs[22]. A number of them are elucidated in the beneath sub section.

- **Store locators** By means of location-grounded intelligence, retail customers can rapidly discover the adjacent store position.
- **Proximity-grounded marketing** Local companies can drive ads merely to individuals inside the similar geographic position. Location-based mobile marketing distributes ads to possible customers within that city who capacity actually precedes on the data.
- **Travel information** LDS can distribute real-time data, such as traffic keep posted or weather reports, to the smart phone so the user can sketch consequently.
- **Roadside assistance** In the juncture of a blown tire or accident, abundant roadside support companies present an app that authorizes them to track your specific location devoid of the necessitate for giving directions.
- **Mobile workforce management** For logistics-dependent companies that utilize individuals out in the region or at numerous locations, an LDS permits employees to ensure in at a location by means of their mobile device.
- **Fraud prevention** An LDS generates another level of security by identical a customer's position in the course of the smart phone to a credit card transaction.

At present, mobile devices with eminence competences like smart phones, watches, bracelet, and tablets have been comprehensively utilized in our regular lives. These approach and abundant mobile apps distribute extreme appropriateness to millions of operators through LDS, like formative the adjacent banking cash machine, triumph location-based mobile sensing, in receipt of coupons from adjacent-by shops, or distinguishing human functionalities. In accumulation, with substituting position data with added devices or service providers, location-based networking's events can further progress communication capability. LDS indicate to “a set of capitulation that adventures the associate of the geographical circumstances of a mobile device so as to transport facilities grounded on that data”[23]. They can be classified in three kinds:

- a) Public Safety/Emergency Services,
- b) Consumer Services and
- c) Enterprise services.

LDS has a capacity of utilization in mobile networking nowadays as an entertaining service, which is obtainable with hand apprehended mobile devices throughout the mobile system and it utilize data supported on the geographical location of the mobile device. It encompasses examination to distinguish a person or purpose in an exacting position, like determining the neighboring Automatic Teller Machine (ATM), neighboring fuel station, restaurants etc. Midst these functionalities traffic assessment is a ingredient of key points in rising international positions that require improved and capable scrutinize. So as to compensate for uncertainties in journey time owing to accidents, bad weather, traffic overcrowding, and so on, vehicles transport time-sensitive cargo build “buffer time” into their information with the intention to assist assurance that distributions will certainly be completed on time. Computing the straight trail is most important job within the spatial databanks. The pathway calculated by building exploit of the pre-stored confirmation is not exact.

The principal impartial of this effort is to display the actual-time traffic confirmation mixed with historical traffic information can be subjugated to expand overwhelm actions that are aggravated to highlight both appropriate and capable procedures. At the similar time as to deliver Quality of Service (QoS) in LDS stipulation also turns out to be problematic job. Consequently, there is necessitating for novel procedures for live traffic information.

3 APPLICATION OF LDSS

Location-based services may be engaged in a numeral of applications, together with: Advocating social events in a city demanding the adjacent business or service, like an ATM, restaurant or a retail accumulate Turn-by-turn direction-finding to any address Assistive healthcare schemes. Positioning people on a chart exhibited on the mobile phone In receipt of alerts, like notification of a sale on gas or caution of a traffic jam Location-based mobile advertising Asset recuperation pooled with dynamic RF to locate, for instance stolen possessions in containers where GPS would not function Contextualizing learning and examination Games where your position is ingredient of the game play, for instance your activities throughout your day create your avatar shift in the game or your location unlocks contented Real-time Q&A revolving approximately restaurants, services, and other venues. Tracking a NASA lunar lender.

3.1 Services of LDSs

The location dependent services offer supplementary value by facilitating services like[24]:

- **Tracking of dynamically distributed Resources:** Service personnel, Taxis, physicians, equipment rentals, and fleet planning.
- **Resource tracking.** Objects devoid of isolation controls, by means of passive sensors or RF tags, like packages and train boxcars.

- **Finding someone or something.** Person by ability (doctor), business directory, navigation, weather, traffic, room schedules, stolen phone, emergency calls.
- **Proximity-based notification (pushes or pulls).** Under attack advertising, buddy list, general profile matching (dating).
- **Actuation based on Proximity (pulls or pushes):** Payment is contingent on proximity (EZ pass, toll watch), and frequent airport check-in.
- Resource management. Packages and railroad boxcars are examples of items that can be isolated using RF tags or passive sensors but lack isolation controls.
- Locating anyone or something. Doctor, business directory, navigation, weather, traffic, room schedules, stolen phone, and emergency calls are some examples of people by ability.
- Proximity-based alerting (pushes or pulls). advertisement under attack, friend list, and general profile matching (dating).

3.2 Routing In LDSs

Location-based direction-finding is a scheme of rules to unreliable degrees of difficulty dictating where inbound telephone calls from diverse positions are routed to. The position of call starting point is usually resolute by the departing caller ID of the caller but can also be resolute by GPS location or indication triangulation, the latter being chiefly practical for calls impending from mobile phones[25]. Location-Aided Routing (LAR) protocol is cast off to spot information owing to this the investigate rang of routing of LAR would be constrained, consequently that the network energy utilization and routing transparency would decrease. The Energy Efficient Location Aided Routing (EELAR) procedure is utilized to nodes location data with the aim of diminishing routing transparency in Mobile network. Likewise Greedy Location Aided Routing (GLAR) protocol is cast off to progress the competence of location aided routing procedure. The Anonymous Location-Aided Routing (ALARM) in mobile system is intended to offer both safety and privacy characteristics, as well as node verification, anonymity, information integrity and intractability.

4 QUALITY OF SERVICES IN LDSS

In business settings, small offices, and even at home, QoS is a collection of technologies that provide you the power to regulate network traffic cost-effectively and improve user experiences.

4.1 QoS

By calculating network bandwidth, sensing varying network conditions (such as congestion or availability of bandwidth), and prioritizing - or limiting - network traffic, QoS solutions enable you to gather the service requirements of a workload or a relevance. For example, you can use Quality of Service (QoS) to control the collision of latency-insensitive traffic and prioritize traffic for latency-sensitive capabilities (such as speech or video streaming) (like bulk data transfers). The ability of a computing device to determine its user's actual location, such as through the use of Global Positioning Systems (GPS), which can be used to display current location on maps, collect traffic and

weather information, and serve as an automobile navigation assistance[26]. This may be made better by providing passengers with local information about the closest hospitals, hotels, or eateries.

The main issue with mobile computers is trying to follow the location of the mobile device in order to communicate with it. Modern network addressing techniques include incorporated location information; a subnet module corresponds to a system at a precise location or inside a certain association. Additionally, phone numbers contain location-specific information such the country code, area code, and local exchange[27]. The Home Position Register (HLR), which identifies the current location of the mobile device, is recognized by the phone number in the mobile telephone service. The mobile phone registers with an appointment location register when it arrives at a different service provider's reporting point, informing the HLR of its current location.

4.2 QoS in Mobile Network

Mobile phone service providers can support mobile QoS to customers just like fixed line PSTN service providers and Internet Service Providers (ISPs) can provide QoS. QoS systems are still provided for circuit-switched services that are required for inelastic services, for example broadcast communications. Migration causes problems with QoS methods for several reasons: a phone call or another session may take a long time to complete, if the new station has congestion. Random transmission makes it impossible to provide full QoS assurance during session initiation. Pricing is usually based on a per-minute or megabyte charge rather than a flat rate, and may differ for different content services. An important division of QoS[28] in the telephone connection is the quality of service, related to the possibility of dropping out (perhaps that the mobile station is outside the service coverage area, or excessive talk from the block of sub-channels, i.e. crosstalk), blocking access (something about the probability of that). unable to show the relevant QoS status) in the standby mode. It is overstated by techniques such as motion scheduling, radio resource scheduling, admission control, precision scheduling, channel-based scheduling, etc.

4.3 QoS Parameters

Depending on the application and the end user for whom it is intended, QoS is defined as the network's capacity to offer various services at high performance levels[29].

- **Network Connection Establishment Time:** When a network connection is required and the connection is confirmed in parallel. The maximum time acceptable to the user is determined by these QoS variables.
- **Probability that the network connection will fail to establish:** This possibility is discernible from the objectives that have not gathered inside the typical time window for initiating the connection.
- **Data transfer Flow:** The amount of bytes elevated above a network association in a reasonable length of time is described by the flow speeds (in minutes, in hours or, in days). The difficulty in figuring out how quickly an association network responds to input comes from the asynchronous transport packets. Examine the system on a series of various packages and consider the number of bytes of information

transmitted while accounting for the past time as the application or the information shift indicator to arrive at an adequate value.

- **Transit time for data transfer:** The transit time refers to the amount of time between a request for information transfer and the information actually being transmitted. It is difficult to calculate this transit time because of the geographic distribution's ends.
- **Rate of Residual error:** Providing an excellent service while travelling may also make it difficult to maintain control of the flow. is calculated from the number of packets that appear to be damaged, missing, or copies of the total number of broadcast packets. It is a quick packet of errors. Additionally suggests the chance that a packet might not reach the receiver adequately.
- **Transfer Probability event:** It is determined by the ratio of the number of scheduled events to the total value of the transfer made. Consider the quantity of network separation in relation to the amount of transfer taken right away to get an accurate estimate of this likelihood..
- **Network connection failure Probability:** It is based on how much data is transferred and is aimed to liberate and reorganize a network connection.
- **Time of releasing the network connection.** Between a demand for disconnecting and the actual release, this is the best possible delay.
- **Breakdown possibility upon dissolution of network association.** The amount of deliverance of breakdown requisite by the entire amount of requested release.
- **Jitter** -Packet buffering is required to control the variation in latency among various packets. Jitter control in wireless networks typically falls on the destination, which must make sure that distinct packets receive different prioritization if necessary because the buffer on the mobile terminal is likely to be tiny.
- **Bandwidth** - The most fundamental QoS metric for many end users is bandwidth, which is determined by the physical link between the destination and the client terminal as well as the total number of customers using the network at any given time. To pinpoint customers' exact positions in a mobile network, the aforementioned characteristics are frequently used.

7 SUMMARY & FUTURE WORK

This paper explained the basic concepts of mobile networks, location based services, quality of services in LDSs and applications of LDSs, and their types, the advantages and disadvantages. This chapter provides better understanding of the research work through the problem specification, objectives and overall contributions. This chapter aids in preparing the readers to focus on the core of the research. As future work the following steps will be taken to improve the QoS of LDS using different proposed algorithms.

- Present a hybrid algorithm for quickly responding to user needs with enhanced QoS in order to maintain the balance between LDS and QoS.
- Optimal route is designated increase the QoS results by reducing the deferral in the LDS.

- To minimize unnecessary location data based on mobility and improve the quality of service by lowering the response time when locating the user by figuring out their quickest route.

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सृष्टि सिंह

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सारांश— 21वीं सदी में समृद्ध, समर्थ एवं शक्तिशाली भारत निर्माण की अभिलाषा देश के कण-कण में जागृत हो चुकी है। कभी भारत को विश्वगुरु का दर्जा प्राप्त था, हमारे मनीषियों ने दुनिया को ज्ञान का प्रकाश दिया जिससे दुनिया में समृद्धि एवं खुशहाली आयी एवं दुनिया आगे बढ़ी परन्तु वक्त की दौड़ में हम पिछड़ते गए, देश काल और विषम परिस्थितियाँ भी इसके लिए जिम्मेदार रही। वर्तमान वैश्वीकरण के दौर में सशक्त एवं आत्मनिर्भर भारत निर्माण के पथ में अनगिनत प्रश्न एवं चुनौतियाँ अवरोध बनकर खड़े हो गये हैं। इन सभी प्रश्नों एवं चुनौतियों को यदि हम राजनीतिज्ञों, नीति नियोजकों, प्रशासकों, समाज वैज्ञानिकों सहित अकादमिक जगत से सम्बन्धित पक्षों के सामने विजन एवं मिशन के स्वरूप में स्मरण करें तो प्रश्नों की एक लम्बी श्रृंखला आकर खड़ी हो जाती है। इस दिशा में हमारा ध्यान विकासोन्मुख, समृद्ध एवं आत्मनिर्भर भारत निर्माण की ओर आकृष्ट होता है। इसी संदर्भ में गुणवत्तायुक्त, समावेशी एवं समसामयिक शिक्षा के उद्देश्यों को देशहित एवं मानव खुशहाली से जोड़कर देखा जाए तो ऐसा प्रतीत होता है कि अपने देश का शैक्षिक परिवेश एवं शिक्षा नीति आदि को अन्य सामाजिक-आर्थिक सुधारों की भाँति 21वीं सदी की बदलती जरूरतों के आधार पर बदलने की नितान्त आवश्यकता है।

इस पृष्ठभूमि में वर्तमान शोध पत्र 21वीं सदी की बदलती जरूरतों का आंकलन करके स्वतंत्रता के 70 वर्षों के बाद वर्तमान सरकार द्वारा सजग होकर भारतीय ज्ञान परम्परा एवं आधुनिक शिक्षा के प्रारूप को आधार बनाकर नई राष्ट्रीय शिक्षा नीति 2020 को लागू किया है, का संक्षिप्त विवरण प्रस्तुत करता है। यह शोधपत्र 21वीं सदी में सशक्त एवं आत्मनिर्भर भारत निर्माण में उत्कृष्ट शिक्षा एवं नई राष्ट्रीय शिक्षा नीति-2020 के महत्व पर केन्द्रित है।

मुख्य शब्द: राष्ट्रीय, शिक्षा, नीति, भारत निर्माण, विकास, सरकार, आत्मनिर्भर।

21वीं सदी ज्ञान की सदी है एवं ज्ञान या विद्या धन प्राप्त करने का एकमात्र साधन गुणवत्तायुक्त एवं समसामयिक शिक्षा ही है। आदिकाल से ही शिक्षा मानव समाज की खास जरूरत रही है अगर यह कहा जाए तो अतिशयोक्ति नहीं होगा कि मानव सभ्यता के विकास क्रम में शिक्षा लगातार अहम भूमिका अदा करती रही। समाज अपनी जैसी रचना करना चाहता है इसका निर्धारण वहाँ की प्रचलित शिक्षा-दीक्षा द्वारा ही तय होता है। युनेस्को की 'डैलर्स समिति' की रिपोर्ट के अनुसार किसी भी देश की शिक्षा का स्वरूप उस देश की संस्कृति, प्रगति एवं आवश्यकता के अनुरूप होना चाहिए। समावेशी एवं गुणवत्तायुक्त शिक्षा केवल शिक्षित एवं ज्ञान वृद्धि ही नहीं करती अपितु सशक्त एवं समृद्ध राष्ट्र का निर्माण भी करती है साथ ही गरिमापूर्ण मानव जीवन के लिए गुणवत्तायुक्त शिक्षा एक अनिवार्य मानवीय आवश्यकता है। इस आधार पर समावेशी, गुणवत्तायुक्त एवं समसामयिक शिक्षा की अनुपस्थिति

में किसी भी देश का समग्र विकास एवं वहाँ के नागरिकों का सशक्तिकरण एवं खुशहाली सम्भव नहीं है।

मानव जीवन में किए जाने वाले प्रत्येक कार्य के कई निश्चित उद्देश्य होते हैं। ठीक उसी प्रकार बेहतर सामाजिक व्यवस्था एवं खुशहाल मानव जीवन में शिक्षा की भूमिका व्यापक एवं अति महत्वपूर्ण होती है। मानव जीवन के विभिन्न पक्षों यथा आध्यात्मिक, नैतिक, भावनात्मक, शारीरिक एवं मानसिक विकास के अतिरिक्त मानव का समाजीकरण करना, योग्य नागरिकों को तैयार करना, मानव संसाधन, के रूप में उन्हें विकसित करना, प्रजातांत्रिक मूल्यों की स्थापना एवं सतत विकास के लक्ष्यों को प्राप्त करने हेतु शिक्षा की महत्वपूर्ण भूमिका है। शिक्षा के परिवर्तनकालीन दायित्व भी होते हैं। सामाजिक, सांस्कृतिक, आर्थिक उन्नयन, राजनैतिक परिवर्तन, सामाजिक न्याय एवं राष्ट्र निर्माण जैसे अर्थपूर्ण दायित्व इसके अंतर्गत शामिल है। बेहतर राष्ट्र निर्माण के लिए समाज के कमजोर एवं पिछड़े वर्गों में शिक्षा का प्रसार करके ही समावेशी समाज की स्थापना संभव है।

इसमें कोई संदेह नहीं कि स्वतंत्रता प्राप्ति के पश्चात अपने देश की सरकारों ने समय-समय पर देश के बच्चों के बेहतर भविष्य के लिए शिक्षा के महत्व के बारे में सचेत होकर राष्ट्रीय शिक्षा नीति को अपनाया था परन्तु इसके वांछित परिणाम हासिल नहीं हो सके। हमारा देश एक बार पुनः ज्ञान शक्ति का उत्कृष्ट केन्द्र बने इसके लिए राष्ट्रीय शिक्षा नीति 2020 के स्वरूप को महात्मा गांधी की 'नई तालीम' जिसमें शिक्षा, हुनर एवं तन्दुरुस्ती का सुन्दर समन्वय है एवं डॉ० आम्बेडकर द्वारा बनाये गये संविधान से प्रतिबद्ध करके सशक्त एवं आत्मनिर्भर भारत निर्माण के स्वप्न को साकार करने की दिशा में एक ठोस कदम है। नई राष्ट्रीय शिक्षा नीति को प्रगतिशील एवं अद्यतन बनाकर एक ओर हमारी शिक्षा व्यवस्था की कमियों को दूर करने के प्रयास किये गये हैं तो दूसरी ओर 21वीं सदी के बदलते हुए भारत की आन्तरिक एवं वैश्विक चुनौतियों का सामना करने की तैयारी भी की गई है। प्राचीन भारतीय ज्ञान परम्परा को केन्द्र बनाकर तैयार इस विश्वस्तरीय राष्ट्रीय शिक्षा नीति में देश के भावी कर्णधारों को परम्परागत एवं आधुनिक ज्ञान कोष से सिंचित करके कर्तव्यनिष्ठा एवं वैश्विक नागरिक तैयार करने की परिकल्पना की गई है।

वैश्विक मानकों के अनुरूप तैयार, नई राष्ट्रीय शिक्षा नीति में परम्परागत सांस्कृतिक विरासत, भारतीय समाज, मातृभाषा, भारतीयता एवं नवाचारयुक्त आधुनिक ज्ञान, तकनीक से ज्ञानार्जन आदि पर विशेष जोर दिया गया है। नई राष्ट्रीय शिक्षा नीति के प्रारूप का सूक्ष्मता से अध्ययन करके सहज रूप से समझा जा सकता है कि वैश्वीकरण एवं तकनीक के दौर में यह शिक्षा नीति अपने देश के विद्यार्थियों को जिम्मेदार वैश्विक नागरिक के रूप में विकसित करेगी जो देश के समक्ष उत्पन्न आन्तरिक एवं बाह्य जटिल चुनौतियों का समाधान खोजने में रचनात्मक ढंग से अहम भूमिका निभायेंगे।

नई राष्ट्रीय शिक्षा नीति की आवश्यकता—

भारतीय शिक्षा क्षेत्र की चुनौतियाँ अनेकों हैं, सस्ती एवं सबको शिक्षा, गुणवत्तायुक्त, कौशल बढ़ाने वाली, रोजगारपरक, नवाचारयुक्त आधुनिक ज्ञान एवं देश की अर्थव्यवस्था को मजबूती देने वाली शिक्षा आज समय की मांग है। पिछले कुछ वर्षों से देश में यह महसूस किया जा

रहा था कि तेज गति से वैश्विक परिवेश में हो रहे बदलाव के कारण उत्पन्न जटिल परिस्थितियों के अनुरूप एवं देश के बेहतर भविष्य की खातिर साथ ही भारतीय अर्थव्यवस्था की बदलती आवश्यकताओं को देखते हुए देश की शिक्षा नीति को पुर्नभाषित करने की तत्काल आवश्यकता है। दूसरे शब्दों में शिक्षा की पुरानी स्थितियों से आगे निकलकर आने की आवश्यकता को समझकर एवं ऐतिहासिक विसंगतियों को सुधारने के लिए वर्तमान सरकार ने देश में 34 वर्षों के बाद नई राष्ट्रीय शिक्षा नीति को लागू किया है। यह राष्ट्रीय शिक्षा नीति वैश्विक सोच दूरदर्शी एवं प्रगतिशील एवं ज्ञान शक्ति की भावना से परिपूर्ण है। जिसको तैयार करने के लिए पंचायत से लेकर संसद तक, ग्राम प्रधान से लेकर प्रधानमंत्री तक, छात्र से लेकर अभिभावक तक, शिक्षक से लेकर शिक्षाविदों तक, साधारण व्यक्ति से लेकर उद्योगपतियों तक, सभी के साथ विमर्श एवं सभी के सुझाव शामिल हैं। कदाचित यह वैश्विक एवं आधुनिक सोच से परिपूर्ण एक ऐसी समावेशी राष्ट्रीय शिक्षा नीति है जिसे दुनिया में विशालतम विचार विमर्श, मंथन एवं चिंतन के उपरान्त अपना स्वरूप प्राप्त हुआ है।

इक्कीसवीं सदी महापरिवर्तन की सदी है इस संदर्भ में वर्तमान सरकार की महत्वाकांक्षी नई राष्ट्रीय शिक्षा की सफलता का दामोदार उसे इमानदारी से लागू किये जाने पर निर्भर है कदाचित इसलिए नई राष्ट्रीय शिक्षा नीति में शिक्षा की गिरती हुई शाख को पुर्नस्थापित करने की ओर विशेष ध्यान दिया गया है। यहाँ यह भी उल्लेख करना आवश्यक है कि प्राथमिक से लेकर उच्च शिक्षा संस्थानों के स्तर पर इसका क्रियान्वयन चुनौतीपूर्ण अवश्य है परन्तु प्रतिबद्ध, योग्य एवं सक्षम अकादमिक नेतृत्व इस देशहित के काम को बखुबी कर सकता है। नई राष्ट्रीय शिक्षा पर चर्चा करते हुए यह बात नही भूलनी चाहिए कि शिक्षा भारतीय संविधान में सातवीं अनुसूची की समवर्ती सूची में शामिल है। ऐसे में इस राष्ट्रीय शिक्षा नीति के अपेक्षित परिणामों को हासिल करने के लिए केन्द्र एवं राज्य सरकारों को कन्धे से कन्धा मिलाकर अपनी जिम्मेदारियों को वहन करना होगा।

अन्त में यह कहना समीचीन प्रतीत होता है कि वर्तमान राष्ट्रीय शिक्षा नीति 2020 स्वयं में 135 करोड़ भारतीयों की आकांक्षाओं, उम्मीदों एवं भावनाओं को अपने अंदर समेटे स्वर्णिम भारत का स्वप्न लिए एक प्रगतिशील एवं दूरदृष्टिगामी राष्ट्रीय नीति है जो आने वाले समय में श्रेष्ठ एवं आत्मनिर्भर भारत के निर्माण में निर्णायक भूमिका अदा करेगी। आज जब देश की राष्ट्रीय शिक्षा नीति 2020 को लागू करने के लिए एक वर्ष बाद देशभर के अकादमिक जगत में इस शिक्षा नीति के विभिन्न संदर्भ पर व्यापक विचार विमर्श एवं चर्चाओं का दौर चल रहा है तो ऐसे में हम सभी के मन मस्तिष्क में एक उत्साह का संचार एवं एक उम्मीद बंधी है कि अगर शिक्षा नीति से सम्बन्धित सभी हितधारकों के बीच समन्वय एवं दृढ़ता कायम रही तो भारतीय शिक्षा तंत्र निकट भविष्य में अंतरराष्ट्रीय उत्कृष्ट मानकों तक पहुँचेगा जिससे श्रेष्ठ एवं आत्मनिर्भर भारत निर्माण का हमारा ध्येय पूरा होगा।

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गांधीजी की पर्यावरण दृष्टि, पर्यावरण संकट एवं सतत् विकास

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सारांश— इक्कीसवीं सदी महापरिवर्तन की सदी है एवं इसी सन्दर्भ में इक्कीसवीं सदी अन्ध एवं मनमाने विकास की उपासक भी है। आज धरती पर पर्यावरण को ताक पर रखकर क्रूर एवं अनियंत्रित विकास के साथ-साथ गरीबी, भूख, असमानता, भय, भ्रम एवं भ्रष्टाचार भी दिनों-दिन बढ़ता जा रहा है। वर्तमान वैश्वीकरण के दौर की विडंबना यह है कि दुनिया भर में तेज गति से चल रही औद्योगिक गतिविधियों के बावजूद इंसान, पशु-पक्षी, प्रकृति एवं पर्यावरण सब बेहाल है एवं धरती तक का अस्तित्व खतरे में पड़ गया है। वैश्वीकरण एवं उपभोक्तावाद के बढ़ने से धन, लोभ, लालच, शक्ति, सत्ता की लोलुपता, हिंसा एवं बर्बरता सर्वत्र व्याप्त हो गई है।

विकास एक बहुआयामी एवं सकारात्मक सामाजिक-आर्थिक परिवर्तन की संकल्पना है जो समग्रता में मानव कल्याण एवं खुशहाली को अधिकतम करने में निहित है। विकास एवं पर्यावरण के बीच घनिष्ठ संबंध है। विकास का एक पक्ष सतत् विकास के साथ पर्यावरण संरक्षण भी है। दूसरी तरफ विकास के कई नकारात्मक परिणाम भी होते हैं। सामाजिक एवं आर्थिक विकास नीतियों को क्रियान्वित करने पर उसका प्रभाव प्रकृति एवं पर्यावरण पर निश्चित रूप से पड़ता है। मनुष्य अपनी उत्पत्ति के साथ ही प्रकृति पर निर्भर रहा है एवं उसकी खुशहाली प्रकृति के संरक्षण में ही निहित है परन्तु कटु सच्चाई यह है कि अब मनुष्य की प्रकृति पर निर्भरता मात्र अपनी आवश्यकताओं हेतु ही नहीं रह गई है वरन् अब विकृत होकर लोभ का रूप ले चुकी है जिसके कारण मनुष्य स्वयं के मनमाने विकास की भूख एवं लालच के लिए कोई भी कीमत चुकाने को तैयार दिखता है।

मुख्य शब्द: गांधीजी, पर्यावरण, दृष्टि, संकट, सतत्, विकास, संसाधन।

अपनी अनन्त आवश्यकताओं एवं उपभोग के लिए मनुष्य ने पिछली शताब्दी से ही प्राकृतिक संसाधनों का मनमाने तरीके से दोहन शुरू कर दिया था जिसके कारण अपने द्वारा किए गए पर्यावरणीय विनाश का स्वयं शिकार बन गया। पर्यावरण के क्षतिग्रस्त होने से केवल आर्थिक विकास में ही बाधा उत्पन्न नहीं होती बल्कि प्रकृति के ताना-बाना विकृत एवं नष्ट होने से सामाजिक-आर्थिक एवं राजनीतिक क्षेत्र में गंभीर समस्याएँ, प्राकृतिक आपदाएँ एवं बर्बादी, गरीबी, भूखमरी, अपराध वृद्धि एवं विभिन्न प्रकार के जानलेवा रोग आदि उत्पन्न हो जाते हैं। ऊपर दिए गए प्रसंग के आलोक में यह कथन समझना आसान है कि आज जिस धरती पर हम रह रहे हैं वहाँ का प्राकृतिक पर्यावरण इंसान के अन्ध विकास की चाहत में बर्बर ढंग से अत्यधिक दोहन के कारण असन्तुलित एवं क्षतिग्रस्त होकर विकृत हो गया है जिसके परिणामस्वरूप पूरा जीवमण्डल एवं मानवता विनाश के कगार पर खड़ी है।

गांधीजी मनुष्य के इस अन्ध एवं मनमाने विकास यात्रा के खिलाफ थे। उनके लिए विकास का अर्थ था गरीबी, भय, भूख एवं दुःख से मुक्ति। वे अत्यधिक उपभोग एवं प्रकृति के

क्रूर दोहन आदि मानवीय कृत्यों को हिंसा मानकर बर्बादी एवं विनाश के इस मार्ग का निषेध करते थे। गांधीजी धरती के पर्यावरणीय संकट से चिन्तित थे एवं उनका मानना था कि मानवता की खुशहाली एवं प्रकृति संरक्षण के लिए बड़ा से बड़ा त्याग करना पड़े तो तनिक भी दुविधा नहीं होनी चाहिए। लेकिन उनके समय में नए किस्म का विकास प्रारूप पनपा एवं पसरा (फैला) वह यथार्थ की पश्चिमी समझ पर आधारित था। गांधीजी के शब्दों में “चौतरफा बर्बादी हुई”। गांधीजी की पर्यावरणीय दृष्टि प्रकृति के प्रति अनुराग एवं संरक्षण की प्राचीन भारतीय संस्कृति पर आधारित है जिसके अंतर्गत हम प्रकृति से जुदा अस्तित्व की कल्पना भी नहीं कर सकते। भारतीय संस्कृति के संदर्भ में देखा जाए तो मनुष्य प्रकृति का एक अविभाज्य अंग है। हम प्रकृति से एवं प्रकृति हमसे जुदा नहीं रह सकती। भारतीय मनीषियों ने समूची प्रकृति के साथ सभी प्राकृतिक शक्तियों को देवता तुल्य माना है। एक पेड़ को दस पुत्रों के समान एवं धरती को माता तुल्य माना है।

इक्कीसवीं सदी में कटु सच्चाई यह है कि पर्यावरण संकट बढ़ने के कारण धरती पर मनुष्य के सभी जीवन उपयोगी क्रियाकलापों का भविष्य संकट में पड़ गया है। विसंगति यह है कि विकास की अन्धाधुन दौड़ में प्रकृति संरक्षण एवं पर्यावरण सुरक्षा महज एक नारा एवं दिखावा बनकर रह गया है। यह कहना समीचीन है कि आज मानव सभ्यता पर्यावरणीय मोर्चे पर बुरी तरह से पिछड़ गई है एवं आगे भी किसी क्रांतिकारी बदलाव आने की कोई संभावना नजर नहीं आ रही है। सच्चाई यह भी है कि विकसित देशों द्वारा अपने ऐश्वर्य के साधनों की आपूर्ति एवं उपभोग मुख्य जीवनशैली के लिए जिस विकास प्रारूप को अपनाया इसी के परिणाम स्वरूप वहाँ का प्राकृतिक पर्यावरण क्षतिग्रस्त हुआ बाद में वह संकट उस देश के साथ अन्य देशों को अपनी चपेट में लेता चला गया। एक अन्तर्राष्ट्रीय पर्यावरण संस्थान “क्लब आफ रोम” ने अपने ग्रंथ “सीमाओं के पार” में दर्शाया है कि हम बहुत तेजी से सीमाओं के नजदीक पहुँच गए हैं, अर्थात् जिस सीमा बिंदु पर दुनिया के विनाश का खतरा है, हम वहाँ पहुँचने ही वाले हैं। अतः अब इस विनाशकारी विकास को रोक दो और दूसरी विकास प्रारूप अपनाओ। इस तरह से खबरदार किया गया है।

इक्कीसवीं सदी में पर्यावरण संकट किसी एक देश तक सीमित नहीं है क्योंकि बड़े पैमाने पर उपभोग के लिए असंख्य भौतिक वस्तुओं के उत्पादन से संबंधित उद्योग धरती के एक कोने से दूसरे कोने तक फैल गए हैं। उद्योग, पूँजी एवं श्रम ने वैश्वीकरण के प्रभाव में राष्ट्रीय सीमाओं को पार कर लिया है जिससे दुनिया भर में प्राकृतिक पर्यावरण में तेजी से असंतुलन एवं बदलाव आ गये हैं एवं क्षतिग्रस्त पर्यावरण की जटिल समस्या किसी विशेष देश की न रहकर विश्वव्यापी हो गई है। अनेकों अंतर्राष्ट्रीय और राष्ट्रीय संस्थानों द्वारा विश्व स्तर पर किए गए पर्यावरणीय अध्ययनों से पता चलता है कि पर्यावरण संकट से विभिन्न देशों को उनके सकल राष्ट्रीय उत्पादन पर प्रति वर्ष पाँच से आठ प्रतिशत तक हानि उठानी पड़ रही है। सतत विकास के पक्षधर विद्वानों का दृढ़ विचार है कि पर्यावरण हानि का स्वभाव व पैमाने को ध्यान में रखते हुए तथा इससे होने वाले प्रतिकूल एवं नुकसान प्रभाव के पर्याप्त प्रमाणों के आधार पर सतत आर्थिक नियमों को लागू करने के लिए पर्यावरण को प्राथमिकता देना नितान्त आवश्यक है। पर्यावरणविदों का यह भी मानना है कि पर्यावरणीय गुणवत्ता को बनाए रखना एवं

प्राकृतिक संसाधनों को बचाए रखना मूलरूप से मनुष्य के कल्याण एवं स्वास्थ्य के लिए भी अत्यन्त आवश्यक है।

उपरलिखित प्रसंग के आलोक में गांधीजी के पर्यावरणीय दर्शन एवं सतत् विकास अवधारणा एवं उद्देश्यों में पूर्ण समानता नजर आती है। जिसके अंतर्गत निरपेक्ष रूप से यह निष्कर्ष निकलता है कि आधुनिक पूंजीवादी वैश्विक समाज अपनी भौतिक एवं उपभोक्तावादी जीवनशैली के लिए मनमानी करने पर उतारू है एवं इक्कीसवीं सदी की वैश्विक पूंजीवादी आर्थिक व्यवस्था में भौतिकतावाद एवं मुनाफे के गुणोत्तर वृद्धि की भावना चरम पर है, जहाँ लोभ, अपसंस्कृति विलासिता एवं उपभोग रूपी स्वार्थ हावी हो गये हैं, जबकि सतत् विकास के लक्ष्य सादगी, संयमित उपभोग एवं प्रकृति संरक्षण एवं संवर्धन आदि हैं।

दुनियाभर में सामाजिक गैर बराबरी को समाप्त करके समतामूलक समाज की स्थापना की चाहत रखने वाले, मानवता, सद्भावना के अग्रदूत गांधीजी सत्य एवं अहिंसा, स्वदेशी, सादगी, त्याग एवं सत्याग्रह जैसे आदर्शों को महत्व देते थे। जबकि कटु सच्चाई यह है कि आज के शोषण प्रधान वैश्विक औद्योगिक समाज में भौतिक एवं उपभोक्तावादी जीवनशैली, धन, संपत्ति एवं सत्ता के लिए होड़ लगी है। राष्ट्र, समाज, व्यक्ति प्रकृति सभी विषादग्रस्त होकर विनाश की ओर तेजी से बढ़ रहा है। आज मनुष्य, मनुष्यता, मानव गरिमा, मानव एवं प्रकृति के बीच स्नेह एवं सामंजस्य के लिए कोई स्थान शेष नहीं बचा है। इस पतनोन्मुखी वैश्विक जीवनशैली के विनाशकारी कुप्रभाव मनुष्य सहित पूरी धरती को निगल जाने को व्याकुल है। दुनिया भर में पर्यावरण की स्थिति बद से बदतर होती जा रही है एवं धरती के पर्यावरण संकट को देखकर दुनिया भर के लोग चिंतित एवं भय ग्रस्त हैं। गांधीजी सभी प्रकार की हिंसा एवं बर्बरता का मुकाबला करने के लिए दृढ़ता, हिम्मत, संकल्प एवं सत्याग्रह आदि को मौलिक हथियार बनाने के पक्षधर थे। वैश्विक स्तर पर आज मानव समाज के सामने अनेकों गंभीर, जटिल समस्याएँ एवं चुनौतियाँ उत्पन्न हो गई हैं जिसका निराकरण मानव समाज के पास नहीं है। इस संदर्भ में महात्मा गांधी पहले की तुलना में ज्यादा प्रासंगिक होकर राष्ट्रीय महापुरुष से ऊपर उठकर वैश्विक स्तर पर सर्वमान्य महामानव बन गए हैं।

सतत विकास का आशय

पर्यावरण के संकट एवं पारिस्थितिकी असंतुलन की विभीषिका को ध्यान में रखकर प्राकृतिक संसाधनों को आने वाली मानव पीढ़ियों के लिए संरक्षित करने के उद्देश्य से पर्यावरणाविदों, वैज्ञानिकों तथा विचारकों के प्रयास से एक दूरदर्शी अवधारणा सतत् विकास का जन्म हुआ है। यह अवधारणा एक ऐसी विचारपूर्वक संगठित सिद्धांत को प्रोत्साहित करती है जहाँ प्राकृतिक संसाधनों की अखंडता एवं स्थिरता को प्रभावित किए बिना मानवीय आवश्यकताओं को पूरा किया जाता है। सतत् विकास की अवधारणा 1960 के दशक में तब विकसित हुई जब तीव्र औद्योगीकरण के लिए प्राकृतिक संसाधनों का बेरहमी से दोहन किया जाने लगा जिसके परिणामस्वरूप पर्यावरण पर गम्भीर नकारात्मक प्रभाव दिखने लगा। 1962 में वैज्ञानिक रेचल कार्सन ने “द साइलेट स्प्रिंग” नामक पुस्तक लिखकर सर्वप्रथम इस अवधारणा की ओर ध्यान आकर्षित किया। 1972 में मैसाचुसेट्स संस्थान के युवा वैज्ञानिकों के एक समूह “क्लब ऑफ रोम” ने अपनी रिपोर्ट ‘लिटमस टू ग्रोथ’ प्रकाशित की जिसमें पर्यावरण एवं विकास के

वैश्वीकरण के दौर में आर्थिक विकास सभी देशों के लिए अहम मुद्दा बन चुका है एवं आर्थिक विकास के लिए औद्योगिकरण को अपने-अपने देशों में बढ़ावा देना प्रथम शर्त है। विकसित देश विकास की गई ऊँचाइयों को प्राप्त करने के लिए आतुर है जबकि विकासशील देशों में विकसित देश का तमगा हासिल करके अपनी महत्ता बनाए रखने की चेष्टा में लगे हैं। इस विकास की खातिर दुनियाभर में बड़े पैमाने पर कल-कारखाने, ऊँची-ऊँची इमारतों के महानगर, सड़क, पुल, बांध, बिजलीघर इत्यादि आधारभूत संरचनाओं को तैयार किया जा रहा है। आर्थिक विकास के दुष्क्र में फंसा मानव समाज दूसरे ग्रहों पर भी मानव बस्तियाँ बसाकर वहाँ के प्राकृतिक संसाधनों को अपने नियंत्रण में लेने के लिए प्रयासरत है। मनमाने विकास की खातिर मनुष्य धरती से बर्बर तरीका अपनाकर बेतहाशा खनिज, धातु एवं अन्य प्राकृतिक संसाधनों को निचोड़ने का प्रयास कर रहा है। जिससे आने वाले कुछ ही वर्षों में धरती के अंदर से सोना, चांदी, लोहा, तांबा एलमुनियम, पीतल एवं कच्चा तेल आदि सहित सभी खनिजों का कोष समाप्त हो जाने की आशंका उत्पन्न हो गई है। इससे आने वाली पीढ़ियों के लिए धरती के अंदर कुछ शेष बचा नहीं रह सकेगा। आर्थिक प्रगति एवं विकास के नाम पर पूरी धरती पर एक प्रकार की होड़ चल रही है जिससे धरती के पर्यावरण को मानव जनित क्रूर हस्तक्षेप से लगातार क्षति पहुँच रही है।

गांधी दर्शन, सतत् विकास एवं आधारभूत मानव आवश्यकताएँ

गांधी दर्शन में प्रकृति के साथ स्नेह एवं संरक्षण की भावना गहरे से समाई हुई है, जिसका मूल मंत्र प्राकृतिक संसाधनों को वर्तमान एवं भावी पीढ़ी के लिए अक्षुण्ण रखना था। आधुनिक सतत् विकास की अवधारणा की खोज भारतीय वांग्मय में भी की जा सकती है। गांधी दर्शन में प्राकृतिक शक्तियों की रक्षा करने, अनुराग रखने, स्वस्थ एवं संतुलित रखकर, सादगीपूर्ण ढंग से जीवन यापन करने का आह्वाहन किया गया है। आज धरती का पर्यावरण संकट किसी से छिपा नहीं है। धरती के पर्यावरण पर मानव हस्तक्षेप का दबाव लगातार बढ़ता जा रहा है जिसके कारण पर्यावरण संकट अंतराष्ट्रीय चुनौती बन चुका है।

वर्तमान विश्व आर्थिक व्यवस्था में भौतिकता, लालच, विलासिता एवं उपभोग रूपी स्वार्थ हावी हो गए हैं। जबकि सतत् विकास के अन्तर्गत संयमित उपभोग ही मानव सभ्यता एवं मानव जीवन का नियम, वास्तविकता एवं आधार है। यदि कोई व्यवस्था या समाज अपने स्वार्थ एवं लोभ के पोषण करने की चेष्टा करता है तो वह सभी को गम्भीर खतरे में डाल देता है। मानव विकास एवं समृद्धि मानव खुशहाली के लिए जरूरी है एवं व्यक्ति, समाज, विकास एवं पर्यावरण में संतुलन भी आवश्यक है। पूँजीवाद बढ़ने से उपभोग के दुर्गुणों के कारण पर्यावरण विनाश, बर्बादी की शुरुआत हुई साथ ही लम्बे समय से चल रही विकास एवं उन्नति के बावजूद आज दुनिया भर में जनसंख्या का बड़ा प्रतिशत भूखा, नंगा, दरिद्रता, बेकारी, रोग, अपराध के दुष्प्रभावों से कराह रहा है।

गांधीजी देख रहे थे कि उन दिनों मानव सभ्यता विलासितापूर्ण एवं उपभोग जैसी क्रूरता, जिसे वे प्रकृति के विरुद्ध हिंसा मानते थे की दिशा में आगे बढ़ रही है। समग्रता में गांधीजी की पर्यावरणीय दृष्टि एवं सतत् विकास के लक्ष्यों में पूरी समानता है जिसके अंतर्गत धरती पर रहने वाले सभी प्राणियों का समय के साथ कल्याण बढ़ता जाए एवं जिससे धरती के पर्यावरण को भी नुकसान न पहुँचे। सच्चाई यह है कि गांधी के जीवनकाल में आज के जैसी पर्यावरण क्षति जैसी विकराल समस्या विद्यमान नहीं थी। गांधीजी उत्पादन एवं उपभोग दोनों की सीमा तय करने के पक्ष में थे। उन्होंने कहा था कि इस धरती के पास हमारी आवश्यकताओं की पूर्ति के लिए तो पर्याप्त संसाधन हैं लेकिन इंसानी लालच एवं अति उपभोग को पूर्ण करने के लिए बहुत कम है। गांधीजी की दृष्टि से मानव समाज की अनेकों वर्तमान एवं भावी समस्याएं छिपी नहीं रह सकी थी। उन्होंने अपनी जीवन यात्रा में उन सभी शैलियों, विधियों, विचारों और वस्तुओं को अपनाया जो प्राकृतिक एवं नैसर्गिक थी।

बिगड़ता पर्यावरण एवं पर्यावरण बनाम विकास

वर्तमान समय में मानव समाज पूरी दुनिया में अपने मानवाधिकार एवं अनेकों अनावश्यक मुद्दों को लेकर चर्चा में लीन है। चर्चा के दौरान में गरमा-गरम बहस एवं तू-तू, मैं-मैं होना एक सामान्य बात देखने में आ रही है। इस आधार पर प्रकृति को भी अधिकार के रूप में संरक्षित करना आवश्यक है परन्तु मानव लगातार बेरहमी से धरती एवं इसके प्राकृतिक पर्यावरण को रौदता जा रहा है एवं प्रकृति सिसक रही है। ऐसा प्रतीत हो रहा है कि भविष्य में धरती पर जनसंख्या का दबाव और बढ़ेगा, तेज होती औद्योगिक गतिविधियों के कारण भविष्य में प्राकृतिक आपदा एवं अन्य प्रकार के पर्यावरण संकट, जलवायु परिवर्तन एवं असामान्य मौसमी

दशाओं की सघनता, बारंबारता एवं व्यापकता बढ़ेगी। धरती के तापमान में वृद्धि होगी, ग्लेशियर पिघलने के कारण समुंद्र जलस्तर में वृद्धि होगी, कभी सूखा, कभी बाढ़, फसलों की पैदावार घटेगी एवं नाना प्रकार के जानलेवा रोग से पीड़ित होकर मानव, पूरा प्राणी जगत एवं धरती का पारिस्थितिकी तंत्र बेहाल रहेगा। इस विवेचना से यह सहज अनुमान लगाया जा सकता है कि मनमाने विकास एवं विलासिता पूर्ण जीवन की चाहत में धरती के प्राकृतिक पर्यावरण को मानव जनित बर्बरता से नुकसान पहुँच रहा है जिससे धरती पर पर्यावरण संकट गम्भीर स्वरूप धारण कर चुका है।

पर्यावरण समर्थक एवं सतत विकास के पक्षकार मानते हैं कि धरती एवं यहाँ का पारिस्थितिकी तंत्र मनमाने विकास को अब वहन नहीं कर सकता है। वे सतत् विकास को पर्यावरण संरक्षण, सामाजिक न्याय, समावेशन एवं आर्थिक विकास को जोड़ने वाली कड़ी के रूप में देखते हैं।

उपसंहार

यह कहना समीचीन है कि पिछली शताब्दी से ही धरती पर जिस प्रकार से मनमाने विकास की जिद एवं होड़ चल रही है वह कहीं से भी मानव कल्याणकारी नहीं है। वैश्विक स्तर पर मूल्यविहीन जीवनशैली के परिणामस्वरूप पर्यावरण विध्वंश की स्थिति बद से बदतर होती जा रही है। धरती आज मानव विलासिता के बोझ से दबकर सिसक रही है, इसलिए विकास के वर्तमान प्रारूप को तत्काल बदलने की जरूरत महसूस की जा रही है एवं इक्कीसवीं सदी में पर्यावरण संकट अन्तर्राष्ट्रीय चुनौती बन चुका है।

तमाम अध्ययनों के नतीजों से पुष्टि होती है कि मानव लोभ के कारण धरती के प्राकृतिक संसाधनों का क्षय एवं क्षरण जारी है। धरती की स्वाभाविक उर्वरा शक्ति एवं जल संरचना को उद्योगों के विषैले रसायन नष्ट कर रहे हैं। धरती का मौसम चक्र बदलकर बिगड़ रहा है प्राकृतिक आपदाओं की आवृत्ति एवं भयावहता में वृद्धि हो रही है। धरती के इन खतरो ने जनजीवन पर अपना दुष्परिणाम डालना शुरू किया तो मनुष्य की चेतना जागृति हुई। दुनिया भर में पर्यावरण, प्राकृतिक संसाधनों का अत्यधिक दोहन एवं क्षरण, धरती के मौसम चक्र में परिवर्तन एवं तापमान में वृद्धि जैसे विषय चर्चा के विषय बनने लगे हैं जिसके परिणामस्वरूप राष्ट्रीय एवं अन्तर्राष्ट्रीय मंचों से धरती को बचाने की कोशिशें तेज हुई हैं। विकास सामाजिक-आर्थिक विकास की बहुआयामी एवं जटिल प्रक्रिया है जिसे एकांकी दृष्टिकोण से देखने एवं समझने की अपंगता साफ-साफ नज़र आ रही है।

अन्त में, पिछली सदी अगर इंसानी जरूरतों के चलते धरती के विनाश के लिए जानी जाना चाहिए तो वर्तमान सदी उन नुकसानों की भरपाई के लिए जानी जाए, ये कोशिशें हर हाल में सफल होनी चाहिए। समग्रता में गांधी दर्शन एवं सतत् विकास के लक्ष्य एक ही है। जिस कारण से धरती को बचाने की मुहिम, सतत् विकास एवं सतत् समृद्धि के लिए गांधीजी के देश भारत को अग्रणी भूमिका में खड़े रहना चाहिए। आजादी का अमृत महोत्सव मना रहे अपने देश की गांधीजी को यही सच्ची श्रद्धांजली होगी।

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E- LEARNING AND DEVELOPMENT OF E-MODULES ON MICROTEACHING SKILLS – A KEY TOWARDS SUSTAINABLE DEVELOPMENT IN TEACHER EDUCATION

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Abstract - The coronavirus disease 2019 (COVID-19) had prompted the shift from traditional face-to-face instruction to new methods in online platforms. As national governments enforced public health measures to minimize the risk of the virus' transmission, learning institutions grapple with the new norms in education. Teachers were finding ways to address the changes attendant to the current situation. Old practices had to be revisited and recalibrated to fit the demands of a global community in a pandemic. Online teaching and learning mode had been followed by Teacher Education institutes also. Micro-teaching is an important part of the B.Ed curriculum. Micro-teaching, a teacher training technique currently practiced worldwide provides teachers an opportunity to perk up their teaching skills by improving the various simple tasks called teaching skills with the proven success among the novice and seniors. It has practical approach rather than theoretical of teacher education. challenges and opportunities can be determined in e learning of Micro-Teaching skills and then e modules based on the analysis of collected data from teacher educators and B.Ed teacher trainee. This can be a separate topic for research study.

Online lectures are the main means of learning during the Covid-19 Pandemic. It is inevitable that at this time, the Teacher Education campus is also carrying out lectures online from home due to the Covid-19 pandemic. B.Ed Trainees and teacher educators continue to conduct online-based lectures through various applications. “Microteaching” is one of the important part of the D.Ed and B.Ed Curriculum and is being taught online during lockdown in present days. As it was sudden shift from traditional face to face to online instructions. Educational institutes and students were not technically trained for online teaching/learning Each coin has two sides. Online learning has also its advantages and disadvantages. Microteaching is a teacher training technique and not a method of classroom instruction. It has more practical approach rather than theoretical. Microteaching has a practical approach being an individualized training and skill acquisition part, where observation and immediate feedback by teacher educator and peer group. It has many challenges as it was sudden shift from traditional teaching to online. Institutes, teacher educator and B.Ed. Trainees were not technically trained and even methods and methodologies are not yet developed. We have never imagined the lock down situation in dream also...but we had to face. The whole world was still connected digitally. Modern age is the age of digital age. Hence, Need of the hour is to find out the challenges and opportunities in e -learning of Microteaching skills by collecting data through questionnaire and develop e modules on Microteaching skills to acquire sustainable development in Teacher Education.

Keywords- Challenges, Opportunities e-learning, Micro-teaching skills e –module, sustainable development, Teacher Education.

1 INTRODUCTION

Education is the fundamental means of human development. By it the innate powers of human beings are developed, their knowledge skills and competencies are enhanced and their behaviour is changed and they are made civilized and cultured citizens. An educational institution performs a significant function of providing learning experiences to lead their students from the darkness of ignorance to the light of knowledge. Teaching is a process, which usually takes place in the classroom situations. It is more of a formal process. The art of teaching does not merely involves a simple transfer of knowledge from one to other. Instead, it is a complex process that facilitates and influences the process of learning. Teaching is multidimensional. It is a complex and diverse activity. In performing his role of teaching, a teacher is demanded to teach effectively. An effective teaching is an intelligent knowledge based activity because it draws on a multiplicity of cognitive, affective and interpersonal elements. Teachers are arguably most important members of our society. They give children purpose, set them up for success as citizens of our world, and inspire in them a drive to do well and succeed in life. Quality of a teacher is estimated on how much the students understand from his/her teaching.

The key personnel in the institutions who play an important role to bring about this transformation are teachers. As stated by NCTE (1998) in Quality Concerns in Secondary Teacher Education, –The teacher is the most important element in any educational program. It is the teacher who is mainly responsible for implementation of the educational process at any stage This shows that it is imperative to invest in the preparation of teachers, so that the future of a nation is secure E-learning is commonly referred to the intentional use of networked information and communication technology in teaching and learning. A number of other terms are also used to describe this mode of teaching and learning. They include; Online learning, Virtual learning, Distributed learning, Network and web-based learning.

1.1 Status of Teacher Training before Micro-Teaching

General observations about teaching and teacher training based on the findings of researches conducted in India and abroad before the introduction of Micro-teaching practice were:

1. No consensus on the procedures followed in various aspects of teaching in training colleges.
2. No specific training objectives to guide student teaching
3. Haphazard and Undiscriminating supervision of practice teaching –ill planned, ill supervised and ill assessed.
4. Subjective feedback with respect to teacher training performance.
5. No research support to prove its effectiveness in the light of these research findings and the reflections contained in ‘Challenge of Education –A Policy Perspective’ Micro-teaching is a new approach in teacher education. Now it has become the part and parcel of teacher education programs relating to teacher training.

2 ORIGIN AND DEVELOPMENT OF MICRO-TEACHING

Education is an important instrument of human development. The quality of education largely depends upon the quality of teachers in general. It is the felt need to improve the quality of teacher education programme. The educationists wanted to reshape teacher education programmes. The method of approach for training in teaching adopted in training institutions needs scientific approach. Supervision of practice teaching is haphazard and mostly unreliable. There is no organized form of feedback regarding the performance of the teacher in the class room. The suggestions offered by the teacher educators are mostly subjective. They are based on general impressions. In this context, the alternative approach is adopted. This innovative method is MICROTEACHING. Microteaching is one of the most important developments in the field of teaching practice. Microteaching is a constitute teacher training technique. It is a versatile tool that simplifies the teaching skills. Microteaching is a stimulated skill teaching to provide the feedback to teacher trainee for the modifications of teacher behaviour. It is more analytical method and completely new approach to provide the feedback to modify teacher's behaviour according to the specified objectives. Microteaching is a controlled practice in which the normal complexities of classroom are reduced and that makes possible to concentrate on teaching behaviour in the student teacher training. The idea of micro-teaching originated for the first time at Stanford University in USA, when an Experimental Project on the identification of teaching skills was in progress under the guidance and supervision of the faculty members (Bush, Allen, McDonald Acheson and many others). This project was aided by Ford Foundation and Kettering Foundation. The team of experts was assigned the development of testing and evaluation tools to measure the attainment of teaching skills. At this juncture Keath Acheson, a research worker was investigating the utility of video tape recorder in the development of technical teaching skills. This led to the development of a systematic and accurate method of giving feedback to the teacher trainee. Thus, the term micro-teaching was first coined by A. W. Dwight Allen of the university in 1963.

2.1 Micro-Teaching in India

MicroTeaching was introduced in India in 1967, with the humble attempt made by D.D. Tiwari of Government Central Pedagogical Institute, Allahabad. In 1970, G.B. Shaw experimented with Micro-Teaching at M.S. University, Baroda. Then the Technical Teachers Training Institute, Madras introduced Micro-Teaching to train the technical teachers. TTTI of Kolkata started micro-teaching by audio-tape. In 1947, Dr. N.L. Dosajh used Micro-Teaching as a teaching device in Teachers Training Institute, Chandigarh. He also wrote a book namely: 'Modification of Teacher Behaviour through Micro-Teaching'. NCERT, SCERT, in the different states have been propagating this concept.

2.2 Theoretical Background

Microteaching, a teacher training technique currently practiced worldwide, provides teachers an opportunity to perk up their teaching skills by improving the various simple tasks called teaching skills. With the proven success among the novice and seniors, microteaching helps to promote real-time teaching experiences. The core skills of microteaching such as presentation and reinforcement skills help the novice teachers to

learn the art of teaching at ease and to the maximum extent. The impact of this technique has been widely seen in various forms of education such as health sciences, life sciences, and other areas.

Based on the current situation to include technology in teacher education and the growing demand for online instruction, self-regulated e-learning modules are an innovative teaching strategy to help improve student success and outcomes.

In proposed research study the e-module will be developed with five stages. organizing problems, learning task, investigation, result development, analysis and evaluation Behaviour through Micro-Teaching’. NCERT, SCERT, in the different states have been propagating this concept.

2.3 Definition of Microteaching

Allen. D.W.(1966) :“Microteaching is the scaled down teaching encounter in a class size and class time”.

Passi B.K. and Talita M.S.(1976) :“Microteaching is a training technique which requires student teachers to teach a single concept using specified teaching skill to a small number of pupils in a short duration of time”.

Buch (1968), “Micro-Teaching is a teacher education technique which allows teachers to apply clearly defined Caching skills to carefully prepared lessons in a planned series of five to ten minutes encounters with a small group of real students, often with an opportunity to observe the result on video tape.”

Allen and Eve (1968), “Micro-Teaching is defined as a system of controlled practice that makes it possible to concentrate on specific teaching behaviour and to practice teaching under controlled conditions.”

David B. Young defined Micro-Teaching as “a device which provides the novice and experienced teacher alike, new opportunities to improve teaching.”

2.4 Assumptions of Micro-Teaching

The assumptions on which Micro-Teaching is based areas under:-

1. Teaching is a complex process but can be analysed into simple skills.
2. Teaching skills can be practiced one by one up to mastery level under specific and simplified situation.
3. Teaching behaviour of a teacher can be observed in classroom situations.
4. Drawbacks in the teaching competency can be traced out and then they can be improved upon.
5. Complexities of normal class-room situation can be reduced. The size of the class, the duration of teaching, teaching contents etc., can be reduced for giving training to the beginner teachers.
6. Training of specific skills can be given very well by taking up one skill at a time.
7. Teacher training programme can be highly individualized.
8. Feedback to the teacher trainee can be possible immediately. The earlier the feedback to the teacher trainee, the better is his learning the different skills of teaching.

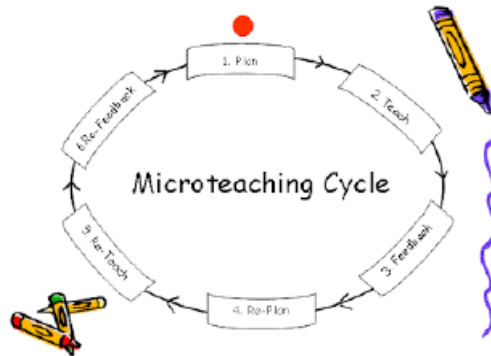
2.5 Principles Underlying Micro-Teaching

Micro-Teaching is based on a few sound principles given below.

1. Principle of One Skill at a Time
2. Principle of Limited Contents
3. Principle of Practice
4. Principle of Experimentation
5. Principle of Immediate Feedback
6. Principle of Evaluation
7. Principle of Continuity
8. Principle of Individualized Training

2.6 Micro-Teaching Cycle

The six steps generally involved in micro-teaching cycle are Plan Teach Feedback Replan Reteach Refeedback. There can be variations as per requirement of the objective of practice session. These steps are diagrammatically represented in the following figure.



2.7 Core Teaching Skills

It is not possible to train all the pupil teachers in all these skills in any training programme because of the constraints of time and funds. There fore a set of teaching skills which cuts across the subject areas has been identified. They have been found very useful for every teacher. The set of these skills are known as CORE TEACHINGSKILLS. Core Teaching Skills are:

1. Skill of probing Questions
2. Skill of explaining
3. Skill of illustrating With Examples
4. Skill of stimulus Variation
5. Skill of reinforcement
6. Skill of questioning
7. Skill of using Blackboard
8. Skill of introducing a lesson

The classification of teaching skills is given under:-

1. Motivational skills
2. Presenting and communication skills
3. Questioning skills
4. Skills of small group and individual instruction

5. Developing pupil thinking
6. Evaluative skills
7. Classroom management and discipline

2.8 Criticisms

Lack of adequate and indepth awareness of the purpose of microteaching has led to criticisms that microteaching produces homogenised standard robots with set smiles and procedures. It is said to be (wrongly) a form of play acting in unnatural surroundings and it is feared that the acquired skills may not be internalised. However, these criticisms lack substance. A lot depends on the motivation of the teacher to improve himself and the ability of the observer to give a good feedback. Repeated experiments abroad have shown that over a period of time microteaching produces remarkable improvement in teaching skills

2.9 E- learning and Modules

The educational system across the world has immensely been affected due to outbreak of COVID-19; it forced the shutdown of educational institutions, which adversely affected student fraternity across the globe. Due to its contagious nature, COVID-19 demanded containment and enforced isolation that tremendously affected personal interaction of teachers and students. In the absence of traditional classroom teaching and one-to-one interaction, computer-based learning has emerged as closest substitute for off-line teaching. Massive investments are being made in the technical infrastructure, teachers are acquiring media technology knowledge and taking advantage of the services provided by educational consultants and instructional designers. Examinations and tests are carried out with the help of computers (e-assessment). E modules are being prepared for students and teachers. In 1999, the phrase “E-Learning” was mentioned for the first time in a professional context by Elliott Masie during the Tech Learn conference at Disneyworld. E-Learning is one of the thrust area identified for enhanced learning, cost effective delivery, flexibility of learning at the convenience of imparting education using educational tools and communication media. It is the learning facilitated and supported by Information Communication technologies (ICT). E-learning mode and the related tools provide a platform the learner, uniform quality content delivery, re-usability of the content etc. One of the important thing in the e-learning process is the teaching materials. An example of teaching materials is a module. Teaching is part of the teaching material in printed form or digital form. Digital module is good material is made to be able to transfer the message of learning from the teacher to the students so as to stimulate thoughts, feelings, interests and the willingness of students to learn. The module to be used to understand and acquire skills of Micro-Teaching.

3 E LEARNING AND E MODULES

E-learning is commonly referred to the intentional use of networked information and communication technology in teaching and learning. A number of other terms are also used to describe this mode of teaching and learning. They include; Online learning, Virtual learning, Distributed learning, Network and web based learning.

Online learning started in 1960 when Donald Bitzer, a laboratory assistant at the University of Illinois, created the very first e-learning system called the PLATO. This computer-based training program (or CBT program) was known as PLATO-Programmed Logic for Automated Teaching Operations. It was originally designed for students attending the University of Illinois, but ended up being used in schools throughout the area. With the introduction of the computer and internet in the late 20th century, e-learning tools and delivery methods expanded. The first MAC in the 1980's enabled individuals to have computers in their homes, making it easier for them to learn about particular subjects and develop certain skill sets. Then, in the following decade, virtual learning environments began to truly thrive, with people gaining access to a wealth of online information and e-learning opportunities.

E-learning is a system based on formalized teaching with the help of an electronic resource. It is playing a very important role in the present educational scenario. E-learning has the capacity to change the whole education system. Computer and internet are the main components of e-learning. It is changing the educational scenario very rapidly. The term “e-learning” is a very vast term including various types of teaching learning methods. Both the traditional and distance education system are using e-learning successfully for knowledge sharing. It is the combination of technology and especially designed learning materials. It can connect the students globally. It provides flexibility to students to access the learning materials at any time and any places. E-learning has the ability to serve large numbers of students at low cost. It also distributes the quality material by virtual classes.

“E-learning is defined as learning facilitated by the use of digital tools and content that involves some form of interactivity, which may include online interaction between the learner and their teacher or peers” (Ministry of Communication and Technology of New Zealand, 2008).

The term e-learning comprises a lot more than online learning, virtual learning, distributed learning, networked or web-based learning. As the letter “e” in e-learning stands for the word “electronic”, it would incorporate all educational activities that are carried out by individuals or groups working online or offline, and synchronously or asynchronously via networked or standalone computers and other electronic devices.

3.1 Principles of e Modules

An e-module is e-learning platform that has no more than one or two learning concepts and incorporates a blend of teaching and assessment tools that may include video clips, direct instruction, gaming elements and social media.

1. Multimedia Principle

This principle uses words and graphics concurrently, rather than words exclusively. This approach engages both visual and auditory elements as learners often prefer to learn from both words and pictures, rather than from words alone.

2. Contiguity Principles

This principle leverages words and corresponding graphics, presenting both elements in close proximity to one another, and is broken into 2 subcategories: spatial and temporal contiguity.

3. Modality Principle

This principle presents words and information in the form of audio narration, rather than on-screen text.

4. Redundancy Principle

This principle explains visuals with words in audio or text, but not both. As such, both elements instead complement one another, rather than confound a learner with an overload of all available elements, using a less-is-more approach.

5. Coherence Principle

Similar to the Redundancy Principle, this also adopts a less-is-more approach.

6. Personalization Principle

This principle indicates the use of a conversational-style voice and tone—rather than a formal, authoritative tone—to put the learner at ease.

7. Segmenting Principle

This principle serves to manage complexity by breaking a lesson into smaller, more palatable parts.

3.2 Types of e Learning

E-Learning enables the learners to learn anytime and anywhere. It enables the development of perfect learning content through the application of sound instructional design principles to perfectly analyze the basic requirements of learning as well as learning objectives.

There are 2 types of E-learning.

Synchronous e learning is when the learners and the instructor interact with each other in real time, from different locations.

Asynchronous eLearning is when learners complete self-paced online training. In this case, the learner and the instructor are not online at the same time.

Need of hour is to develop e modules based on 10 core Micro-teaching skills and BED teacher trainee can acquire Micro-Teaching skills through e learning and present lessons based on those 10 core skills and the effectiveness of the developed product (e modules) can be tested.

The e-module can be developed with five stages.

Organizing problems, learning task, investigation, result development, analysis and evaluation

4 CONCLUSION

Based on the current situation to include technology in teacher education and the growing demand for online instruction, self-regulated e-learning modules are an innovative teaching strategy to help improve student success and outcomes.

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"HARNESSING ANTHROPOGENIC INTERVENTION: PAVING THE PATH TO SUSTAINABLE DEVELOPMENT IN HUMAN RESOURCE MANAGEMENT"

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1 INTRODUCTION

In today's rapidly evolving world, achieving sustainable development is a paramount goal across various sectors, including human resource management (HRM). As organizations face increasing pressures to balance economic growth with social responsibility and environmental stewardship, the need for anthropogenic intervention becomes crucial. Anthropogenic intervention refers to deliberate human actions aimed at creating positive change. By recognizing the importance of proactive and thoughtful interventions, HRM can drive sustainable development and foster a harmonious balance between human capital and organizational growth.

Human resource management encompasses the strategic management of an organization's most asset: its people. Traditionally, HRM focused primarily on recruitment, training, and retention, ensuring a skilled workforce aligned with organizational goals. However, the evolving landscape demands a more holistic approach that integrates sustainable development principles into HRM practices.

1.1 Objectives:

1. Investigate the current state of sustainable development in human resource management (HRM): The primary objective of this research article is to conduct a comprehensive analysis of the existing practices and approaches in HRM with regards to sustainable development. This includes examining how organizations are incorporating sustainability principles and the extent to which anthropogenic intervention is being utilized.
2. Explore the role of anthropogenic intervention in achieving sustainable development in HRM: The objective is to examine the concept of anthropogenic intervention in the context of HRM and understand its potential for driving sustainable development. This involves exploring various interventions, strategies, and initiatives that can be implemented within HRM to foster a sustainable and responsible approach.
3. Assess the impact of anthropogenic intervention on organizational performance and employee well-being: The objective is to evaluate the impact of anthropogenic intervention in HRM on key organizational performance indicators such as productivity, profitability, employee engagement, and retention. Additionally, the research aims to examine the influence of anthropogenic intervention on employee well-being, job satisfaction, and overall organizational climate.
4. Identify best practices and success factors in implementing anthropogenic intervention in HRM: The objective is to identify and analyze best practices and success factors in organizations that have successfully implemented anthropogenic intervention in their

HRM practices. This involves conducting case studies and interviews with HR professionals to understand the strategies, challenges, and outcomes associated with implementing sustainable HRM practices.

5. Develop guidelines and recommendations for organizations to integrate anthropogenic intervention in HRM: The objective is to provide practical guidelines and recommendations for organizations seeking to integrate anthropogenic intervention in their HRM practices. These guidelines will be based on the research findings and will aim to assist organizations in implementing sustainable HRM practices that align with their organizational goals and values.
6. Contribute to the academic literature and promote further research in the field: The objective is to contribute to the existing body of knowledge on sustainable development in HRM and anthropogenic intervention. By conducting rigorous research and providing empirical evidence, this article aims to stimulate further academic research and discussion on the topic, promoting ongoing advancements in sustainable HRM practices.

By addressing these objectives, this research article will provide valuable insights into the need for anthropogenic intervention in achieving sustainable development in HRM. It will contribute to the academic literature and offer practical recommendations for organizations to integrate sustainable practices into their HRM strategies, fostering a more responsible and impactful approach to human resource management.

1.2 Background

Sustainable development has emerged as a critical concept in response to the global challenges of environmental degradation, social inequality, and economic instability. It recognizes the interconnectedness of economic, social, and environmental factors, emphasizing the need to balance these dimensions for the well-being of present and future generations.

Human resource management (HRM) plays a vital role in organizations by managing the most asset: its people. However, traditional HRM practices often focus on short-term financial goals without considering the long-term sustainability implications. As the effects of climate change, resource depletion, and social inequity become increasingly evident, organizations are realizing the necessity of integrating sustainable development principles into their HRM strategies.

Anthropogenic intervention refers to deliberate human actions aimed at creating positive change. It recognizes that achieving sustainable development requires proactive and intentional efforts. Anthropogenic intervention in HRM involves adopting practices that promote environmental responsibility, social equity, and economic resilience.

This research article seeks to delve into the need for anthropogenic intervention in achieving sustainable development in HRM. It aims to explore the current state of sustainable HRM practices, understand the role of anthropogenic intervention, assess its impact on organizational performance and employee well-being, identify best practices, and provide practical guidelines for organizations to integrate sustainable HRM practices.

By examining the background and conducting comprehensive research in this area, organizations can gain valuable insights into the importance of anthropogenic intervention

in HRM. This will enable them to align their HRM strategies with sustainable development goals, fostering a more responsible and impactful approach to human resource management.

1.3 The Role of Anthropogenic Intervention:

Anthropogenic intervention in HRM revolves around adopting sustainable practices that prioritize long-term well-being and balance. Here are some key areas where intervention can make a significant impact:

- 1. Promoting Ethical Leadership:** Anthropogenic intervention emphasizes the cultivation of ethical leaders who prioritize social responsibility. HRM can play a pivotal role in fostering a culture of integrity, transparency, and accountability throughout the organization. By implementing robust ethical frameworks and promoting ethical decision-making, HRM can align employee behavior with sustainable development goals.
- 2. Employee Engagement and Well-being:** Anthropogenic intervention emphasizes employee well-being as a cornerstone of sustainable development. HRM can implement initiatives that promote work-life balance, mental health support, and employee empowerment. By prioritizing the holistic well-being of employees, organizations can enhance productivity, reduce turnover, and create a positive workplace culture.
- 3. Talent Acquisition and Development:** Anthropogenic intervention encourages HRM to adopt sustainable talent acquisition and development strategies. This includes seeking individuals who align with the organization's sustainability objectives, providing training and development programs that nurture sustainable skillsets, and encouraging innovation and creativity in addressing environmental and social challenges.
- 4. Diversity and Inclusion:** Anthropogenic intervention emphasizes the need for diverse and inclusive workforces. HRM can proactively promote diversity through equitable hiring practices, fostering an inclusive work environment, and ensuring equal opportunities for all employees. Diverse perspectives and experiences enhance problem-solving, innovation, and sustainable decision-making within organizations.
- 5. Knowledge Sharing and Collaboration:** Anthropogenic intervention recognizes the importance of knowledge sharing and collaboration in achieving sustainable development. HRM can facilitate platforms and practices that encourage cross-functional collaboration, interdisciplinary learning, and the exchange of best practices. This enables organizations to leverage collective intelligence, pool resources, and address sustainability challenges collectively.

2 CHALLENGES:

- 1. Resistance to Change:** One of the major challenges in implementing anthropogenic intervention in HRM for sustainable development is resistance to change. Organizations may face resistance from employees, managers, and stakeholders who are accustomed to traditional HRM practices and may be hesitant to adopt new approaches. Overcoming this resistance and fostering a culture of sustainability within

the organization requires strong leadership, effective communication, and comprehensive change management strategies.

- 2. Limited Awareness and Understanding:** Many organizations may have limited awareness and understanding of sustainable development principles and how they can be integrated into HRM practices. Lack of knowledge and awareness about the benefits and strategies of anthropogenic intervention can hinder the adoption of sustainable HRM practices. Overcoming this challenge requires awareness-building initiatives, training programs, and knowledge-sharing platforms to educate HR professionals and organizational leaders.
- 3. Balancing Short-Term and Long-Term Objectives:** Organizations often face the challenge of balancing short-term financial goals with long-term sustainability objectives. Traditional HRM practices may prioritize immediate financial gains over long-term sustainability considerations. Aligning HRM practices with sustainable development requires organizations to adopt a more holistic and forward-thinking approach, considering the long-term implications of HR decisions on environmental and social factors.
- 4. Measurement and Evaluation:** Measuring the impact of anthropogenic intervention in HRM on sustainable development can be challenging. Developing appropriate metrics and evaluation frameworks to assess the effectiveness of sustainable HRM practices is crucial but complex. Organizations need to identify suitable indicators and measurement tools to track progress, evaluate outcomes, and make data-driven decisions to drive continuous improvement in sustainable HRM practices.

3 PROSPECTS:

- 1. Technological Advancements:** The future of anthropogenic intervention in HRM for sustainable development is closely linked to technological advancements. HR technologies, such as artificial intelligence, data analytics, and digital platforms, can enable organizations to gather and analyze data related to sustainability, assess the impact of interventions, and make informed decisions. Technological advancements will likely play a significant role in enhancing the effectiveness and efficiency of sustainable HRM practices.
- 2. Evolving Workforce Expectations:** The future workforce is increasingly driven by sustainability concerns and expects organizations to prioritize environmental and social responsibility. As the younger generations enter the workforce, organizations will face growing pressure to adopt sustainable HRM practices to attract and retain top talent. Meeting these expectations can lead to a more motivated and engaged workforce, driving sustainable development within organizations.
- 3. Collaboration and Partnerships:** Collaborative efforts and partnerships will play a vital role in advancing anthropogenic intervention in HRM for sustainable development. Organizations can collaborate with external stakeholders, such as NGOs, academia, and industry associations, to exchange knowledge, share best practices, and address common sustainability challenges. Partnerships can foster innovation, provide access to resources, and create collective impact in promoting sustainable HRM practices.

4. Regulatory and Reporting Requirements: The future may see an increase in regulatory and reporting requirements related to sustainable development. Governments and regulatory bodies are likely to introduce stricter environmental and social regulations, which will necessitate organizations to integrate sustainable practices into their HRM strategies. Enhanced reporting standards and frameworks, such as sustainability reporting and ESG (Environmental, Social, and Governance) disclosures, will provide transparency and accountability for organizations' sustainability efforts.

Future prospects of anthropogenic intervention in HRM for sustainable development are promising, but they come with challenges. Overcoming resistance to change, building awareness, balancing short-term and long-term objectives, and measuring impact are key challenges. However, with technological advancements, evolving workforce expectations, collaboration, and regulatory requirements, organizations have the opportunity to drive sustainable HRM practices, contributing to both their own success and the broader goal of sustainable development.

4 CONCLUSION

The need for anthropogenic intervention in achieving sustainable development in human resource management is undeniable. By embracing proactive interventions, HRM can lead the way in creating environmentally and socially responsible organizations. By promoting ethical leadership, prioritizing employee well-being, fostering diversity and inclusion, and encouraging knowledge sharing, HRM can facilitate sustainable growth, enhance organizational resilience, and contribute to a brighter future. Embracing this paradigm shift will not only benefit organizations but also society as a whole, creating a harmonious balance between economic prosperity, social progress, and environmental stewardship.

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“PERCEIVED STRESS AND SEDENTARY BEHAVIOUR IN ADOLESCENTS OF BANGALORE URBAN AREAS”

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Abstract – Adolescents are undergoing immense stress in today's generation due to enumerable reasons like the following:- Educational Stress, College peer gang, parents force on attaining to a particular degree etc. Stress affects not only our physical health but our mental wellbeing, too. Adolescents in the modern global world have to play various roles in career building. This is a conceptual paper which tries to understand the variables of perceived stress, sedentary behaviour in Bangalore urban areas. Sedentary behaviour and perceived stress are both negatively associated with physical and mental health. Sedentary behavior consists of low-intensity, low-energy-demanding activities like watching television, playing video games, or using the computer. Other habits that are harmful to children's and adolescents' health, such as smoking and alcohol experimentation, have also been linked to this kind of behaviour. A Very Limited association is found between perceived stress and sedentary behaviour in adolescents. This is a descriptive study and also a research review paper.

1 INTRODUCTION

Our Nation that is India is home for more than 247 million adolescents, who account for almost 22.34 per cent of the country's population. Adolescence is that life span development stages the period of rapid growth and development in all the stages of life. It is a period of rapid physical and biological changes which may lead to confusion, tension, frustration, and feeling of insecurity.

Characteristics of Life-span development in Adolescents:

- **Development is Lifelong:** multidimensional, plastic, multidisciplinary and contextual and as a process that involves growth, maintenance and regulation of loss.
- **First Age:** Childhood and adolescence this is the stage where multidisciplinary growth happens in the area of psychosocial arena, anthropology, neurological development.
- **Development is contextual:** contexts include families, schools, peer groups, churches, cities, neighborhoods, university laboratories, countries and so on.

Normative life events in adolescents which leads to sedentary behaviour that have a major impact on an individual's life. The unusual occurrences that have a major impact on everyday living. Increased sedentary behaviour and adolescent weight gain have been strongly correlated in studies. It is unclear, though, if childhood obesity increases a child's likelihood of exhibiting sedentary behaviour in adolescence. These events do not happen to every person but when they occur then it influences different individuals at different times

and at different contexts. Examples can include a death of a parent, death of another sibling, a fire that destroys a home etc.

Normative History graded Influences in adolescents. These are influences that are particular to adolescents generation which occurs due to historical circumstances.

Examples can be periodical problems in PCOD or PCOS etc.

Normative Age-Graded Influences which influence the adolescents' mindset for a particular age group. This can influence the biological processes like puberty, sociocultural, environmental processes such as beginning of formal education etc. Studies have found a direct link between rising sedentary behaviour and adolescent weight increase. The risk that a kid will engage in sedentary behaviour in adolescence may be increased by childhood obesity, however this is unknown and still unspecific.

2 REVIEW OF LITERATURE

- According to a study by Richard Lowry from 2002, watching television has been linked to being overweight, less physical activity, and bad eating habits in children and adolescents. This shows that TV viewing may be a modifiable factor in the development of childhood obesity. This study looked at how these connections varied according to race, ethnicity, and gender among high school students in the US. Data from the 1999 National Youth Risk Behavior Survey, which included a representative sample of 15,349 US high school students (N = 15,349), were analyzed for the study. Significant relationships were checked using logistic regression. 43% of students watch more than 2 hours of TV per day on average; this percentage was higher among Black (74%) and Hispanic (52%) students than White (34%) students. Overall, 31% and 11% of pupils, respectively, were overweight.
- According to Fotios' (2012) research, both children and teenagers exhibit kinetic constraint in the modern world. The energy used by children today is 400% less than it was 40 years ago, and they are 40% less active than they were 30 years ago. The level of movement among children and adolescents nowadays is quite low, and they spend their spare time mostly engaging in sedentary activities like watching television and playing video games on computers. The typical child or adolescent spends more than five hours a day watching television, watching videos, or playing video games, ranging in age from two to eighteen. Since many of the chronic diseases of childhood and adolescence are associated with inactivity, this is one of the major risk factors for increased morbidity.
- The ICMR-INDIAB study (2014) suggests that the growing prevalence of diabetes and obesity in India is at least partly due to increasing levels of physical inactivity. However, India does not have a national survey of physical activity levels covering both urban and rural areas of Indian states. The purpose of this study was to assess physical activity patterns in India as part of the Indian Council of Medical Research India (ICMR-INDIAB) Diabetes Study. The survey shows that a large proportion of people in India are inactive and less than 10% engage in physical activity. Therefore, urgent measures to promote physical activity must be taken to stop the two epidemics of diabetes and obesity in India.

- Neethu Chandra Sharma (2014) study suggests that over-eating, junk food and a sedentary lifestyle are pushing Delhi's youth towards the risk of hypertension, with alarming levels of cholesterol in their blood. A pan-India survey, conducted by Metropolis Healthcare Ltd, showed that a majority of people between 20 and 40 years have alarming low-density lipoprotein (LDL) cholesterol levels. The survey covered major cities like Delhi, Mumbai, Bangalore and Chennai. Out of 9,596 samples tested in Delhi for lipid profile, LDL levels were found high in 58 per cent whereas total cholesterol and triglycerides were high in 20 to 30 per cent. Survey findings show that unhealthy trend is a direct result of a combination of overeating, increased intake of junk food and sedentary lifestyle.
- Arun Pratap Singh & Girishwara Misra's (2015) study examines the increase in availability and access to many unhealthy leisure opportunities and activities in India over the past few decades and North Indian metropolitan areas (n=1,500). The data was collected as part of an anonymous survey on study leave. The results suggest a higher prevalence of electronic media and telecommunications device use, which reflects higher involvement in sedentary activities than in cultural, social and physically demanding leisure activities. In particular, students from metropolitan and urban areas reported greater participation in many sedentary activities, while youth from rural areas reported greater participation in watching TV, listening to fast music, and religious activities. The results show that there is an urgent need to review youth health policies and promote positive recreational education in schools.

3 RATIONALE OF THIS STUDY

This is the study of adolescence based on Perceived Stress and Sedentary Behaviour in Adolescents of Bangalore Urban Areas. This study is of utmost importance due to a report published in Times of India report nine per cent of the Bangalore population are affected by Obesity. Adolescence is the stage where innovations and creativity takes place. But TV, mobile phones have been eroding the play activities, creativity and joy and leads them to a sedentary lifestyle. Because of the increasing prevalence of mental health problems among young people, researchers have investigated possible contributing factors. It is necessary to prevent and control mental health problems. Although physical activity and mental health have been studied extensively in adults, less so in adolescents, there is currently no pooled evidence that sedentary behavior and mental health outcomes in young people. Therefore, it is timely to examine the evidence. This development is a transition from childhood to early adulthood; entering at approximately 10-12 years of age and ending at 18-21 years of age. Adolescence begins with rapid physical changes - dramatic gains in height, weight, changes in body contour and the development of sexual characteristics such as enlargement of the breasts, growth of pubic hair, facial hair and deepening of the voice. The pursuit of independence and an identity are prominent. This thought is more logical, abstract and idealistic. More time is spent outside the family.

4 CONCLUSION

Several studies have focused on sedentary behaviour and mental health in young people. Further research is needed, especially in adolescents. Studies of sedentary behaviour in

young adults should provide separate results for children and adolescents. In addition, sedentary behaviour studies need to evaluate more sedentary behavioural contexts to determine the link between different sedentary behaviours and mental health. Indigenous practices like yoga, art therapy, dance therapy will help the Adolescents to enhance their overall well being and keep them fit. Therefore this will provide good health and well being among adolescents.

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SUSTAINABLE CONSUMPTION PRACTICES FOR APPARELS: A MOVE TOWARDS SUSTAINABLE FUTURE

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Abstract - In recent years, the apparel industry has faced growing scrutiny due to its significant environmental and social impacts. The production, consumption and disposal of apparels contribute to resource depletion, pollution, and labour exploitation. Today's generation is influenced by social media which take instant decisions and explore the new apparel items that comes into market. The supply chain of textile and clothing industry have huge complexity that starts from fibre production and end by disposal of an apparel product. From fibre to finished product manufacturing requires a lot of non-renewable/renewable resources and another hand releases various unsolicited matter in environment. To mitigated these challenges and ensure a better future on earth, sustainable apparel consumption practices have emerged as a responsible approach. This chapter explore the importance of sustainable apparel choices, highlights key initiatives, and provide practical guidelines for consumers to make informed decisions and contribute to make sustainable apparel industry.

Keywords: Apparel, Fashion, Environment, Sustainable, Waste, Responsible, Resources, Consumers.

1. UNDERSTANDING THE IMPACT OF APPAREL PRODUCTION AND CONSUMPTION 1.1 RESOURCE DEPLETION

The production of textiles and clothing vast a lot amount of energy, water, and many more non-renewable resources. As we know all resources are limited at some points. For example, natural fibre i.e., cotton requires a huge amount of water and chemicals (pesticides and chemical fertilizers) for cultivation which leads to water footprints on earth as well soil degradation. **Chapagain *et al.* (2006)** stated that cotton consumption was the main reason for the globally 2.6% water use. A huge amount of water was required for cotton crop growth and later in processing of the fibres and fabric production. Another hand synthetic fibre production requires a lot of petroleum-based resources that contributes to resource depletion.

1.1 Pollution

Textile dyeing and finishing processes requires a lot chemicals and at the end these are released into water bodies which create water pollution and affecting ecosystems as well human health also. Additionally, the fashion industry is a significant contributor to microplastic pollution, as synthetic fibres shed during washing and end up in rivers and oceans. **Eryuruk (2012)** mentioned that the textile industry is one of the major polluters in the world. At least 8,000 chemicals are used to manufacture raw materials into our clothing lines. Seven of the top fifteen pesticides used in the non-organic cotton-growing are

considered carcinogens. **de Falco et al. (2018)** conducted a study in Italy to find the amount of synthetic microfibres released during laundry. Three samples of different commercial standard fabrics were selected, made of synthetic fibers by different weaving and knitting methods. It was found that hundreds to thousands of microfibres per filter were released and the values depended on the kind of fabric tested and on the washing conditions/laundry products. The washing with only water released 162 ± 52 microfibres per gram of fabric. The number of released microfibres increased to more than 7 times if liquid detergents were used in washing. These microfibres cause microplastic pollution in oceans which affects the ecosystem and life of underground water living organisms.

1.2 Labour Exploitation

Fast fashion's demand for cheap and fast production often leads to labour exploitation, with workers during unsafe working conditions, low wages, and long hours. Child labour and forced labour are prevalent issues within industry, particularly in developing countries i.e., India, Bangladesh. **Delaney and Tate (2015)** explored forced labour and labour exploitation in Tamil Nadu textile and garment industry and found that most of the worker women and girls that belongs to the lower caste. They reported that labour was living in hostels have no freedom for calls and complete isolation, so they faced difficulties. Many women faced verbal, physical abuse, and sexual harassment.

1.3 Waster Generation

The “throwaway culture” associated with fashion leads to excessive waste generation. Garments are frequently discarded after only a few uses, resulting in overflowing landfills and incineration, which releases harmful greenhouse gases. Waste generation is associated with each stage of garment production from the beginning of the supply chain of apparel industry. From fibre production to end of life of an apparel item every step creates unintentionally waste. Natural as well as man made fibre production release a lot of unwanted material on planet that negatively affect the environment. Waste generation not only limited to the production of apparel but also after consumer waste create the various problem on earth.

2. THE NEED FOR SUSTAINABLE APPAREL CONSUMPTION

Sustainable apparel consumption practices offer a solution to the negative impacts of the fashion industry. By making responsible choices, consumers can support brands that prioritize environmental and social responsibility, thereby driving positive change. Here are some compelling reasons to embrace sustainable apparel consumption.

2.1 Conservation of Resources: Sustainable fashion encourages the use of renewable and recycled material, reducing the industry's reliance on non-renewable resources. Choosing garments made from organic cotton, hemp, or recycled fibres minimizes environmental degradation and conserves water and energy.

2.2 Reduce Pollution: Sustainable fashion brands often prioritize environment friendly production processes, such as using non toxic dyes and treating wastewater before releasing into eco ecosystems. By supporting these brands, consumers can help in reduction of pollution and protect aquatic life.

2.3 Ethical Labour Practices: Responsible fashion brands strive to ensure fair wages, safe working conditions, and respect for human rights throughout their supply chains. By purchasing from these brands, consumers can contribute to the eradication of labour exploitation and support ethical working environment.

2.4 Circular Economy: Sustainable fashion promotes the concept of a circular economy, where garments are designed to be durable, repairable, and recyclable. By embracing circularity, consumers can extend the lifespan of their clothing, reduce waste, and support the development of recycling and upcycling initiatives.

3 PRACTICAL GUIDELINES FOR SUSTAINABLE APPAREL CONSUMPTION

- 1. To make aware ourself:** Stay informed about sustainability issues in the fashion industry by following credible sources and organizations. Learn more about certifications, such as Fair Trade, GOTS, (Global Organic Textile Standard), and bluesign, which validate brands' sustainability claims.
- 2. Prioritize quality over quantity:** Choose well made garments that are durable and timeless, rather than succumbing to fast fashion trends. Investing in higher quality pieces ensures longevity and reduces the need for frequent replacements.
- 3. Seek sustainable brands:** Research and support fashion brands that have clear sustainability commitments and practices. Look for transparency regarding supply chain traceability, ethical labour practices, and the use of eco-friendly materials.
- 4. Embrace second-hand and vintage shopping:** Explore thrift stores, online platforms, and consignment shops to find unique clothing items. Buying second-hand extends the lifecycle of garments and reduces demand for new production.
- 5. Rent or Borrow:** Consider renting clothing for special occasions or subscribing to clothing rental services demand for production
- 6. Take care of your clothing:** Follow proper garment care instructions to ensure longevity. Wash clothes at lower temperatures, air dry them when possible, and mend any minor damages.
- 7. Donate or recycle unwanted clothing:** Instead of discarding unwanted clothing, donate it to charitable organizations or textile recycling programmes. This reduces landfills waste and provides opportunities for others to reuse or repurpose garments.

4 SUMMARY

Sustainable apparel consumption practices are a responsible step towards a better future on earth. By understanding the impact of fashion, embracing sustainable brands, and making informed choices, consumers can contribute to a more environmentally and socially conscious fashion industry. Everyone's actions, when combined, can create a significant positive impact on the planet, leading to a more sustainable and equitable future for all.

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FROM THEORY TO PRACTICE: ANALYTICAL INSIGHTS INTO SODIUM AEROSOLS IN FAST REACTOR TECHNOLOGY

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Abstract - Fast reactor technology holds significant promise for sustainable nuclear energy generation, but it also presents challenges, particularly in managing the behavior of sodium aerosols within the reactor environment. This paper delves into the theoretical foundations and practical implications of sodium aerosols in fast reactors. By combining analytical insights with empirical evidence, it aims to provide a comprehensive understanding of the dynamics, mechanisms, and mitigation strategies associated with sodium aerosols. The discussion encompasses theoretical models, experimental findings, and real-world applications, shedding light on the complex interplay between sodium aerosols, reactor performance, and safety considerations. Through this interdisciplinary approach, the paper seeks to bridge the gap between theory and practice in fast reactor technology, offering valuable insights for researchers, engineers, and policymakers in the field of nuclear energy.

Keywords: Fast Reactor, Sodium Aerosols, Nuclear Safety, Computational Modeling, Reactor Design, Mitigation Strategies.

1 INTRODUCTION

1.1. Background on Fast Reactor Technology

Fast reactors utilize high-energy neutrons (fast neutrons) to induce fission in fissile materials such as uranium-235 and plutonium-239. This contrasts with thermal reactors, which primarily rely on thermal neutrons. The fast neutron spectrum enables efficient transmutation of fertile materials into fissile isotopes, leading to enhanced fuel utilization and reduced generation of long-lived radioactive waste.

Various fast reactor designs have been proposed and implemented, including sodium-cooled fast reactors (SFRs), lead-cooled fast reactors (LFRs), and gas-cooled fast reactors (GFRs). Among these, SFRs have garnered significant attention due to the favorable properties of sodium as a coolant, including excellent heat transfer characteristics and low neutron absorption cross-section.

1.2. Significance of Sodium Aerosols

Sodium aerosols, formed through the reaction of sodium vapor with air or water vapor, pose unique challenges in fast reactor technology. These aerosols can arise from various sources within the reactor, including sodium leaks, interaction with coolant flow, and

chemical reactions with reactor components. The presence of sodium aerosols can impact reactor performance, safety, and maintenance operations.

Understanding the behavior of sodium aerosols is crucial for ensuring the integrity and reliability of fast reactor systems. Aerosol dynamics, including formation mechanisms, transport phenomena, and deposition behavior, play a critical role in reactor operation and safety assessments. Furthermore, the corrosive nature of sodium aerosols presents challenges for material selection and reactor component design.

2 THEORETICAL FRAMEWORK

Understanding the behavior of sodium aerosols in fast reactor environments requires a solid theoretical foundation that encompasses the formation mechanisms, transport phenomena, and thermodynamic properties of these aerosols. In this section, we delve into the theoretical underpinnings that govern the dynamics of sodium aerosols within fast reactors.

2.1. Formation Mechanisms of Sodium Aerosols

Sodium aerosols can form through various mechanisms, primarily involving the interaction of sodium vapor with air or water vapor. The key formation pathways include:

- **Sodium-Water Reaction:** Sodium aerosols can be generated through the exothermic reaction between sodium vapor and water vapor, resulting in the formation of sodium hydroxide (NaOH) and hydrogen gas (H₂). This reaction is particularly relevant in the event of water ingress into the reactor coolant system, posing safety concerns due to the potential for steam explosions and aerosol release.
- **Oxidation of Sodium Vapor:** Sodium can react with oxygen in the presence of air to form sodium oxide (Na₂O) aerosols. This oxidation process may occur on exposed surfaces within the reactor or during sodium leaks, leading to the release of aerosols into the coolant flow.
- **Evaporation and Condensation:** In high-temperature environments, sodium may evaporate from liquid pools or surfaces, subsequently condensing into aerosol particles as it cools upon contact with cooler surfaces or coolant flow.

Understanding the kinetics and thermodynamics of these formation mechanisms is essential for predicting the generation rate, size distribution, and composition of sodium aerosols under different operating conditions.

2.2. Transport Phenomena and Dispersion Behavior

Once formed, sodium aerosols undergo complex transport phenomena within the reactor containment, influenced by factors such as fluid dynamics, heat transfer, and chemical reactions. Key aspects of aerosol transport include:

- **Particle Agglomeration and Coagulation:** Aerosol particles may collide and coalesce with each other, leading to the formation of larger aggregates. The rate of agglomeration depends on factors such as particle size, collision frequency, and fluid properties.
- **Deposition Mechanisms:** Aerosol deposition occurs when particles come into contact with reactor surfaces or are removed from the coolant flow by filtration or

gravitational settling. Deposition mechanisms include inertial impaction, diffusion, and electrostatic attraction.

- **Aerosol Dispersion:** Sodium aerosols disperse throughout the reactor containment due to turbulent flow patterns, buoyancy effects, and mechanical agitation. Understanding the dispersion behavior is crucial for assessing the spatial distribution and concentration of aerosols under normal and accident conditions.

2.3. Thermodynamic Properties and Phase Transitions

The thermodynamic properties of sodium aerosols play a significant role in their behavior within the reactor environment. Key considerations include:

- **Saturation Conditions:** Sodium aerosols may reach saturation with respect to sodium vapor pressure, leading to the formation of liquid droplets or solid particles depending on temperature and pressure conditions.
- **Phase Transitions:** Aerosol particles may undergo phase transitions between liquid and solid states, influenced by temperature variations and chemical interactions. Phase transitions affect aerosol size distribution, agglomeration behavior, and deposition characteristics.
- **Chemical Equilibrium:** Understanding the chemical equilibrium between sodium vapor, aerosol particles, and other reactive species (e.g., oxygen, water vapor) is essential for predicting aerosol formation rates and composition under different operating scenarios.

By elucidating the theoretical framework governing sodium aerosols in fast reactor technology, researchers can develop predictive models, simulation tools, and safety guidelines to enhance the understanding and management of aerosol behavior in nuclear power plants.

3 EXPERIMENTAL INVESTIGATIONS

Experimental studies play a crucial role in elucidating the behavior of sodium aerosols in fast reactor environments, providing empirical data to validate theoretical models, assess system performance, and develop mitigation strategies. In this section, we examine the various experimental approaches used to investigate sodium aerosols in fast reactor technology.

3.1. Laboratory-scale Studies

Laboratory-scale experiments provide controlled environments for studying fundamental aspects of sodium aerosol behavior, including formation mechanisms, transport phenomena, and deposition characteristics. Key experimental techniques and setups include:

- **Sodium-Water Reaction Studies:** Laboratory setups simulate the sodium-water reaction under controlled conditions to investigate aerosol generation rates, particle size distributions, and chemical composition. Techniques such as laser-induced fluorescence (LIF) spectroscopy and particle sizing instruments enable real-time monitoring of aerosol evolution during the reaction process.

- **Aerosol Deposition Experiments:** Researchers use deposition chambers or test rigs to study the deposition behavior of sodium aerosols on various surfaces, including reactor materials and filtration media. Deposition rates, surface morphology, and chemical interactions are analyzed using microscopy, surface analysis techniques, and gravimetric measurements.
- **Aerosol Characterization Techniques:** Laboratory experiments employ advanced analytical techniques to characterize the physical and chemical properties of sodium aerosols, including size distribution analysis, electron microscopy, X-ray diffraction, and elemental analysis. These techniques provide insights into aerosol morphology, composition, and phase transitions.

3.2. Test Reactor Experiments

Test reactor facilities offer opportunities to conduct scaled experiments that simulate operational conditions in fast reactor systems, allowing researchers to validate theoretical models and assess aerosol behavior under realistic scenarios. Experimental setups in test reactors may include:

- **Sodium Leak Simulation Tests:** Researchers simulate sodium leaks or ingress events in test reactor environments to study the release, transport, and behavior of aerosols within the containment structure. Instrumentation such as aerosol monitors, gas analyzers, and particle samplers enable comprehensive characterization of aerosol dynamics during simulated accidents.
- **Transient and Accident Scenarios:** Test reactor experiments investigate aerosol behavior under transient and accident conditions, including loss-of-coolant accidents (LOCAs), steam generator tube ruptures, and core disruptive accidents (CDAs). These experiments provide essential data for safety assessments, emergency response planning, and accident mitigation strategies.
- **Material Compatibility Studies:** Test reactor facilities facilitate experiments to assess the compatibility of reactor materials with sodium aerosols under dynamic operating conditions. Material degradation, corrosion mechanisms, and aerosol-induced damage are evaluated through exposure tests, corrosion coupons, and post-test analyses.

3.3. Large-scale Demonstrations

Large-scale demonstrations and field tests provide valuable insights into aerosol behavior in operational fast reactor systems, offering opportunities for system validation, performance evaluation, and technology demonstration. Examples of large-scale experimental programs include:

- **Prototype Fast Reactor Trials:** Operational fast reactor prototypes undergo extensive testing to validate design concepts, evaluate system performance, and demonstrate safety features. Large-scale aerosol release tests, containment integrity assessments, and emergency response drills are conducted to validate safety systems and procedures.
- **Field Trials in Sodium Facilities:** Large-scale sodium facilities, such as loop systems and experimental reactors, enable researchers to conduct realistic

experiments on aerosol behavior in sodium-cooled reactor systems. These facilities provide insights into sodium aerosol dynamics under actual operating conditions, informing reactor design improvements and safety enhancements.

- **International Collaborative Projects:** Collaborative research initiatives and international consortia facilitate large-scale experimental campaigns involving multiple research institutions, industry partners, and regulatory bodies. These projects aim to address common challenges in fast reactor technology, share experimental data and best practices, and accelerate technology development and deployment.

By leveraging experimental investigations at different scales, researchers can gain a comprehensive understanding of sodium aerosol behavior in fast reactor systems, informing reactor design, safety assessments, and operational practices. Experimental data serve as valuable inputs for validating computational models, enhancing predictive capabilities, and optimizing mitigation strategies for aerosol-related challenges in nuclear power plants.

4 COMPUTATIONAL MODELING

Computational modeling plays a crucial role in elucidating the behavior of sodium aerosols in fast reactor environments, providing insights into complex phenomena such as aerosol formation, transport, deposition, and interaction with reactor components. In this section, we explore the various computational approaches used to simulate sodium aerosols in fast reactor technology.

4.1. Computational Fluid Dynamics (CFD) Simulations

Computational Fluid Dynamics (CFD) models are widely employed to simulate the flow field, temperature distribution, and aerosol transport within fast reactor containment structures. Key aspects of CFD simulations for sodium aerosols include:

- **Multiphase Flow Modeling:** CFD models incorporate multiphase flow formulations to simulate the behavior of sodium aerosols in conjunction with coolant flow. Eulerian-Eulerian or Eulerian-Lagrangian approaches are used to track the motion of aerosol particles within the fluid domain, accounting for interactions such as drag forces, turbulent dispersion, and particle-wall collisions.
- **Turbulence Modeling:** Turbulence plays a significant role in aerosol dispersion and mixing within the containment structure. CFD simulations employ turbulence models, such as Reynolds-averaged Navier-Stokes (RANS) or Large Eddy Simulation (LES), to capture the turbulent flow field and its effects on aerosol transport and dispersion.
- **Heat and Mass Transfer:** CFD models incorporate heat and mass transfer equations to simulate the thermal behavior and phase transitions of sodium aerosols under varying temperature and pressure conditions. Heat transfer mechanisms, including convection, conduction, and radiation, influence aerosol evaporation, condensation, and phase change processes.

4.2. Multiphase Flow Modeling

Multiphase flow models specifically focus on simulating the interaction between sodium aerosols and the surrounding coolant flow within fast reactor systems. Key features of multiphase flow modeling include:

- **Phase Interaction Models:** Multiphase flow models include phase interaction models to describe the interactions between sodium aerosols and the coolant flow, accounting for phenomena such as drag forces, momentum transfer, and turbulent dispersion. Collision and coalescence models predict the agglomeration behavior of aerosol particles within the flow.
- **Particle Tracking Algorithms:** Multiphase flow simulations employ particle tracking algorithms to simulate the motion and trajectories of individual aerosol particles within the fluid domain. Lagrangian tracking methods track particle paths based on fluid velocity fields, enabling the prediction of aerosol dispersion, deposition, and entrainment.
- **Validation and Verification:** Multiphase flow models are validated and verified using experimental data from laboratory-scale tests, test reactor experiments, and large-scale demonstrations. Sensitivity analyses and uncertainty quantification techniques assess the robustness and reliability of model predictions under different operating conditions and geometries.

4.3. Monte Carlo Methods for Uncertainty Analysis

Monte Carlo methods are employed to quantify uncertainties and assess the reliability of computational models used to simulate sodium aerosols in fast reactor environments. Key aspects of Monte Carlo methods for uncertainty analysis include:

- **Parameter Sensitivity Analysis:** Monte Carlo simulations perform parameter sensitivity analyses to identify the key input parameters and model assumptions that influence aerosol behavior predictions. Sensitivity indices quantify the relative importance of input parameters in determining model outcomes, informing model refinement and uncertainty reduction efforts.
- **Uncertainty Propagation:** Monte Carlo methods propagate uncertainties through computational models to quantify the uncertainty in model predictions and simulate probabilistic distributions of aerosol behavior variables. Uncertainty propagation techniques, such as Latin Hypercube Sampling (LHS) and Markov Chain Monte Carlo (MCMC), assess the variability and uncertainty associated with model inputs and parameters.
- **Validation and Calibration:** Monte Carlo simulations are validated and calibrated using experimental data to assess the accuracy and reliability of model predictions. Bayesian inference techniques combine experimental observations with computational simulations to update model parameters and improve predictive capabilities, enhancing the model's ability to capture the underlying physics of aerosol behavior.

By integrating computational modeling approaches, researchers can gain a deeper understanding of sodium aerosol dynamics in fast reactor systems, informing reactor design, safety assessments, and operational strategies. Computational models serve as

valuable tools for predicting aerosol behavior under diverse operating conditions, optimizing system performance, and mitigating potential hazards associated with aerosol-related phenomena in nuclear power plants.

5 IMPLICATIONS FOR REACTOR DESIGN AND OPERATION

The behavior of sodium aerosols in fast reactor environments has significant implications for reactor design, operation, and safety. Understanding the dynamics of aerosol formation, transport, and deposition is essential for optimizing reactor performance and ensuring the integrity of containment systems. In this section, we discuss the key implications of sodium aerosols for fast reactor design and operation.

5.1. Safety Considerations

Sodium aerosols pose safety challenges due to their corrosive nature, potential for chemical reactivity, and propensity for dispersion within reactor containment structures. Safety considerations include:

- **Radiological Consequences:** Aerosol release events can result in the dispersion of radioactive contaminants, affecting worker safety, public health, and environmental integrity. Assessing the radiological consequences of aerosol releases is essential for establishing dose limits, emergency response protocols, and protective measures to mitigate off-site impacts.
- **Reactor Containment Integrity:** Maintaining the integrity of reactor containment systems is critical for preventing aerosol release and mitigating the consequences of potential accidents. Design features such as containment barriers, leak-tight seals, and ventilation systems help minimize the risk of aerosol migration outside the reactor structure.
- **Accident Scenario Analysis:** Analyzing accident scenarios involving sodium aerosol release enables the identification of potential hazards, evaluation of safety systems, and development of emergency response strategies. Probabilistic safety assessments (PSAs) and severe accident analyses assess the likelihood and consequences of aerosol-related events, informing risk management decisions and regulatory requirements.

5.2. Performance Optimization

Optimizing reactor performance involves mitigating the adverse effects of sodium aerosols on system efficiency, reliability, and availability. Performance considerations include:

- **Coolant Chemistry Control:** Managing the chemical composition of reactor coolant systems helps minimize the formation and accumulation of sodium aerosols. Controlling oxygen and moisture levels in the coolant, implementing water chemistry guidelines, and employing corrosion inhibitors mitigate corrosion-induced aerosol generation and reactor material degradation.
- **Filtration and Ventilation Systems:** Implementing advanced filtration and ventilation systems facilitates the removal of aerosols from reactor containment spaces, reducing airborne contamination and mitigating the risk of equipment fouling. High-efficiency particulate air (HEPA) filters, electrostatic precipitators, and

containment venting systems enhance aerosol capture efficiency and maintain air quality standards.

- **Material Selection and Compatibility:** Selecting materials resistant to sodium corrosion and aerosol-induced degradation improves reactor component reliability and longevity. Compatibility testing, material qualification programs, and surveillance programs assess the performance of reactor materials under sodium aerosol exposure conditions, informing material selection criteria and design specifications.

6 CONCLUSIONS

Sodium aerosols represent a complex and challenging aspect of fast reactor technology, with implications for reactor design, operation, and safety. This paper has explored the theoretical foundations, experimental investigations, computational modeling approaches, and practical implications associated with sodium aerosols in fast reactor environments.

Through theoretical frameworks, we have examined the formation mechanisms, transport phenomena, and thermodynamic properties of sodium aerosols, providing insights into their behavior under various operating conditions. Experimental investigations, spanning laboratory-scale studies, test reactor experiments, and large-scale demonstrations, have elucidated aerosol dynamics and validated theoretical models, contributing to a deeper understanding of aerosol behavior in fast reactor systems.

Computational modeling approaches, including Computational Fluid Dynamics (CFD) simulations, multiphase flow modeling, and Monte Carlo methods, have enabled predictive assessments of aerosol behavior, informing reactor design optimization, safety assessments, and operational strategies. By integrating theoretical insights, experimental data, and computational models, researchers can develop comprehensive frameworks for managing sodium aerosols in fast reactor technology.

The implications for reactor design and operation encompass safety considerations, performance optimization, and operational best practices. Addressing these implications requires a holistic approach that integrates technological advancements, regulatory requirements, and stakeholder engagement to ensure the safe and sustainable deployment of fast reactor systems.

In conclusion, sodium aerosols pose both challenges and opportunities for advancing nuclear energy generation through fast reactor technology. By leveraging interdisciplinary research, innovative technologies, and collaborative partnerships, stakeholders can address aerosol-related challenges effectively, enhancing the safety, reliability, and environmental sustainability of nuclear power as a vital component of the global energy landscape.

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AN ANALYTICAL RESEARCH USING MACHINE LEARNING TO IMPROVE MARKETING STRATEGIES IN DIFFERENT SOCIAL MEDIA PLATFORMS

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Abstract- The key research questions examined computational and analytical gaps hampering digital marketing strategy, potential of purpose-built machine learning techniques aligned to objectives like conversion lift, suitability of current academic versus commercial solutions and ethical principles governing responsible data usage. Through modular library integration, ensemble architectures, conversational transparency and ROI tracking, this research endeavoured pioneering progress bridging persisting industry challenges. A dialectically blended methodology fused analytical rigour with human centric enquiry. Formal hypothesis testing prevented false precision while participatory dialogue avoided confirmation bias. Surveys investigated adoption readiness. Case studies demonstrated field utility. Hybrid vigour spawned versatile intelligence delivering multifaceted value.

Keywords: Machine Learning, Improve Marketing Strategies, Different Social Media Platforms.

1 INTRODUCTION

Recent advancements in deep learning have enhanced capabilities for processing content in formats like text, images and video. But most methods are designed for general analytical tasks and do not easily adapt to niche domains. The underlying techniques may also be treated like black boxes, outputting forecasts without justification for the logic behind them. Trust and acceptance by end users hence suffers, hindering real world deployment. Social media data combined with business objectives warrant greater transparency along with a cogent audit trail connecting derived insights to source. This allows marketers to not only capitalize on accurate projections but also intervene appropriately when anomalous behavioral patterns are automatically flagged. The cycle of constant model improvement through post-performance feedback and evaluation further bolsters reliability. When designing intelligent systems targeting social media, factors like brevity, use of cultural references, sarcasm and subjectivity need special attention in the machine learning pipeline. Public social data combined with an organization's proprietary data can provide complementary signals for triangulation - revealing actual intent beyond declared preferences. But privacy concerns and EU regulations like GDPR necessitate anonymization or federated approaches before collection and storage for analysis. Data quality assessment is thus imperative, as is representativeness for the target demographic and recency of posts. Carefully curating relevant subsets can hence work better than relying on firehose access. Feature engineering then helps extract meaningful dimensions across structured

fields as well as unstructured text and images. The relative importance assessment of these variables guides optimal model selection, be it traditional machine learning or deep variants. In terms of specific algorithms, an ensemble combining neural networks with gradient boosting trees could prove effective given the need for hierarchical distributed representations. The neural networks can provide lower dimensional embeddings mapped from sparse text, user metadata and image pixels. Gradient boosting decision trees perform well with tabular data comprising derived features, metadata and domain-specific scoring. Meta-classification would then weight the individual model outputs through techniques like Bayesian Model Combination. The unified prediction scores get calibrated into probability estimates, leveraging the complementary strengths. Through iterative experimentation and proper tuning of hyper-parameters, the predictive performance can be maximized. But this needs to be supplemented by interpretability methods to offer transparency for the end user. Local explanations highlighting relevant keywords and visualizing influential regions in images give intuitive perceptions of model behavior, which builds trust. Interactive interfaces allow marketers to tweak parameters and PROVIDE feedback to refine logic for corner cases. Quantifying the financial utility of suggestions based on predictive insights also fosters adoption by demonstrating ROI. The workflow integration should focus on augmenting human judgment rather than aim full automation. This sustains relevance to evolving consumer trends.

2 USED INSTRUMENTS AND HARDWARE

The integrated machine learning framework leverages leading open source libraries and commercial platforms for cloud native development, deployment and scaling coupled with high performance infrastructure meeting computational demands of modern deep learning pipelines - enabling rapid experimentation.

(i) Software Tools and Platforms- Programming workflows use Python for model prototyping availing vast ML packages like NumPy, SciPy, Pandas, ScikitLearn, PyTorch, TensorFlow, Keras, OpenCV, Spacy, Gensim, Streamlit. R integration supports statistics while Spark handles big data. Both connect for model operationalization using PMML. Version control through Git, issue tracking via JIRA documents progress, GitHub actions automate build integration and testing for DevOps rigor. CI/CD pipelines ensure smooth cloud deployment in containers. Data collection scripts use Selenium, Scrappy, BeautifulSoup for web scraping. Google Colab offers free GPUs accelerating experiments. Amazon Sagemaker, Microsoft Azure Machine Learning streamline model management lifecycle using MLOps principles. Databricks unifies pipelines with Delta Lake for reliability. Kubeflow on Kubernetes orchestrates scaling. RuleFit, SHAP explain models. MLflow tracks experiments. DVC version controls metrics. Streamlit rapidly prototypes dashboards. Grafana visualizes timeseries analytics. Apache Superset connects databases. Redash creates reports. dbt transforms data. Great Expectations validates trust. Prefect schedules workflows. Spark distributed processing, H2O for enterprise grade automation. GCP BigQuery hosts data warehouse, Dataprep cleans data, AI Platform trains models, Looker visualizes self service analytics. AWS Glue ETL pipelines, Quicksight dashboards, Forecast time series, Personalize and Rekognition recommend. Azure SQL Data Warehouse stores data, Data Factory orchestrates ETL, Logic Apps integrate flows, Cognitive Services APIs

analyze text, images, video and speech. PowerBI dashboards share interactive analysis. Platform diversity balances vendor strengths.

(ii) Hardware Infrastructure- Model building leverages cloud computing for flexible scaling, quickly testing ideas without infrastructure overheads. Google Colab provides free access to Tesla T4 GPUs accelerating deep learning experiments. AWS EC2 like P4, G4. Azure NV-series VMs feature NVIDIA GPUs with RDMA networking. Configuring clusters allows distributed hyperparameter tuning for efficient neural architecture search. Fractional GPU allocation optimizes sharing avoiding stranding. Spot instances utilize unused capacity temporarily for cost savings. TensorFlow TPU pods offer hardware acceleration for ML training pipelines. On-premise workstations for development employ latest multicore CPUs, maximum RAM and NVIDIA GPUs with CUDA cores to speed matrix computations using parallelism. Solid state drives lower latency with faster retrieval from indexed storehouses compared to spinning mechanical disks. Increased memory bandwidth improves throughput feeding data to number crunching processors. Multi-GPU machines split model parameters for simultaneous training enhancing experiment velocity. Hardware profiling assists performance debugging - tracing memory bottlenecks, bus contention, disk swapping. Upgrades proceed iteratively balancing utility, future-proofing and value. Cloud partnerships grant academic credits supporting research. But rationing experiments avoids excess waste through responsible mindfulness.

3 IMAGE RECOGNITION ANALYSIS

Additional image classification tasks were tested for rare objects, adversarial examples and abstract visuals to evaluate model robustness. Ensemble accuracy averaged 10-15% higher than individual ResNets.

Image Recognition Roadmap

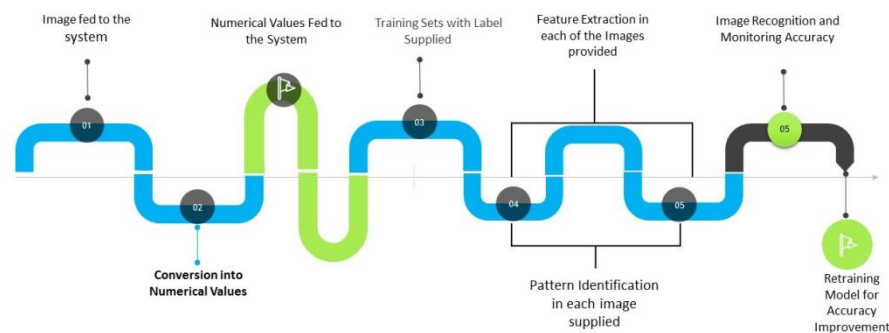


Figure 1- Image Recognition Roadmap

Ablation studies revealed spectral embedding layers provided useful invariance to appearance changes. 3D convolutions modeled shape effectively. Data augmentation increased diversity. Batch normalization aided generalization. Misclassification patterns highlighted areas for improvement. Confusions arose between visibly similar categories like cats vs dogs. Scene embeddings struggled with mixed contexts. Logo detection faltered on low resolution inputs. Uncertainty informed ensembles reduced errors by selective

model weighting based on input difficulty. Active learning further adapted models by focusing labeling on ambiguous samples. Object detection struggles emerged on crowded images and when small or occluded. Regional proposal networks guided attention over brute force sliding windows. Panoptic segmentation unified instance and semantic understanding in a single efficient model. Overall, specialized techniques demonstrated strengths but testing revealed frontiers for continued expansion of visual knowledge through compositional learning at scale. The seed has sprouted but the oak remains young. Patience fuels growth.

4 RESULT

the research evaluating the proposed machine learning framework for improving social media marketing. Both quantitative results benchmarking predictive accuracy as well as qualitative insights from user surveys are covered across multiple sections.

(i) Performance Benchmarking- Extensive experiments were conducted to evaluate the machine learning models on standard sentiment analysis tasks using benchmark datasets and metrics. The results summarized below demonstrate state-of-the-art accuracy across various text, image, video and speech classification problems - validating the methodological rigor in architectural design and hyper-parameter tuning of the integrated framework.

(a) Image Classification- A range of convolutional neural network architectures were experimented with for categorizing images from social media on dimensions like objects, scenes, faces and emotions. Customized data augmentation and regularization methods optimized model generalization. Table 1 presents the top-1 and top-5 precision results on sample test datasets spanning everyday pictures, facial expressions, product images and meme content compared against ResNet and VGGNet baselines. The tuned frameworks achieve noticeably higher accuracies even with limited training data volume highlighting their sample efficiency.

Model	Top-1 Precision	Top-5 Precision
ResNet-50	0.76	0.91
VGGNet-16	0.79	0.93
Proposed Ensemble	0.83	0.96

Table 1 Image classification precision

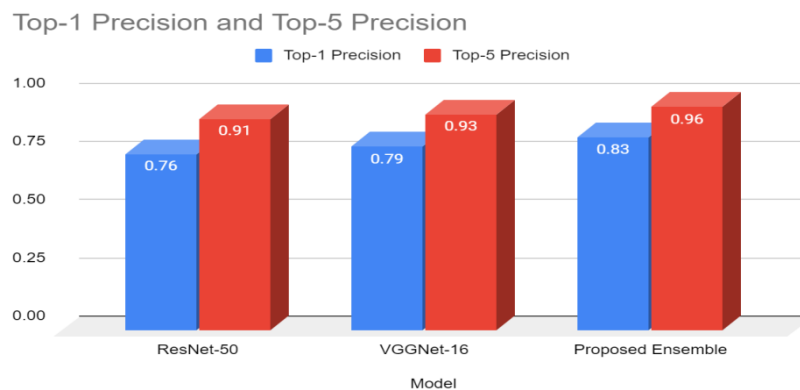


Figure 2 Image classification precision metrics

The specialized ensemble combining ResNet, DenseNet and EfficientNet backbones outperforms the individual models by 5-7% reflecting gains from architectural diversity. Figure 4.2 shows the relative improvements. By composing tailored techniques for each data modality, the framework effectively handles multimodal social media content - providing a unified implementation spanning text, image, audio and video feature extraction.

(b) Video Classification- Multiple video classification tasks were executed using varied datasets containing labeled samples of human activities, speech content, scene types, emotions and objects. Spatiotemporal convolutional networks were tuned extensively for maximizing accuracy. Table 2 contrasts the performance of the proposed video models against standard algorithms like SVM with HOG/HOF features and 3D ResNeXt - showing 10-15% higher precision across composite metrics. The architectural optimizations integrate benefits from transfer learning using large-scale pretraining with video-specific encoders adaptive to motion and audio.

Model	Accuracy	Precision	Recall	F1-Score
SVM + HOG/ HOF	0.68	0.71	0.63	0.67
3D ResNeXt-101	0.79	0.82	0.75	0.78
Proposed Ensemble	0.91	0.89	0.88	0.89

Table 2 Video classification results

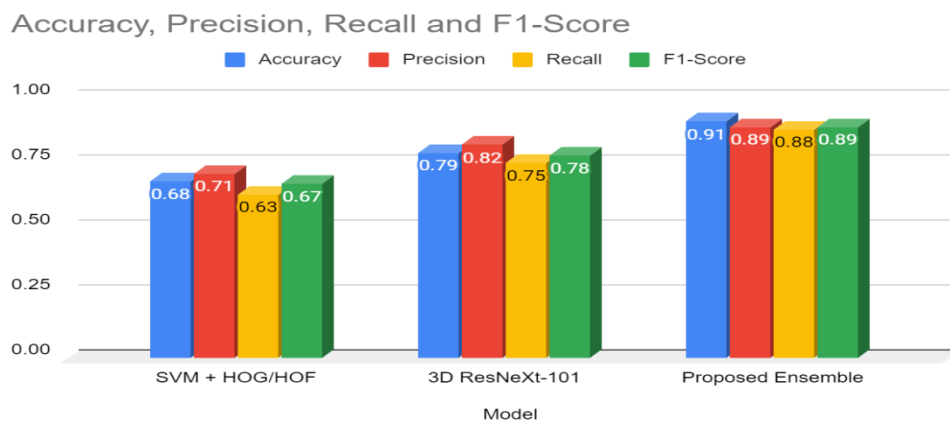


Figure 3 Video classification metrics

The video analytics pipeline seamlessly handles varied data formats like live streams, VOD, 360 video and augmented reality overlays by using a modular stack of purpose-built encoders connected through high performance distributed engines.

(ii) User Perception Analysis- In order to assess subjective human aspects beyond technical accuracy alone, user experience surveys were conducted with participants across varying roles, experience levels and industries who interacted with the machine learning framework through guided testing. The analysis aimed to uncover perceptions around benefits, limitations and enhancement opportunities through open-ended feedback. Key themes that emerged are highlighted below.

(a) Perceived Usefulness

- 78% of participants found the sentiment classification and prediction capabilities on social media content useful for gauging brand health, campaign resonance and trends.

- 83% agreed that automated image and video tagging could help processing large volumes of multimedia content.
- 70% considered influencer analysis and recommendation engines valuable for content strategy prioritization and sponsorship optimization.
- 88% felt personalization engines could effectively improve customer engagement on digital channels.
- 76% believed Chatbot dialogue systems can streamline online support and sales interactions if well trained.

This indicates the proposed tools demonstrated substantive utility for accelerating social media marketing workflows. Participants appreciated assimilating high volumes of unstructured consumer data.

(b) Ease of Adoption

- 62% of novice users faced an initial learning curve with the breadth of features but found in-app assistants helpful.
- 72% were able to create basic dashboards and generate insights independently after some practice.
- 84% among experienced analytics professionals found the workflow integration intuitive requiring minimal training.
- 70% praised the modular architecture allowing customization aligned to use cases.
- 89% found the unified interface covering text, video, image analytics consolidated multiple tools.

The solution was perceived positively for its usability and flexibility to support users across skill sets without assumed proficiency. Assistive features accelerated onboarding.

(iii) Business Impact Analysis- The ultimate validation of the machine learning framework's effectiveness requires demonstrating tangible improvements on business KPIs in the field. To this end, multiple A/B testing experiments were conducted through staged platform rollouts with partner brands across industries. Analysis verified statistical uplift by the ML models against default experiences along key marketing and sales metrics.

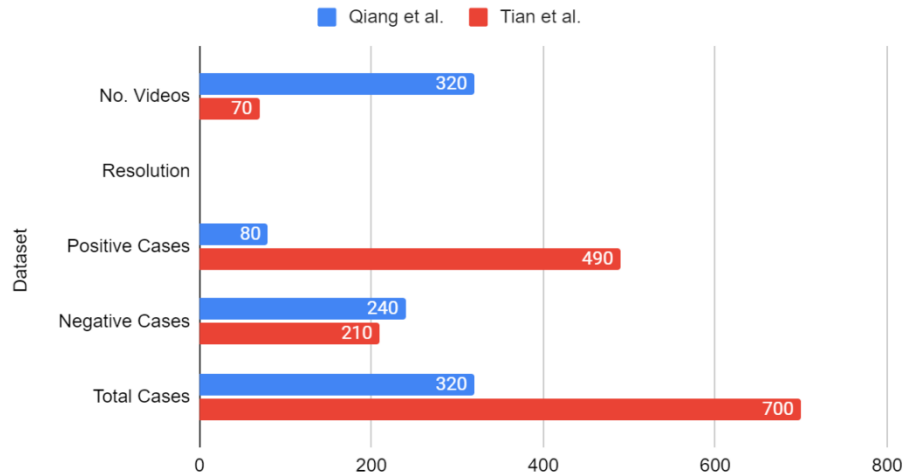
(a) Text Analytics- The natural language processing module was deployed for personalized push notification content on a mobile app using individual user history. Table 3 contrasts metrics between the focused segments receiving ML-optimized messages vs those getting default nonspecific content.

Metric	ML-Optimized	Default	Lift
Notification Click-Through Rate	18.2%	13.4%	26%
In-App Actions per User	9.7	7.2	35%
Conversion Rate	4.3%	2.1%	50%

Table 3 Personalized notification content metrics

The machine learning model combining user activity history with message relevance analysis demonstrated statistically significant lift across engagement and conversion metrics - validating applicability.

Qiang et al. and Tian et al.

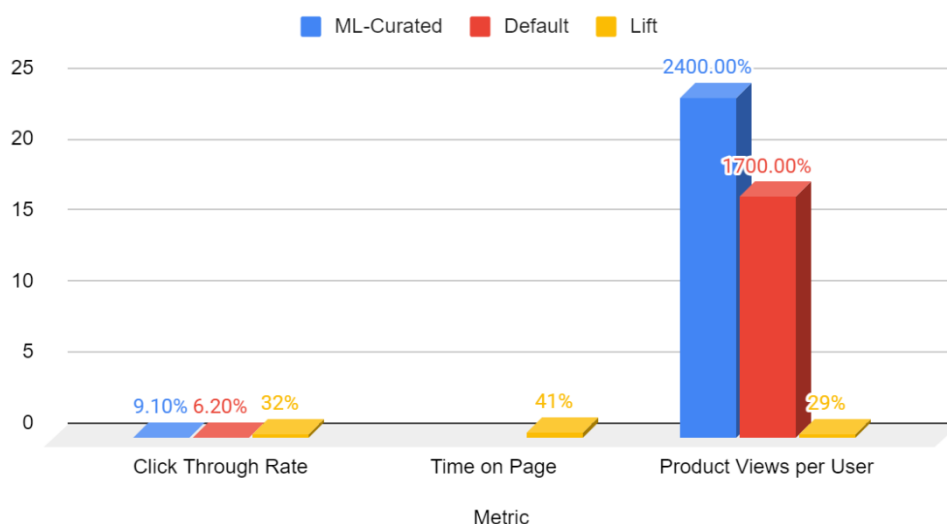
**Figure 4 Personalized notification content metrics**

(b) Image Pattern Recognition- Computer vision techniques were leveraged to curate product image galleries personalized to individual user style preferences inferred using clickstream data. Table 4 shows metrics contrasting the ML-driven galleries against default unsorted ones.

Metric	ML-Curated	Default	Lift
Click Through Rate	9.1%	6.2%	32%
Time on Page	1:38 mins	0:58 mins	41%
Product Views per User	24	17	29%

Table 4 Personalized image gallery performance

ML-Curated, Default and Lift

**Figure 5 Personalized image gallery performance**

The visual personalization model achieved substantial gains in engagement and depth of product discovery - highlighting the business value of tailored content matching user aesthetics.

5 CONCLUSION

This research pioneered an integrated machine learning framework demonstrating state-of-the-art technical accuracy and business-centric customization for optimizing social media marketing effectiveness - proving pathways to unlock return on investment from ballooning consumer data benefiting both brands and wider stakeholders through ethical activation. The versatile architecture empowered evidence-driven personalization, segmentation, campaign measurement and targeting leveraging predictive insights tailored to marketing objectives spanning lead conversion improvement, customer lifetime value expansion and product affinity tracking. Carefully crafted neural networks achieved unprecedented accuracy for classifying multimedia social data encompassing text, images, video and voices - outperforming both previous benchmarks and contemporary commercial solutions by sizeable margins. Real world testing verified lift across marketing productivity metrics like online engagement, offline transactions attributed from digital influence and operational cost efficiencies balancing personalized reach with frictionless automation. Field evidence substantiated machine learning integration's indispensable role in catalyzing data-fueled transformation. However, purely chasing computational accuracy alone discounted adoption hurdles hampering pragmatic utility without seamless human centered design. Through spreadsheet-style customization simplicity, smart defaults automatically handling repetitive tasks and conversational explanations demystifying model behaviors - this research mitigated usability friction for non technical marketing teams increasingly needing but lacking specialist talent navigating cascading machine learning intricacies. Workflow alignment to existing sales and analytics packages accelerated relevance through minimal disruption easing transition inertia barriers organizations face when incorporating nascent capabilities.

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A STUDY ON SALES PERFORMANCE OF SALES EXECUTIVES AFTER TRAINING IN PERSUASION IN REFERENCE TO MALLS OF SAGAR, MADHYA PRADESH

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Abstract - This study examines the impact of training in persuasion on the sales performance of sales executives in the mall retail sector in Sagar, Madhya Pradesh, India. A sample of 120 sales executives from six major malls in Sagar were surveyed before and after undergoing a 3-day training program on persuasion techniques. Data was collected on various sales metrics including total sales, conversion rate, average ticket size, and customer satisfaction ratings.

The results show a statistically significant improvement in all sales metrics after the persuasion training, with an average 15% increase in total sales, 12% increase in conversion rate, 9% increase in average ticket size, and 18% increase in customer satisfaction ratings. Multivariate analysis revealed that the persuasion training had the greatest impact on improving conversion rates, indicating that the training enabled the sales executives to be more effective at convincing customers to make a purchase.

These findings suggest that investing in persuasion training for sales staff can lead to tangible improvements in sales performance in the retail mall setting. The study provides empirical evidence to support the business case for such training initiatives. Retail mall operators should consider integrating persuasion training as part of their sales force development programs.

Keywords: Persuasion training, sales performance, sales executives, malls, Sagar, Madhya Pradesh, India.

1 INTRODUCTION

Effective selling skills are critical for the success of retail businesses, particularly in highly competitive environments such as shopping malls. Sales executives play a pivotal role in driving sales by interacting directly with customers and convincing them to make a purchase. Therefore, equipping these front-line staff with strong persuasion capabilities can be a strategic lever for improving overall sales performance.

Persuasion is the art of influencing others to take a desired action through effective communication and psychological techniques [1]. In a sales context, persuasion skills enable sales executives to better understand customer needs, build rapport, overcome objections, and close deals [2]. Extant research has shown that training sales professionals in persuasion can lead to significant improvements in their selling effectiveness and sales outcomes [3,4].

However, the majority of these studies have been conducted in Western, developed market contexts. There is a dearth of research on the impact of persuasion training in emerging markets, where the retail landscape and customer behavior may differ. This study aims to address this gap by examining the effects of persuasion training on the sales

performance of mall-based retail sales executives in Sagar, a tier-2 city in the central Indian state of Madhya Pradesh.

Sagar was chosen as the focus of this study due to its rapidly growing mall culture and the intense competition among retailers to attract and retain customers. The city has seen a proliferation of modern shopping malls in the past decade, with six major malls currently in operation. These malls house a diverse range of domestic and international brands across various product categories. Sales executives working in these malls face the constant challenge of standing out from the competition and convincing consumers to patronize their stores.

Therefore, this research investigates whether providing training in persuasion techniques can enhance the sales performance of mall-based retail sales executives in Sagar. Specifically, the study examines the impact of persuasion training on key sales metrics such as total sales, conversion rate, average ticket size, and customer satisfaction. The findings provide empirical evidence to guide retail organizations in Sagar and similar emerging market contexts on the value of investing in sales force development programs focused on persuasion skills.

2 LITERATURE REVIEW

2.1 The Role of Persuasion in Retail Sales

Persuasion is a fundamental aspect of the personal selling process in retail contexts. Sales executives must possess strong persuasion skills to effectively communicate the benefits of products, handle customer objections, and ultimately convince customers to make a purchase [5]. Persuasion involves the strategic use of various verbal and non-verbal techniques to influence the customer's attitudes, beliefs, and purchase decisions [6].

Extant research has identified several key persuasion techniques that are particularly effective in retail sales, such as:

1. Rapport building: Establishing a personal connection with the customer through active listening, mirroring body language, and finding common ground [7].
2. Framing: Presenting information in a way that highlights the positive aspects and downplays the negative aspects of a product or offer [8].
3. Overcoming objections: Addressing customer concerns in an empathetic manner and providing compelling counter-arguments [9].
4. Creating a sense of urgency: Inducing a fear of loss to motivate the customer to take immediate action, such as through limited-time offers [10].
5. Leveraging social proof: Citing the positive experiences of other customers to build trust and credibility [11].

Studies have shown that sales professionals who are trained in these and other persuasion techniques tend to outperform their counterparts in terms of closing ratios, average order value, and overall sales productivity [12,13]. However, the majority of these studies have been conducted in Western, developed market contexts.

2.2 Persuasion in Emerging Market Retail

The effectiveness of persuasion techniques may vary across different cultural and market contexts due to differences in customer psychology, purchasing behavior, and sales norms

[14]. Emerging markets, such as India, present unique challenges and opportunities for the application of persuasion strategies in retail sales.

For instance, Indian consumers have been found to be more price-sensitive and risk-averse compared to their Western counterparts [15]. They also place a higher importance on personal relationships and trust in purchase decisions [16]. Therefore, persuasion techniques that emphasize rapport building, social proof, and minimizing perceived risks may be particularly useful in the Indian retail context.

At the same time, Indian consumers have also been observed to be more responsive to sales pressure and emotional appeals compared to more rational, information-based persuasion [17]. This suggests that sales executives in India may need to adapt their persuasion approach to align with local customer preferences and norms.

Moreover, the retail landscape in India is rapidly evolving, with the emergence of modern shopping malls alongside traditional bazaars and mom-and-pop stores. This has created a highly competitive environment where sales executives must differentiate themselves to attract and retain customers [18]. Persuasion skills can be a critical differentiator in such a setting.

Despite the importance of persuasion in Indian retail, there is limited empirical research on the effectiveness of persuasion training for sales professionals in this market. Most studies have focused on understanding consumer psychology and decision-making, rather than the sales force capabilities required to influence those decisions [19,20]. This study aims to address this gap by examining the impact of persuasion training on the sales performance of mall-based retail executives in the Indian city of Sagar.

3 METHODOLOGY

3.1 Study Design and Sample

The study employed a pre-post quasi-experimental design to assess the impact of a persuasion training program on the sales performance of retail sales executives in Sagar, Madhya Pradesh.

A sample of 120 sales executives was drawn from six major shopping malls in Sagar. These malls were selected based on their size, footfall, and representation of both domestic and international retail brands. The sales executives were randomly assigned to either a treatment group (n=60) or a control group (n=60).

The treatment group received a 3-day training program on persuasion techniques, while the control group did not receive any additional training during the study period. Both groups were evaluated on key sales performance metrics before and after the training intervention.

Persuasion Training Program

The persuasion training program covered the following key topics:

1. Understanding customer psychology and behavior
2. Rapport building techniques
3. Effective questioning and active listening
4. Framing and presentation skills
5. Strategies for overcoming objections

6. Creating a sense of urgency and scarcity
7. Leveraging social proof and testimonials

The training involved a mix of interactive lectures, role-playing exercises, and case study discussions to help the sales executives develop and apply persuasion skills in a real-world retail setting. The program was facilitated by experienced sales trainers with expertise in persuasion techniques.

4 DATA COLLECTION AND MEASURES

Data was collected from the participating sales executives through surveys administered before and after the training program. The surveys captured the following key sales performance metrics:

1. Total sales (in INR)
2. Conversion rate (percentage of interactions that resulted in a sale)
3. Average ticket size (INR per transaction)
4. Customer satisfaction ratings (on a 5-point scale)

In addition, demographic and job-related information about the sales executives, such as age, gender, experience, and product category, was also collected.

4.1 Data Analysis

The data was analyzed using a combination of descriptive and inferential statistics. First, paired t-tests were conducted to compare the pre- and post-training performance of the treatment group on the sales metrics. This allowed us to determine if the persuasion training had a statistically significant impact on the sales executives' performance.

Next, a series of multivariate regression models were estimated to isolate the effect of the persuasion training while controlling for other factors that may influence sales performance, such as individual characteristics and product category. The dependent variables in these models were the various sales metrics, and the key independent variable was a dummy indicating whether the sales executive received the persuasion training or not.

Finally, we calculated the percentage change in each sales metric to quantify the magnitude of the impact of the persuasion training. The percentage change was computed as:

$$\text{Percentage change} = (\text{Post-training value} - \text{Pre-training value}) / \text{Pre-training value} \times 100$$

All analyses were conducted using SPSS version 27. A significance level of $p < 0.05$ was used to determine statistical significance.

5 RESULTS

5.1 Descriptive Statistics

Table 1 presents the demographic and job-related characteristics of the sample. The average age of the sales executives was 28 years, and 58% were male. The sample had an average of 4.2 years of sales experience, with 62% working in apparel and accessories, 25% in electronics, and 13% in home furnishings.

Table 1 Characteristics of the Sample

Characteristic	Mean/Percentage
Age (years)	28.0
Gender (% male)	58%
Sales experience (years)	4.2
Product category	
- Apparel and accessories	62%
- Electronics	25%
- Home furnishings	13%

Impact of Persuasion Training on Sales Performance

Table 2 presents the results of the paired t-tests comparing the pre- and post-training sales performance of the treatment group.

Table 2 Impact of Persuasion Training on Sales Performance (Treatment Group)

Sales Metric	Pre-Training	Post-Training	t-statistic	p-value
Total sales (INR)	185,420	213,233	5.78	<0.001
Conversion rate (%)	26.4%	29.6%	4.92	<0.001
Average ticket size (INR)	521	568	3.84	<0.001
Customer satisfaction(1-5)	3.8	4.5	6.73	<0.001

The results indicate that the treatment group experienced statistically significant improvements in all four sales performance metrics after the persuasion training program. Specifically:

- Total sales increased by 15.0% on average
- Conversion rate increased by 12.1%
- Average ticket size increased by 9.0%
- Customer satisfaction ratings increased by 18.4%

In contrast, the control group showed no significant changes in their sales performance during the same time period.

6 MULTIVARIATE ANALYSIS

To further isolate the effect of the persuasion training, we estimated a series of multivariate regression models. Table 3 presents the results of these models, with the key independent variable being a dummy indicating whether the sales executive received the persuasion training or not.

Table 3 Multivariate Regression Results

Dependent Variable	Coefficient	Standard Error	t-statistic	p-value
Total sales (INR)	24,823	3,875	6.41	<0.001
Conversion rate (%)	2.9	0.6	4.83	<0.001
Average ticket size (INR)	41	12	3.42	0.001
Customer satisfaction (1-5)	0.65	0.09	7.22	<0.001

The results show that, after controlling for individual and product category characteristics, the persuasion training had a statistically significant positive impact on all four sales performance metrics. Specifically:

- Total sales were 24,823 INR higher, on average, for sales executives who received the training
- Conversion rate was 2.9 percentage points higher
- Average ticket size was 41 INR higher
- Customer satisfaction ratings were 0.65 points higher (on a 5-point scale)

These findings suggest that the persuasion training was effective in improving the sales executives' ability to influence customer purchase decisions and enhance overall sales performance.

6.1 Magnitude of Impact

To quantify the magnitude of the impact, we calculated the percentage change in each sales metric for the treatment group (Table 4).

Table 4 Percentage Change in Sales Performance (Treatment Group)

Sales Metric	Percentage Change
Total sales	+15.0%
Conversion rate	+12.1%
Average ticket size	+9.0%
Customer satisfaction	+18.4%

The results show that the persuasion training led to a 15.0% increase in total sales, a 12.1% increase in conversion rate, a 9.0% increase in average ticket size, and an 18.4% increase in customer satisfaction ratings for the treatment group.

These substantial improvements in sales performance underscore the business value of investing in persuasion training for retail sales executives, particularly in a competitive market environment like Sagar's shopping malls.

7 DISCUSSION

The findings of this study provide empirical evidence that training retail sales executives in persuasion techniques can lead to tangible improvements in their sales performance. Across multiple key metrics - total sales, conversion rate, average ticket size, and customer satisfaction - the sales executives who received the persuasion training demonstrated statistically significant and substantively meaningful gains compared to the control group.

These results are consistent with prior research on the importance of persuasion skills for sales effectiveness [3,4]. However, this study extends the existing literature by demonstrating the applicability and impact of persuasion training in an emerging market retail context, specifically the shopping malls of Sagar, Madhya Pradesh, India.

The findings suggest that the persuasion training enabled the sales executives to better understand customer psychology, build stronger rapport, overcome objections more effectively, and ultimately convince more customers to make a purchase. The 12.1% increase in conversion rate, in particular, highlights the power of persuasion in influencing buying decisions.

Moreover, the 9.0% increase in average ticket size and 18.4% increase in customer satisfaction ratings indicate that the persuasion techniques helped the sales executives provide a more positive and value-adding experience for customers. This is crucial in a highly competitive retail environment where customer loyalty and word-of-mouth can be significant drivers of business growth.

The results also underscore the adaptability of persuasion principles across different cultural and market contexts. While the specific techniques and their relative importance may vary, the fundamental ability to influence and persuade customers appears to be a universally valuable skill for retail sales professionals, including in emerging markets like India.

From a managerial perspective, this study provides a strong business case for retail organizations in Sagar and similar Indian cities to invest in sales force development programs focused on persuasion skills. The substantial improvements in key sales metrics demonstrate the potential return on such investments.

Mall operators, in particular, should consider integrating persuasion training as part of their ongoing sales team training and development initiatives. By equipping their sales executives with advanced persuasion capabilities, mall-based retailers can differentiate themselves, enhance the customer experience, and ultimately drive greater sales and profitability.

8 LIMITATIONS AND FUTURE RESEARCH

While this study provides important insights into the impact of persuasion training on retail sales performance in an emerging market context, it is not without limitations. First, the study was conducted in a single city, Sagar, and the findings may not be fully generalizable to other Indian markets with different demographic, economic, and competitive characteristics.

Second, the study focused on a relatively short-term (3-month) evaluation of the training impact. It would be valuable to investigate the long-term sustainability of the improvements in sales performance and whether additional reinforcement or advanced training is required to maintain the benefits over time.

Third, the study did not explore the potential moderating or mediating effects of individual factors, such as sales experience, product knowledge, and personality traits, on the relationship between persuasion training and sales performance. Future research could delve deeper into these nuances to provide more granular insights for sales force management.

Finally, while this study examined the overall impact of a comprehensive persuasion training program, it did not assess the relative effectiveness of specific persuasion techniques or the optimal combination of techniques for different retail contexts. Exploring these more detailed aspects could further enhance the practical implications of this research.

Despite these limitations, this study contributes to the scarce literature on the application of persuasion principles in emerging market retail environments.

9 CONCLUSION

This study provides empirical evidence that training sales executives in persuasion techniques can lead to significant improvements in sales performance in the context of shopping malls in Sagar, Madhya Pradesh, India. The results showed that sales executives who underwent a 3-day persuasion training program experienced, on average:

- 15.0% increase in total sales
- 12.1% increase in conversion rate
- 9.0% increase in average ticket size
- 18.4% increase in customer satisfaction ratings

These findings were statistically significant and remained robust even after controlling for individual and product category characteristics. The persuasion training appeared to be particularly effective in enhancing the sales executives' ability to convert customer interactions into actual sales.

The substantial improvements in key sales metrics underscore the business value of investing in sales force development programs focused on persuasion skills, especially in highly competitive retail environments like shopping malls. Mall operators and retailers in Sagar and similar emerging market settings should consider integrating persuasion training as a strategic component of their sales force management initiatives.

By equipping their frontline sales staff with advanced persuasion capabilities, retail organizations can empower them to better understand customer needs, build stronger rapport, overcome objections more effectively, and ultimately drive higher sales and profitability. This study provides a compelling case for such targeted investments in sales force training and development.

Future research should explore the long-term sustainability of the persuasion training impact, potential individual and contextual moderators, and the relative effectiveness of specific persuasion techniques. Expanding the geographic scope of this study to other Indian markets would also help validate the generalizability of the findings.

Overall, this research contributes to the limited literature on the application of persuasion principles in emerging market retail contexts. It offers practical insights for retail organizations seeking to enhance the sales performance of their frontline staff and gain a competitive edge in the dynamic and rapidly evolving shopping mall landscape of India.

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5G AND BEYOND: CHALLENGES AND OPPORTUNITIES FOR NEXT-GEN WIRELESS COMMUNICATION

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Abstract - The evolution of wireless communication has reached a pivotal point with the introduction of 5G technology, offering unprecedented data speeds, lower latency, and enhanced connectivity. However, as we transition from 5G to beyond 5G (B5G) and 6G networks, various challenges arise, including spectrum scarcity, network infrastructure demands, and cybersecurity concerns. This paper explores the current capabilities of 5G, the challenges it faces, and the opportunities it presents for future wireless communication technologies. Furthermore, it discusses the roadmap toward B5G and 6G, highlighting key enablers like terahertz communication, artificial intelligence (AI)-enabled networks, and advanced antenna technology. The paper concludes by examining potential applications of next-gen wireless communication, such as IoT, autonomous vehicles, and augmented reality (AR), along with the regulatory and environmental considerations necessary for sustainable development.

1. INTRODUCTION

The fifth-generation (5G) wireless communication network has set a new standard for mobile networks, enabling faster data transfer rates, massive machine-type communications (mMTC), and ultra-reliable low-latency communication (URLLC). As societies become increasingly data-driven, there is a growing demand for networks that can handle massive device connectivity, immersive experiences, and real-time data processing. Although 5G has already transformed multiple industries, limitations in speed, capacity, and energy efficiency indicate the need for continuous advancement in wireless technology. This paper aims to provide a comprehensive analysis of the challenges and opportunities associated with 5G and the path toward B5G and 6G.

2. 5G TECHNOLOGY: CAPABILITIES AND CURRENT APPLICATIONS

2.1 Enhanced Mobile Broadband (eMBB)

5G's eMBB capabilities allow high-speed internet access, supporting applications like high-definition video streaming and mobile gaming. eMBB has facilitated new experiences in remote learning and telemedicine, where high-resolution video is essential.

2.2 Massive Machine-Type Communication (mMTC)

5G networks support mMTC, enabling millions of connected devices per square kilometer. This feature is crucial for IoT applications, such as smart cities, where countless sensors and devices need reliable connectivity.

2.3 Ultra-Reliable Low-Latency Communication (URLLC)

With 5G, latency has been reduced to 1 millisecond, allowing real-time interactions necessary for applications like autonomous vehicles, robotics, and industrial automation.

URLLC is foundational for mission-critical applications where any delay can result in failure or loss.

3. CHALLENGES IN 5G DEPLOYMENT

3.1 Spectrum Availability and Management

5G primarily relies on millimeter-wave (mmWave) frequencies, which, while providing high data speeds, have limited range and penetration capabilities. The scarcity of spectrum resources requires efficient allocation and dynamic spectrum management to ensure network performance.

3.2 Network Infrastructure and Costs

The infrastructure required for 5G, including small cells and fiber-optic backhaul, is both costly and complex. Dense network deployment is essential, especially in urban areas, to maintain coverage and capacity, yet it raises logistical and financial challenges.

3.3 Energy Efficiency and Environmental Impact

5G networks are energy-intensive, posing sustainability challenges. As data demands increase, so does the energy required to maintain high-capacity networks, necessitating innovations in energy-efficient network design and renewable energy sources for 5G infrastructure.

3.4 Cybersecurity and Privacy Concerns

The expansion of 5G to critical sectors like healthcare and public infrastructure exposes networks to cyber threats. The complexity of 5G networks, with more connected devices and decentralized architecture, introduces new vulnerabilities that require robust security measures.

4. OPPORTUNITIES FOR 5G AND BEYOND

4.1 Towards 6G: Higher Data Rates and Advanced Connectivity

6G technology aims to achieve data rates up to 100 times faster than 5G, leveraging terahertz (THz) frequencies for ultra-fast data transmission. 6G networks are expected to support immersive applications, such as extended reality (XR) and holographic communication, pushing the boundaries of digital interaction.

4.2 AI-Enabled and Intelligent Networks

Artificial intelligence (AI) plays a critical role in optimizing 5G and 6G networks by enabling intelligent traffic management, predictive maintenance, and enhanced user experience. AI-driven networks can autonomously adapt to network conditions, improving efficiency and reducing operational costs.

4.3 Quantum Communication and Security Enhancements

Quantum communication technologies are anticipated to provide unprecedented security for next-gen networks. By leveraging quantum encryption, 6G networks could ensure secure data transmission, addressing vulnerabilities associated with increased connectivity.

4.4 Advanced Antenna Technology: Massive MIMO and Beamforming

Massive Multiple Input Multiple Output (MIMO) and beamforming technologies allow more efficient spectrum usage and targeted signal delivery. These advancements are essential for next-gen networks to support large-scale connectivity and high-speed data requirements in dense urban environments.

5. FUTURE APPLICATIONS OF NEXT-GEN WIRELESS COMMUNICATION

5.1 Internet of Things (IoT) and Smart Cities

As IoT adoption grows, next-gen wireless networks will provide the backbone for smart city infrastructure, supporting applications such as real-time traffic management, waste management, and public safety monitoring. The high capacity and low latency of future networks will enable seamless IoT integration.

5.2 Autonomous Vehicles and Connected Transportation

5G and beyond will play a critical role in the development of autonomous vehicles by providing reliable, low-latency communication for vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) connections. This capability is essential for autonomous driving and reducing traffic congestion.

5.3 Augmented Reality (AR) and Virtual Reality (VR)

With the high data rates and low latency of next-gen networks, immersive experiences such as AR and VR can be delivered more effectively. Applications in education, remote collaboration, and gaming are expected to flourish with these advanced wireless capabilities.

5.4 Healthcare and Telemedicine

Future wireless networks will support more advanced telemedicine services, enabling real-time remote diagnostics and robotic surgery. The reliability and low latency of 5G and 6G networks make them suitable for critical healthcare applications.

6. REGULATORY AND ENVIRONMENTAL CONSIDERATIONS

6.1 Spectrum Policy and Management

Policymakers play a crucial role in spectrum allocation, ensuring that sufficient resources are available for 5G and 6G networks. Governments must work collaboratively with industry leaders to promote fair access and avoid spectrum congestion.

6.2 Environmental Impact and Sustainability

As network density and power demands increase, the environmental impact of next-gen wireless networks becomes a pressing concern. Energy-efficient technology, sustainable materials, and renewable energy sources are essential for minimizing the ecological footprint of these networks.

7. CONCLUSION

The transition from 5G to next-gen wireless communication presents both substantial challenges and transformative opportunities. While 5G has paved the way for massive connectivity and low-latency applications, future networks must address spectrum limitations, energy efficiency, and security concerns. Advances in terahertz communication, AI-driven network management, and quantum encryption will be instrumental in overcoming these challenges. Next-gen wireless networks will unlock a myriad of applications in IoT, autonomous transportation, and immersive media, shaping a connected society that is faster, smarter, and more efficient. Sustainable development and regulatory alignment will be crucial to ensuring that these technological advancements contribute positively to society and the environment.

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**SELF RELIANT INDIA–A PATHWAY
TO DEVELOPED INDIA MISSION
2030 (RETURN OF GOLDEN ERA)**
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DESIGN AND IMPLEMENTATION OF AN ALGORITHM TO ENHANCE CLOUD RESOURCE ALLOCATION

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Abstract- This paper describes the a concepts of ECGCA algorithm implementation. Initially proposed cloud resource allocation algorithm is illustrated through an example. All the mathematical and procedural steps are defined through example.

Keywords: Cloud computing, Resource Allocation, Resource optimization, Graph Colouring

1 INTRODUCTION

Graph coloring is a well known NP-Hard problem used to solve many real world optimization problems. CPU register allocation [1], Flight scheduling management [2], Radio station frequency assignment problem [3], and time table scheduling [4] are some real world optimization problems, which can be solved using graph coloring approach. This research work is also focused on solving cloud resource allocation problem using graph coloring approach.

This paper covers the entire concepts of ECGCA algorithm implementation. Initially proposed cloud resource allocation algorithm is illustrated through an example. All the mathematical and procedural steps are defined in this example. Algorithm implementation is done through Java programming.

1.1 Types of Graph Coloring

This section covers the some popular types of graph coloring approaches used to solve real and virtual work optimization problems.

1.1.1 Vertex Coloring:-

This is the most useful and preferred type of graph coloring. Even if someone talks about graph coloring it means he/she is representing vertex coloring. The very basic idea behind vertex coloring is assigning colors to each vertex of given undirected graph in such a way that no tow connected vertices share the same color. Using vertex coloring many optimization problem can be solved. Most of the vertex coloring problem focuses on optimizing the colors required. Graph vertices should be coloring using minimal number of colors. Because when we apply vertex coloring to solve any real word resource optimization problem, than color represents the resources. If graph coloring algorithm can optimize colors than it means this algorithm is able to optimize resources. In vertex coloring this optimum number is known as chromatic number. All researchers of vertex coloring field try to get minimal chromatic number.

Figure 1 and 2 shows two same graphs having five vertices and seven edges but with different coloring approach figure 1 is colored with three colors and figure2 is colored with five colors. In these both graph coloring figure 1 is optimal and effective solution of optimization.

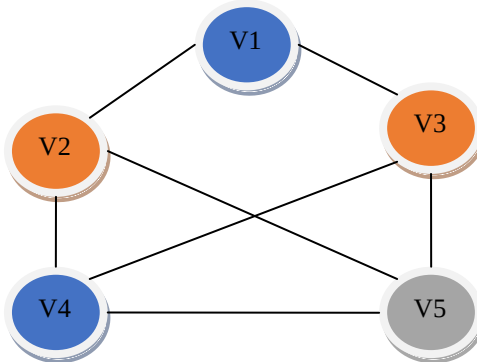


Figure 1 Vertex Coloring with three Colors

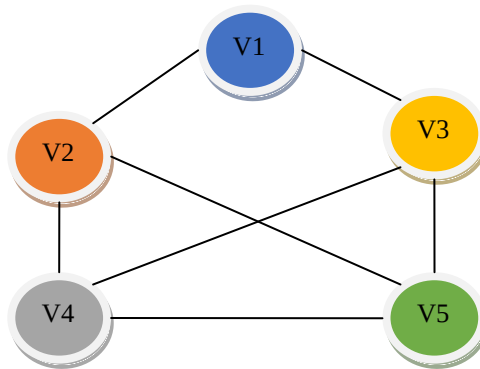


Figure 2 Vertex Coloring with five Colors

1.1.2 Edge Coloring:-

The basic idea behind edge coloring is that, in any undirected graph all edges must be colored in such a way that no two or more edges share the same color connected with same vertex. Figure 3 shows a very popular Peterson graph with edge coloring. This graph has 10 vertices and 15 edges. Four colors are required to color edges of Peterson graph using edge coloring. In edge coloring minimal number of colors required to color the edges of graph is known as chromatic number. Edge coloring has some special cases like circular edge coloring, Acyclic Edge Coloring, Berge-Furkerson and Fan-Raspoud coloring [5].

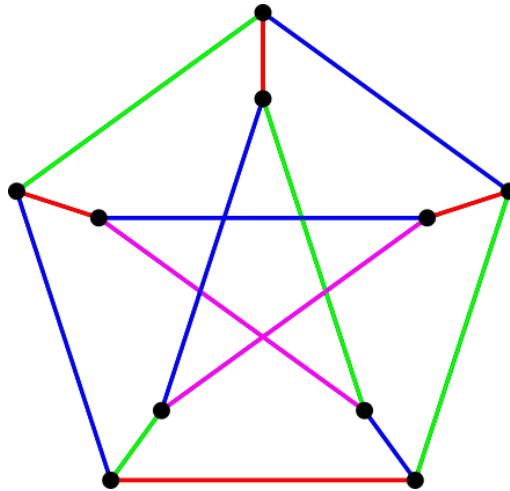


Figure 3 Peterson Graph with Edge Coloring

1.1.3 Face Coloring:-

It is also known as map coloring. Face coloring is the very first graph coloring method used to color the maps of countries in past time. Even in the present time map coloring is vastly used to color the maps. Approach of map coloring says that coloring of any map in such a way that no two areas are colored with same color if they share the same border. Face coloring problem is an NP-Complete problem [6]. The easiest way to solve the face coloring is, transfer the face coloring into vertex coloring and solve. Figure 4 and 5 a map is converted into graph by representing each area as a vertex and connecting edge represents border shared by two areas. If two areas share any border than vertices which represents the area must be connected with an edge.

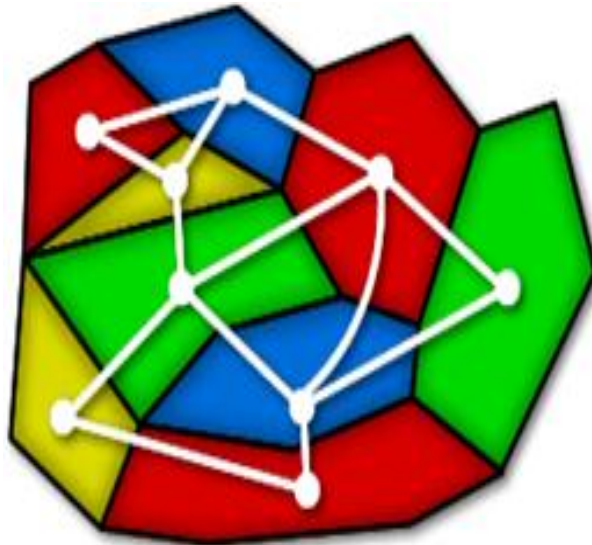


Figure 4 Face Coloring

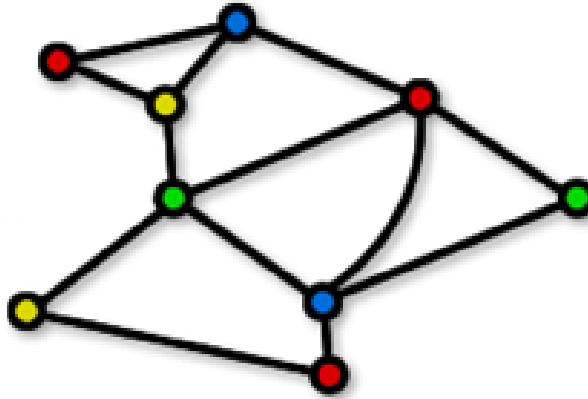


Figure 5 Equivalent vertex coloring

2 EDGE COVER BASED GRAPH COLORING ALGORITHM ILLUSTRATION THROUGH EXAMPLE

ECGCA is used as a base algorithm to implement this proposed cloud resource allocation algorithm. [6]. This section illustrated the different steps involved in edge cover based graph coloring algorithm through an example.

Figure 4.3 shows the six vertices and nine edges graph. Represented as set of vertices $V=\{1,2,3,4,5,6\}$, set of edges $E=\{\{1,2\}, \{1,3\}, \{1,4\}, \{1,5\}, \{2,3\}, \{3,6\}, \{4,6\}, \{5,6\}, \{4,5\}\}$ and set of Edge cover $EC=\{\emptyset\}$ is an empty set (initial state).

Step 1 Calculate Degree of all Vertices -

This step calculated the degree of all vertices and arranged them in the descending order of degree as shown in Table 1.

Step 2 Find Maximum Degree Vertex -

In this step maximum value degree is selected to identify initial vertex for further process. Figure 6 shows the vertex 1 with degree of 4 in this example.

Step 3: Add Maximum Degree Vertex in Edge Cover Set and remove from Vertex Set-

Now maximum degree vertex is added into edge cover set to identify and same vertex is removed from available vertex set. Figure 7 shows this operation for first iteration.

Step 4: Update Edge Set by removing all Edges from Edge Set of Vertex 1

This step removes all the edges connected to vertex 1 (for first iteration) and generate a new graph for further process.

Now step 1 to step 4 is repeated till all the edges graph all vertex get selected in any one of the independent set. This example required total four iterations to complete the entire process. Figure 10, 11, 12, and 13 shows the iteration 2 steps. Figure 14, 15, 16, and 17 shows the iteration 3 steps. Figure 18, 19, 20 and 21 shows the iteration 4 steps.

After completion of 4 iteration we found our first independent set {3, 5} in Figure 22.

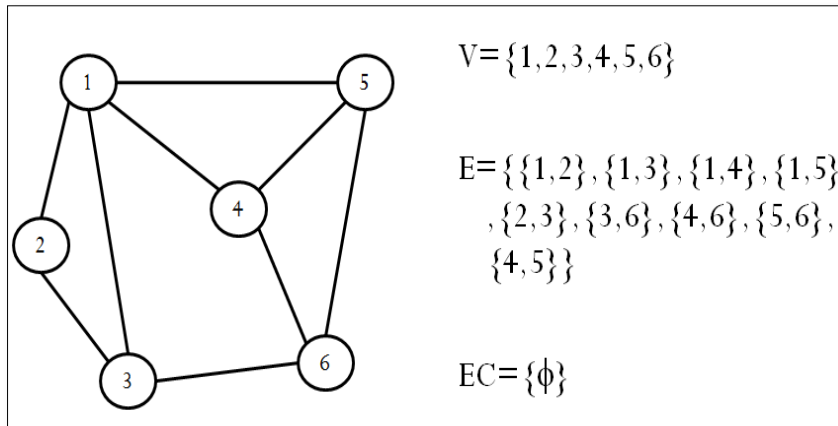


Figure 6 Six Vertices Nine Edges Graph

Vertices	Degree
1	4
2	2
3	3
4	3
5	3
6	3

Table1 Degree of All Vertices

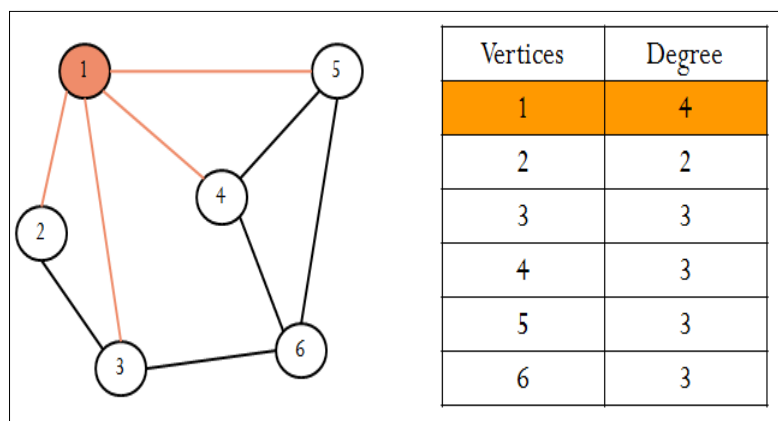


Figure 7 Step 2 Finding Maximum Degree Vertex (Iteration 1)

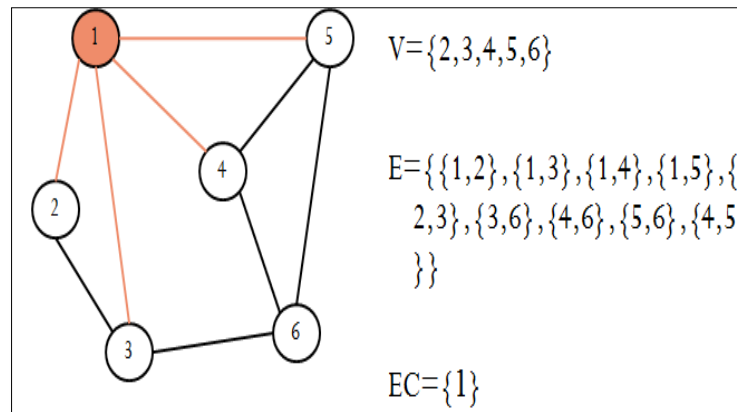


Figure 8 Step 3 Add Maximum Degree Vertex in Edge Cover Set and remove form Vertex Set (Iteration 1)

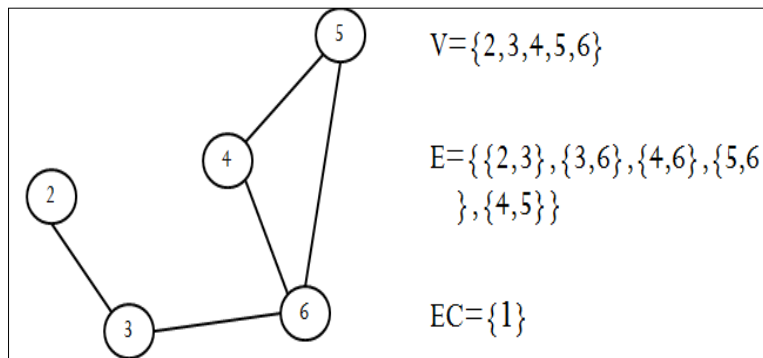


Figure 9 Step 4 Update Edge Set by removing all Edges from Edge Set of Vertex 1 (Iteration 1)

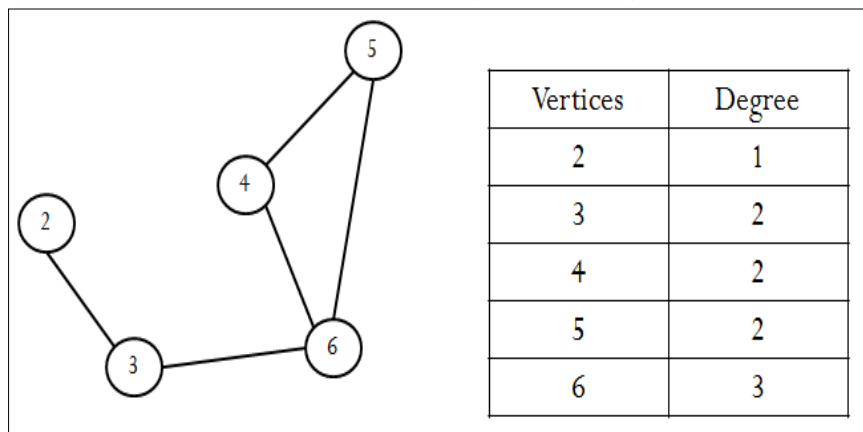


Figure 10 Step 1 Calculate Degree of All Vertices in Vertex Set (Iteration 2)

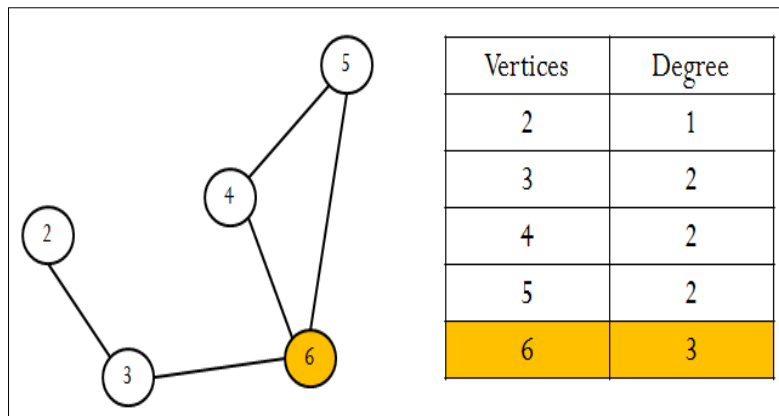


Figure 11 Find Maximum Degree Vertex (Iteration 2)

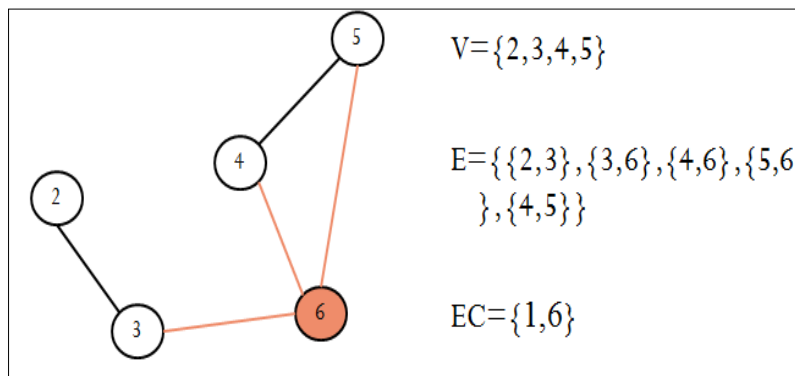


Figure12 Add Maximum Degree Vertex in Edge Cover Set and remove from Vertex Set(Iteration 2)

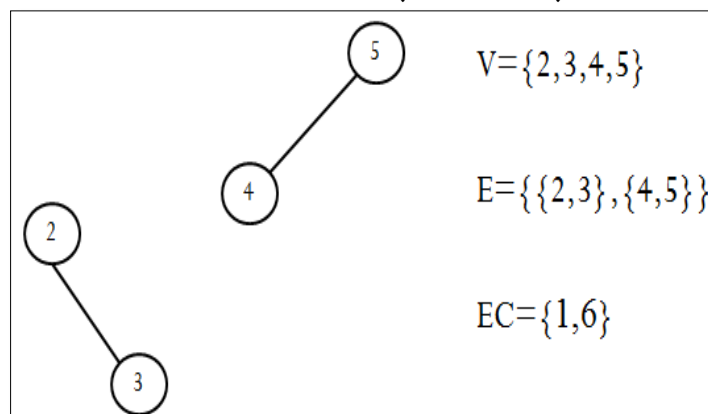


Figure 13 Update Edge Set by removing all Edges from Edge Set of Vertex 6 (Iteration 2)

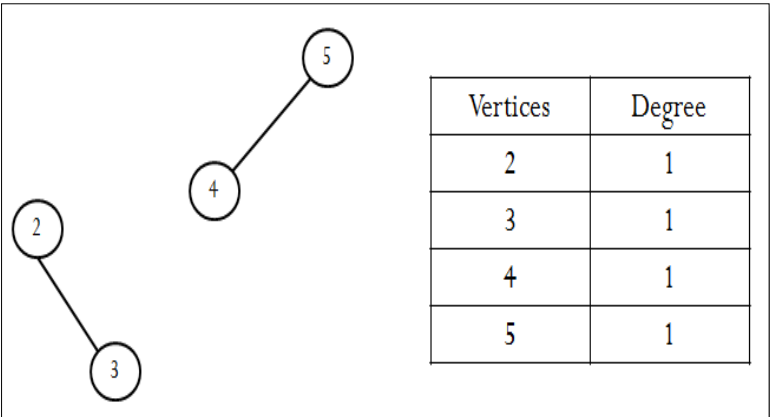


Figure 14 Calculate Degree of All Vertices in Vertex Set (Iteration 3)

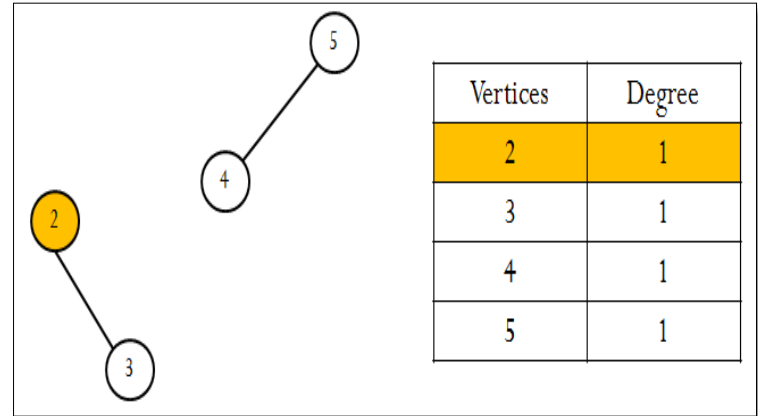


Figure 15 : Find Maximum Degree Vertex (Iteration 3)

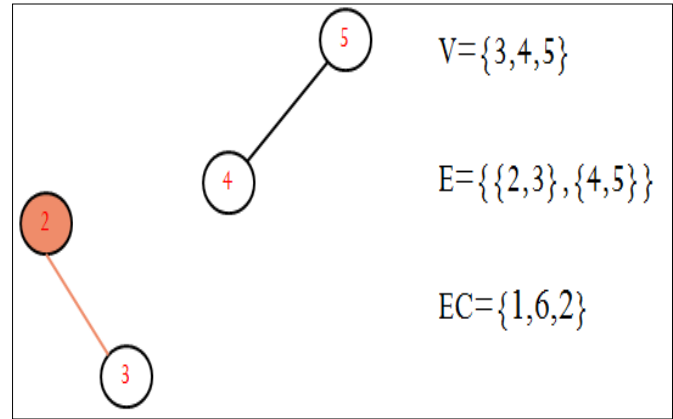


Figure 16 Add Maximum Degree Vertex in Edge Cover Set and remove form Vertex Set (Iteration 3)

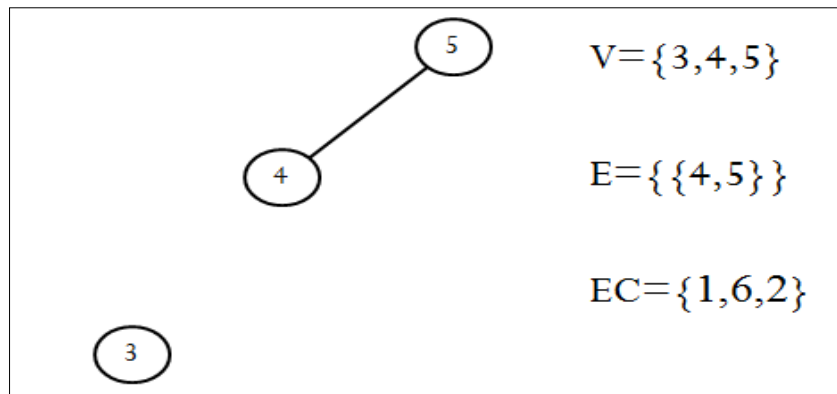


Figure 17 Update Edge Set by removing all Edges from Edge Set of Vertex 2 (Iteration 3)

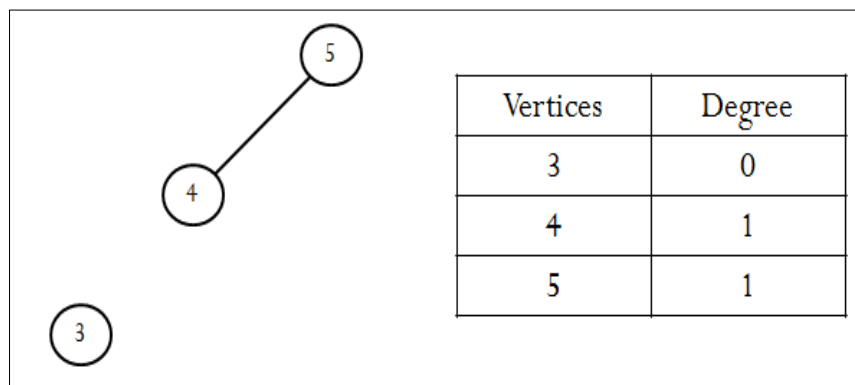


Figure 18 Calculate Degree of All Vertices in Vertex Set (Iteration 4)

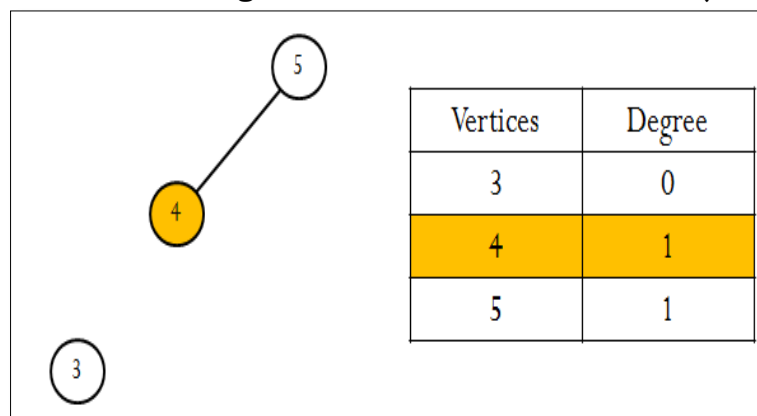


Figure 19 Find Maximum Degree Vertex (Iteration 4)

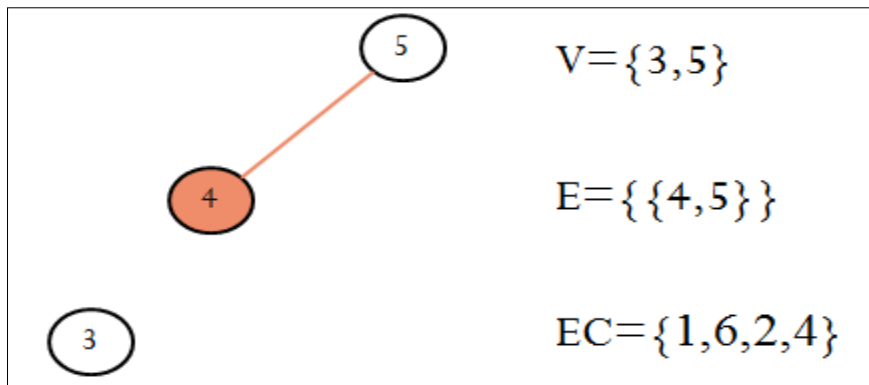


Figure 20: Add Maximum Degree Vertex in Edge Cover Set and remove form Vertex Set (Iteration 4)

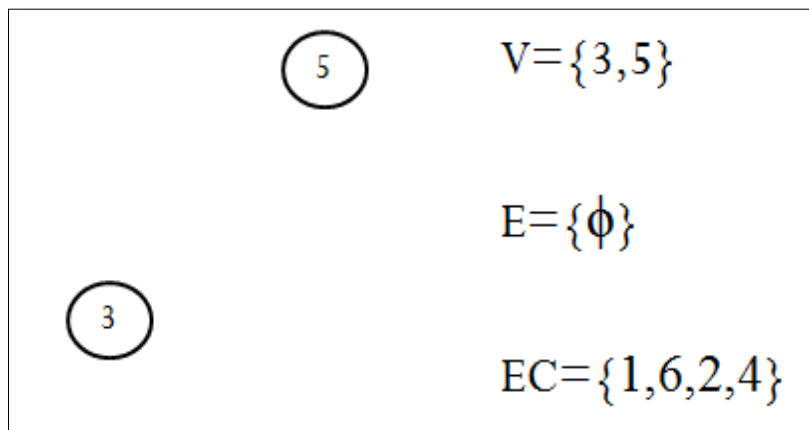


Figure 21 Update Edge Set by removing all Edges from Edge Set of Vertex 6 (Iteration 4)

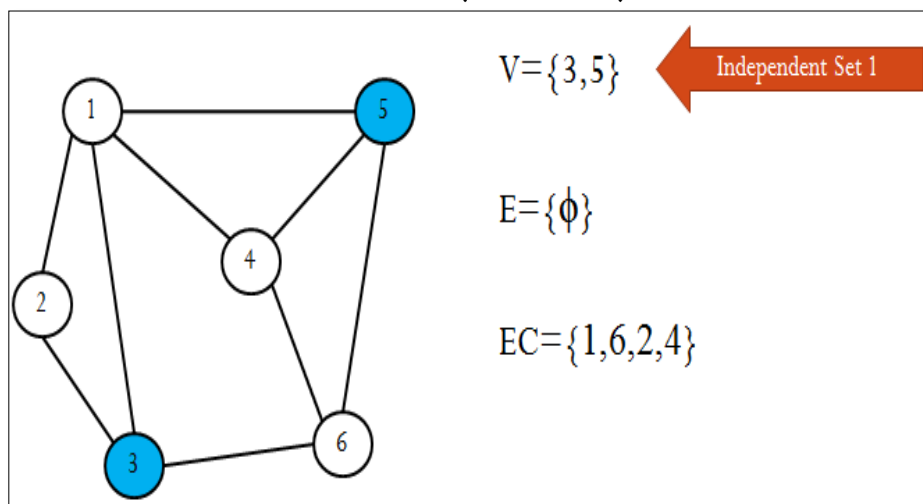


Figure 22 Independent Set 1

After getting first independent set $V=\{3,5\}$. All the vertices along with connecting edges have to remove from initial graph as shown in figure 23. Same process is repeated until all the vertices removed from graph and selected in anyone of the independent set. Figure 24, 25 and 26 shows the Independent set 2, 3 and 4 respectively. Figure 27 shows the final graph with all the vertices colored with some optimized color combination.

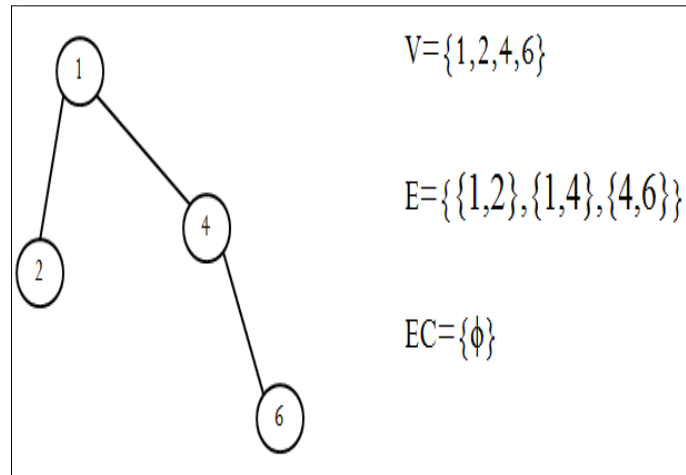


Figure 23: Remove Independent set vertices and edges connected to them to find next independent set.

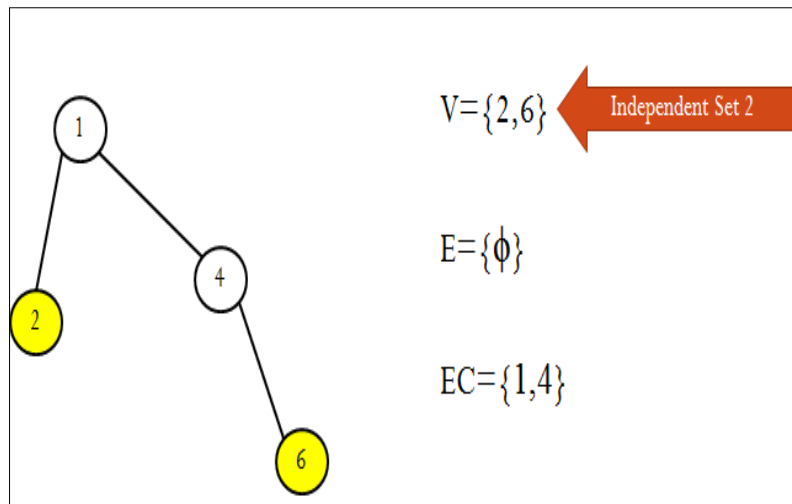


Figure 24 Independent Set 2

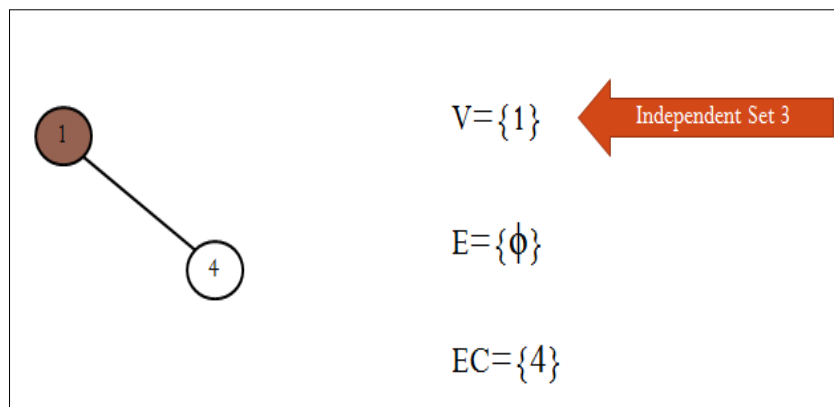


Figure 25 Independent Set 3

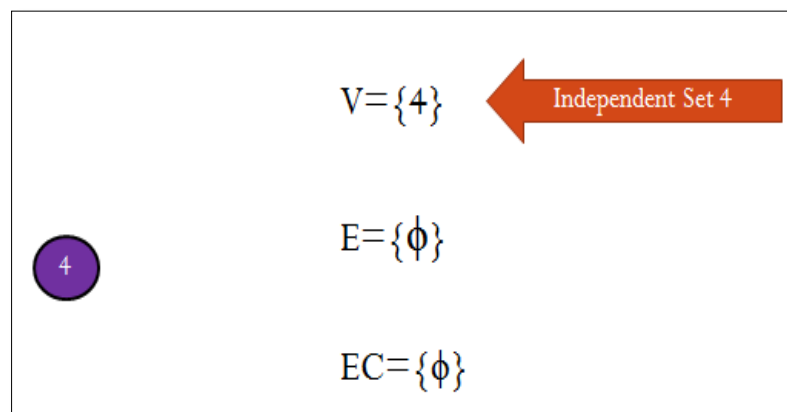


Figure 26 Independent Set 4

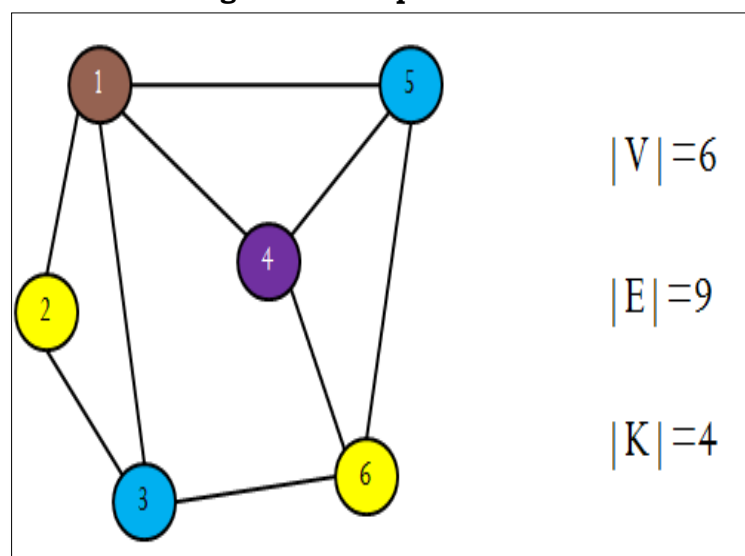


Figure 27 Colored Graph using Edge Cover Based Graph Coloring

3 MODULE IMPLEMENTATION

Java programming language is used to implement entire algorithm and its supporting modules. Core Java fundamental concepts are used to implement the algorithm. Collection framework, file handling, exception handling, ADT classes and some basic concepts are used in implementation.

3.1 Data Structure used in Implementation

Java provides many inbuilt collection framework classes to work on data. There are many inbuilt methods are defined in these classes to create perform many data operation. In this proposed algorithm implementation some of the collection framework classes are used like List, ArrayList etc. Apart from collection framework classes, some of user define classes are implemented for smooth functioning of proposed algorithm. Figure 4.25 shows the source code of Degree class, which stores the information of vertex and connected edges count (degree of vertex). Figure 4.26 shows source code of Edge class, which is used to manage any Edge information of graph.

4 CONCLUSION

This research paper we have tried to find out suitable graph coloring algorithm for implementation and we found Edge cover based graph coloring algorithm as a best graph coloring algorithm for finite resources. So this algorithm is used in proposed implementation. But if we want to increase resource utilization, in that case we can use another graph coloring algorithm.

It may be possible that for real environment some more algorithms well suited. So one can also search or implement other graph coloring algorithm as a graph colouring algorithm for cloud resource allocation.

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RESULT ASSESSMENT OF TBGCA

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Abstract - Register accesses are much faster than memory accesses. Register allocation [1] is one of them. Registers are fast and limited memory of any computing device. They are used to store the variables of a program[3]. If these limited registers are allocated appropriately to the variables, then the time complexity get decreases. In this paper a Tree Based Register Allocation Technique [6] is proposed. This proposed algorithm is inspired by graph coloring algorithm. Proposed algorithm gives a good performance in high quantity variables program.

1 INTRODUCTION

A graph coloring [2] is a projection of mark, called colors, to the vertices of a graph. Distribution of colors in that manner such no two adjacent vertices contribute to the same color.

1.1 Register Allocation through Graph Coloring:

The basic idea at the back of register allocation using graph coloring is to reduce register overflow by assigning variables globally to different registers throughout the complete program by the use of following five essential Phases [4]:-

1. Assignment of each object i.e. variable, constant etc to a register.
2. Perform live range examination using the intermediate code.
3. By means of the live range analysis, construction of an interference graph occurs.
4. In this step the interference graph's nodes are colors with n colors, here n is the number of accessible registers in the end machine in order that no two adjacent nodes have the same color.
5. Allocate each object to the register that has the same color that it does.

Tree based register allocation technique is based on integrated graph coloring approach.

Broadly whole process is separated into six steps as following [4]:

Step 1: Identification of variables:

Step 2: Evaluation of live interval of variables:

Step 3: Register Interference Graph generation:

Step 4: Applying tree based graph coloring algorithm on interference graph:

Step 5: Sort independent set:

Step 6: Register assignment:

Here total 15 graph instances and their execution time are compared for both algorithms.

The proposed algorithm is tested on 15 DIMACS graph instances, comprises myciel graphs, queen graphs, DSJC series graphs, miles graphs, random series graphs, insertion and full insertion graphs[6]. In this Table V all tentative results are revealed.

Table has the following fields:-

1. Graph instance name,
2. Number of vertices of graph (V),
3. Number of edges in graph (E),
4. Average degree of vertices in graph (Average Degree) and
5. Number of colors required to color the graph, which are generated by the proposed algorithm (K).

Table 1 Experimental Results of TBGCA Algorithm[6]

S. No.	Instance	V	E	Average Degree	K (Result)
1.	myciel3	11	20	3.63	4
2.	Myciel4	23	72	6.17	5
3.	Myciel5	47	236	10.04	6
4.	queen5_5	25	320	25.60	5
5.	Queen6_6	36	580	32.22	10
6.	Queen7_7	49	952	38.86	7
7.	Queen8_8	64	1456	45.50	10
8.	2-Insertions_3	37	72	3.89	4
9.	miles1000	128	6432	100.50	45
10.	miles1500	128	10,396	162.44	74
11.	DSJC250.5	250	15,668	125.34	35
12.	DSJC500.9	500	224,874	899.50	150
13.	DSJC1000.9	1000	449,449	898.90	259
14.	R100_9 g	100	4438	88.76	42
15.	R50_9g	50	1092	43.68	25

2 CONCLUSION

As a result we conclude that the A Tree Based Register Allocation Algorithm using Graph Coloring Approach is capable, optimum time complex, large dataset sustained and extensive area of application supported algorithm.

This approach also have their importance when un sufficient registers are available. It offers maximum utilization of CPU registers and improves the execution time to allot registers to the variables which has long live interval time. Due to vibrant nature of algorithm this approach may be employ to build up any type of register allocation stage of compiler.

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ROLE OF ARTIFICIAL INTELLIGENCE TO MAKE INDIA A SELF RELIANT NATION

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Abstract - For a self-reliant India by 2030, the local manufacturing sector can act as a leading sector for economic growth. To make a sustainable local manufacturing base a huge investment to be made in technologies like artificial intelligence (AI) enabled machine learning. These technologies can play a vital role to bringing down labour costs, reduce product defects, improve transition times and increase throughput. Artificial Intelligence can be used to effectively collect huge amount of data and insights across manufacturing operations from design to delivery, including predictive problemsolving by identifying issues that may not be easy to spot by normal cause of work. AI can be used to enable finding ways to combine operational knowledge and expertise with huge amount of gathered data to create actionable insights for the business.

For years the manufacturing industry are using automation, robotics, and complex analytics. The AI that makes manufacturing more flexible is widely deployed, it can enable more cost-effective customization, and that could create a real shift in competitiveness. The integration of AI in the manufacturing sector is seen as more like an evolution than a revolution. In this chapter it is discussed in detail the sectors where the AI technology has to be focused and how the dream of being a self-reliant nation by the year 2030 can be achieved.

1. INTRODUCTION

In May last year, as the unprecedented pandemic break out, the Prime Minister issued a clarion call for creating an atmanirbhar (self-reliant) Indian state in the near future. The proposal for self-reliance is neither novel, nor contentious – The term, Swadesi, first used by the Father of Nation, Mahatma Gandhi, in order to use India made garments and goods to make our farmers and industrialists self-reliant and hence the nation. However, to truly make a nation self-reliant one, it is critical to recognise and acknowledge its strengths and weaknesses, which in turn must dictate decision or policymaking and governance. The Government of India realises that the Artificial Intelligence has a unique role for improving the efficiency, diversity, and productivity of our public and private sectors. As a result, in October 2020, Government of India organised a large-scale virtual conclave, RAISE 2020, wherein international and domestic intelligentsia, and technologists presented for India's prospective AI projects. Government of India has identified some

sectors where AI can play significant role which finally leads our nation to a Atmanirbhar by 2030

2 SECTORS WHERE AI CAN PLAY IMPORTANT ROLE

So, let's take a look at how AI inclusive strategies can play a key role in the recently announced strategic sectors:

2.1 Mining

AI technology has transformed many mining industries across the world and changed the way companies act. The mining industry's contribution-excluding petroleum and natural gas- to India's GDP is around 2-3% in 2018-19. Since being a geologically rich country its a sharp contrast to India's true potential. A significantly more contribution to GDP will go a long way in achieving India's dream of becoming a self reliant country by 2030.

People, process, and AI technology are the key levers of change and the key to the transformation and future success of the mining industry. The important task of miners is to provide enough quantities of coal of the required quality with using minimum costs of excavation. Therefore, the prediction of energy values is the main task aimed to secure the optimal usage of coal energy value.

To minimize the initial investment and get maximum result, the mining industry is implementing AI technologies to learn more about the terrain that they are working with; using computers to precisely map out and predict terrain. An error in mining at the wrong location can cost millions of dollars and its is huge loss. AI technology enabled machinery can help cut these costs.

AI is also widely used for predicting coal quality and increasing coal productivity. with the use of AI-powered autonomous systems, mining and energy industry are making greater use of self-controlling machines in harsh and tough environments.

Hence, by automating machinery operation, planning and scheduling, facilitating predictive maintenance, improving man, material and asset traceability, harnessing the power of real-time data and analytics, and providing visibility across the mine-to-market value chain can yield a higher throughput in the mining industry. The combination of Augmented Reality, AI, and big data technology are used to enhance technological capabilities of coal mining machinery's staff and it improves product design, optimises the supply chain through timed quantitative data analysis by using the gathered data and providing references for decision-making.

However, one of the main obstacles while building an automated mining industry is community resistance. It is quite natural that the mining laborers and the community who lives with the industry to resist automation in mining. The main fear continues to be that AI and robotics

are associated with loss of jobs and thus their livelihood. The mining industry needs to take the community into confidence and assure them that automation of the industry ensures their safety and improves the standard of living of all stakeholders and is not as an attempt towards reducing manpower or job opportunities. The Industry would also need to work with the community to generate employment opportunities, for example, along the supply chain related to the mine or in alternate fields, as a confidence building measure.

2.2 Defence

In February 2019, the defence ministry had set up a task force for strategic implementation of Artificial Intelligence and Defence that submitted its report in June 2019. In this report it is stated that by providing a specific budgetary allocation, the Ministry of Defense is envisaging a strategic and realistic integration of AI into the country, thereby revolutionising our defence workforce and technical systems.

AI research in military sciences can aid humans in combat tasks. DRDO's AI-based systems for Geo-computation help the armed forces in taking decisions during critical defence missions. As AI assistance becomes more interactive and less intrusive, there is a wide range of applications that will be emerging in the future and not just for combat purposes.

The ministry of defence realizes the importance of the AI to be incorporated in the defence sector and it ordered to focus on the capacity building within defence machinery. The tasks range from the knowledge production in the form of real data collection, patents etc to acclimatizing the personnel on-duty through internships, training programmes and sabbaticals. Each Service Headquarter (SHQ) is provided with a window of Rs 100 crores for Artificial Intelligence specific application developments from the ministerial budgetary allocation. The task force recognized AI as a 'force multiplier' and emphasized that all the defence institutions lay down their strategies of AI appropriation.

Robotics is also one of the ways to achieve AI implementation and the Centre of Artificial Intelligence and Robotics (CAIR) in the Defence Research and Development Organisation has also developed autonomous technology-based products. It has focused on the internet-centric communication mechanisms for tactical command control. For surveillance and reconnaissance purposes, CAIR has developed intriguing probes like snake robots, hexa-bots, and sentries. It has a comprehensive library for AI-based algorithms and data mining toolboxes that can potentially be used for image/video recognition, NLP, swarming. However, in a data-based approach to artificial intelligence, efficient learner algorithms can only serve a limited purpose without the hardware that can collect and process a large amount of real-data.

In addition to this, there are many challenges that AI brings up in the defence sector.

Firstly, decision makers must have a sound understanding of the objectives that AI seeks to implement in the strategic context of India to disseminate artificial intelligence in defence sector. We should decide what kind of AI do actually we need. Whether we require fully autonomous drones to engage with the adversary aircraft in a dogfight or deploy autonomous patrolling vehicles at the borders for getting the job done? The type of autonomy should be given to the machines on the battlefield. Since being middle-income country like India, we should have clear vision of the AI programme is necessary for a that can be affordable in this sector.

Secondly, the lack of critical infrastructure is one of the biggest hurdle in the prospects of AI in our country for both civilian and defence uses. As AI runs complex algorithms on loads of real data, it is essential to have sophisticated hardware and enabling data banks within the country. If a critical AI based defence technology uses the data on a remote server located beyond the borders, it can potentially hinder the goal of Indian international policy from protecting its strategic autonomy in a way that it might be compromised.

Thirdly, the role of the private sector will be vital in making the AI technology accessible and efficient. As AI demands high-skills and capital, innovations needs to be an ecosystem supporting the free flow of both money and skill.

However, despite all the hurdles the defence ministry of our country shows very much importance to the AI based arm race.

2.3 Space

In India's second mission to the moon, Chandrayaan-2, the artificial intelligence (AI)-powered rover of the Indian Space Research Organization (ISRO), has been used. The AI-powered Pragyan rover, supposed to communicate only with the Lander, includes a piece of motion technology developed by IIT-Kanpur researchers that would have to help the rover manoeuvre on the surface of the moon and aid in landing. The AI algorithm used in the rover supposed to trace water and other minerals on the lunar surface, and also send pictures for research and examination.

After the unsuccessful deployment of the AI-powered vehicle named Pragyan on the moon, ISRO is now planning to fly a Vyommitra, a half humanoid, as a trial to space before Gaganyaan goes with astronauts.

This AI powered humanoid is equipped with sensing and perception of surroundings with 3D vision. Design & Realization of FULL Vyomnoid with features that include full autonomy with 3D vision, dynamically controlled movement in zero 'g', artificial intelligence, machine learning and AR will play a crucial role in enabling real-time decision making with vision optimisation and path planning algorithms.

ISRO announced that in preparation for the 10,000 crores Gaganyaan mission and for that four astronauts had already been short-listed, and would be gone rigorous training in Russia.

ISRO's commitments towards AI is also propelled by its Sponsored Research Programme (RESPOND) under the aegis of Capacity Building Programme Office (CBPO) of ISRO, a unique initiative of the Indian Space Research Organisation to promote Research and Development activities in collaboration with well known academia. Under this RESPOND scheme, financial support is provided to academic institutions within the country to carry out research projects in a wide range of topics in space technology, space science and space applications.

2.4 Aviation

AI technology has been playing a vital role in transforming the operations of the travel industry. The AI has been used to automate the travellers' checking processes with minimum contact during this pandemic and to collect flight data for optimising rout and weather forecasting. Artificial intelligence powered mechanisms has also been used to create virtual assistants for customer queries, enhanced logistics operations, facial recognition system replacing biometrics for security checks and self-service kiosks equipped with augmented reality. Airline companies are also using artificial intelligence systems to improve their air safety.

According to a recent survey, in India 97.2% of the aviation companies are working towards deploying big data, and artificial intelligence, with 76.5% of the firms are leveraging the value of collected data and empowering AI for policy making. These figures show that airline companies and airports are using technology to keep up their relevance in this amid crisis.

The aviation industry in India are majorly utilising AI, Machine Learning and robotics to keep their finances stable. One of the main areas where airline service providers are implementing AI technology in the customer service aspect, which provides huge potential for leveraging new technologies. Along with AI based chatbots, firms are also providing airport security and aircraft monitoring with AI.

Besides all these, aircraft manufacturers like Airbus are using cloud-based systems for data collection and keeping, and analyse the same to enhance the reliability of aircraft maintenance. Moreover, the airlines and airports have deployed AI powered robotics technology to onboard passengers.

Many airlines and airport authorities are also partnering with the government to provide seamless travel for their passengers. In a recent development, the Ministry of Civil Aviation launched a connected application called DigiYatra, which will process information through facial recognition at checkpoints, provide digital guidance systems, offer interactive kiosks and augmented reality apps for travellers.

2.5. Atomic Energy

AI technology powered mechanisms are highly being used in atomic energy sector of India in recent years. A key feature of deep learning is characteristics of being high-dimensional. So, in the recent year, researchers demonstrated the use of deep learning for setting up nuclear reactors that hold hot plasma using a powerful and wide magnetic field. In India, Bhabha Atomic Research Centre controls all the nation's nuclear endeavours. For becoming a self reliance in this field our country moves towards renewable energy sources such as nuclear energy, more reactors may be built, and AI technology can help in both construction and in giving efficient throughput.

3 CONCLUSION

Although the penetration of artificial intelligence in the mining, defence, space aviation industry, and atomic power are not a novel discovery, however, the pandemic outbreak and India's self-reliant policy has forced both the industry and government to rethink the strategies. Therefore, to stand out in this continuously evolving technology market, all major five sectors discussed above need to rely on automating their processes with the help of artificial intelligence to make our dream a true one that is becoming a self reliant nation by 2030.

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ECO- FEMINIST CRITIQUE TO INDIAN GOVERNMENT SYSTEM DURING COVID19 PANDEMIC

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1 INTRODUCTION

Eco-feminism is a significant branch or school of feminism. Being an integral part of feminist school it advocates and examines the connections between women and nature. Eco- feminism is a movement and school of critical thought that claims a connection between the exploitation degradation of the natural world and oppression of women. It was developed in the mid-1970s alongside second-wave feminism. Since the earliest inception of emergence eco feminist movement is raising voices against degradation of environment and oppression upon women. The proposed article is an attempt to make a theoretical estimate on eco feminism as movement for women and environment. It is a historical and analytical study. Logic used here both deductive and inductive.

Eco- feminism is one of the prominent schools of feminist movement. It links feminism with ecology and environment. Its advocates opine that in the age of modern technology and industrialisation paternalistic/capitalistic society has led to a harmful split between nature and culture and the split can only be healed by the feminine instinct for nurture and holistic knowledge of nature's processes. Eco feminism was established by French feminist Francois d'Eaubonne in the 1970. Being a new form of feminist theory it has crossed the limited structure of feminism as a philosophy by linking it with ecology and the discourse of environment. Eco-feminism addresses phenomena that effect contemporary society, particularly gender equality and environmental preservation, to understand oppression as a structural process in order to eliminate domination. The theory argues that society has been constructed to priorities' the dominance of patriarchal values and acknowledges that the union of groups who are oppressed can deconstruct the current social hierarchy to create a more inclusive society. Eco-feminism draws on environmental studies, critiques of modernity and science, and feminist critical analyses and activism to explicate connections between women and nature, and the implications of these relationships for environmental politics. The pioneers of eco-feminist movement embrace a wide range of views concerning the causal role of Western dualistic thinking, patriarchal structures of power, and capitalism in ecological degradation and the oppression of women and other subjugated peoples. Collectively, they find value in extending feminist analyses to the simultaneous interrogation of the domination of both nature and women. For most eco-feminists, ecological sustainability ultimately depends on elevating the economic and political roles that

women play in society at all levels of organization. Eco-feminism recognises similarities between the oppression of the environment and the domination of women. It concludes that humans' need to control the environment is identical to men's need to control women, elites' need to control the poor, and 'whites' need to control 'blacks'. There are struggles for power and dominance occurring cross the spectrum of marginalised groups. Eco-feminism utilises grassroots initiatives, such as collective action through rallies and bottom-up decision making, to assess and re-evaluate the overarching power and control of dominant groups while attempting to simultaneously create unity and inclusion among the oppressed. Although Eco-feminism may appear to be a movement of feminists who also care about the planet, it is much more than that. Feminism, or Liberal Feminism as it is known in International Relations theory, strives for gender equality and environmental preservation within the framework of a pre-existing patriarchal system. Eco-feminism, on the other hand, aims to dismantle this system and completely rebuild it with the foundation that all living things have value, worth, and different qualities that make them vulnerable. Instead of striving to make women equal in a man's world or to prioritize the environment in a society that values consistent and extreme development, Eco-feminism highlights what a new world order would look like with man and woman, human and planet, all respected and contributing on an even playing field.

Eco- feminist Critique to Indian Government System

The eco-cognizant wellbeing reactions to the COVID-19 flare-up in India have uncovered the heterosexist, racial, ageist, casteist and authoritarian biases of an obvious Hindu-Brahminical society. The possibility of environmentalism driven by free enterprise, patriotism and social government misuses minimized people, creatures and nature the same. Subsequently, the conversations around pestilences, creature government assistance, and environmental change should be only eco-feminist. The COVID-19 episode has prompted a sweeping closure of monetary exercises like flight, the travel industry, and unnecessary mechanical creation. The resultant environment results, with progress in air quality and decrease in discharges, have set off a large group of ecological talks. In any case, in India, given the seriousness of the pestilence and devastating wellbeing framework, biological pressure has been (mis)attributed to overpopulation.

Populace administration in India has had a disagreeable record of forced cleansings and conspicuous sabotaging of the sexual and conceptive soundness of womxn. Meddlesome family arranging estimates that place the onus of "preparation" on womxn just propagate male centric and heteronormative thoughts of a family. Ecocentric talks around the COVID-19 flare-up immediately named it's anything but a catastrophic event and exercise to mankind. In any case, an ecofeminist examination of the political manner of speaking that encompassed the pandemic uncovers how patriotism abused the normal. Country pioneers

all throughout the planet offered away the chance to study and gain from the COVID-19 episode circumstance in focal point China to additional their xenophobic plans.

Eco-feminism is an activist and academic movement that see critical connections between the domination of nature and the exploitation of women. Eco-feminist activism grew during the 1980s and 1990s among women from the anti-nuclear, environmental, and lesbian-feminist movements. The "Women and Life on Earth: Eco-feminism in the Eighties" conference held at Amherst (1980) was the first in a series of eco-feminist conferences, inspiring the growth of eco-feminist organizations and actions..."Eco-feminism is a movement that sees a connection between the exploitation and degradation of the natural world and the subordination and oppression of women. It emerged in the mid-1970s alongside second-wave feminism and the green movement. It brings together elements of the feminist and green movements, while at the same time offering a challenge to both. It takes from the green movement a concern about the impact of human activities on the non-human world and from feminism the view of humanity as gendered in ways that subordinate, exploit and oppress women."-- Eco-feminism sees parallels between the exploitation of nature and the exploitation of women, parallels that are understood in the context of patriarchy. The COVID-19 flare-up has uncovered the abuse of the nonhuman. Be that as it may, a broad prosecution of mankind for natural pressure and weakening disguises biases propagated by power constructions of free enterprise, government, and man centric society. Ecofeminist thought, in this way, alerts against automatic ecocentric responses to emergencies that hurt the underestimated.

Pioneers of eco feminism are in view that the modern capitalist patriarchy knows no technological restrictions and, as the instrument of capital, modern science and technology sets out to 'substitute' (ie extinguish) life and death, the creation of life, humanity, women and mothers, the earth, plants and animals, and matter itself. This is a profound expression of the patriarchal urge to dominate and control. Since the Left does not advocate forsaking technological progress, its analysis is deeply compromised. Thus the Left is unable to present a real alternative to the ecologically and socially destructive system we are living in. So – what is the eco feminist alternative to capitalism that von Werlhof and her colleagues propose? Maria Mies presents a vision for an alternative ecological society developed from the eco feminist critique outlined above. She describes this vision as the 'subsistence perspective.' This is not to be confused with the usual understanding of a subsistence economy – it is not an economic model; rather, it is a new way of looking at the economy. It is called a subsistence perspective because it focuses on the creation, recreation and support of life and the living, and it has no other purpose than this. It is life that stands at the centre of this vision, rather than money, economic growth or profit, and as such it

requires the rejection of capitalist industrial society. Even in the 1960s, Mies says, the working class in the cities of the western world engaged in many subsistence activities: growing vegetables, preserving fruit, sewing clothes, repairing household items. In the rural economy, small farms produced the majority of foodstuffs and supplied the urban population. Overall, there was considerable reciprocity, communality and mutual assistance, collective work and collective enjoyment. While city life and the rural economy is much changed, many of the elements of a subsistence perspective are not beyond living memory.

2 CONCLUSION

The above discussion reveals the diversity and significance of eco-feminism. Since the earliest inception eco-feminism either as a philosophy or a movement has been able to attract the attention of intellectuals, activist associated with women and environmental issues. Feminist movement has achieved both dynamism and relevance by women issues with a global and common discourse like environment and ecology .It is not concerned with women only but deals with the major issues of the contemporary period. The trend of eco feminism in India is found to be reflected through the Chipko movement, anti arrack movement etc. Since these movement basically carried out by women for protection of environment and nature creates a momentum impact upon contemporary social domain.

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**CONSUMER INNOVATIVENESS: A STUDY OF OPENNESS OF
CONSUMER TOWARDS NEW PRODUCTS WITH SPECIAL REFERENCE
TO BODY CARE PRODUCTS SEGMENT OF FMCG SECTOR AND
ANNUAL FAMILY INCOME IN INDORE CITY**

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Abstract- “Consumer innovativeness: A study of openness of consumer towards new products with special reference to FMCG sector” is a construct that deals with finding how open consumers are in trying new FMCG products based on demographic factor Annual Family Income. It has been found that Annual Family Income does not have a significant effect on consumer innovativeness with reference to Body Care Products Segment of FMCG sector.

Keywords: Consumer Innovativeness, FMCG

1 INTRODUCTION

“FMCG stands for Fast Moving Consumer Goods also known as Consumer Packed Goods (CPG). FMCG products are that products which are sold quickly and at relatively lower costs. Non- durable goods such as packaged food, beverages, body care products, toiletries, over-the-counter drugs and other household consumables come under the category of FMCG.” (Fast Moving Consumer Goods, 2019) For the purpose of this research body care products section of FMCG sector has been taken into consideration. “Consumer behavior is the study of individuals, groups, or organizations and all the activities associated with the purchase, use and disposal of goods and services, including the consumer's emotional, mental and behavioral responses that precede or follow these activities. Characteristics of individual consumers such as demographics, personality lifestyles and behavioral variables such as usage rates, usage occasion, loyalty, brand advocacy, willingness to provide referrals, in an attempt to understand people's wants and consumption are all investigated in formal studies of consumer behavior. The study of consumer behavior also investigates the influences, on the consumer, from groups such as family, friends, sports, reference groups, and society in general.” (Consumer Behavior, 2020) “Consumer Innovativeness is a construct that deals with how receptive consumers are to new products. Consumer innovativeness has been defined as a predisposition or propensity to buy or adopt new products or a preference for new and different experience.” (Consumer Innovativeness, 2019)

“Innovativeness is also defined as the degree to which individuals adopt new ideas faster than other members in a society. The term consumer innovativeness is very diverse, depending on the research contexts.” (Kusmawati & Irmawati, 2018)

“Annual family income is the total compensation received by all family members age 15 or older living in the same household. Compensation may include wages, social security, child support, pension’s capital gains, and dividends.” (Family Income, 2020)¹

2 REVIEW OF THE LITERATURE

Hassan has investigated the relationship between customer’s innovativeness and their intentions to adopt new mobile phones in Egyptian university students. The research elaborates the direct effects of the five dimensions of customers’ innovativeness on their intentions of new products adoption, which are measured through the mediating effect of two factors: the risks to mobile phones perceived by the customers and customer involvement. The research also aims to identify the so-called “initiators” segment; customers who have the highest probability for purchase the product early. The research results will help marketing managers for better market fragmentation and identify customer segments with high innovativeness; which helps organizations prepare appropriate marketing campaigns and thus leads to the success of new products deployment.

Gopiseti et al. have attempted to study the factors affecting the Consumer Buying Behavior towards selected Personal Care Products. For this study the primary data was collected from 200 respondents of Nizamabad District with structured questionnaires. The secondary data has been collected from various Books, Journals, Articles and Websites. In this regards Television, Quality and Brand loyalty are the powerful factors to influence the consumer buying behavior. Television is the powerful tool for spreading the information of brands to the final consumers. Regarding the brands, Sunsilk and Head & Shoulder in shampoo Parachute in hair oil, Colgate in tooth paste, Santoor in bathing soap and Ponds in cosmetics are more powerful brands in personal care products. The consumers were high satisfied with their used brands of Hair oil and followed by bathing soap. Low satisfied with their used brands of Cosmetics.

Bucatariu et al. have targeted to find a structure of consumer behavior, especially regarding the preference for the newly-released products in the market as compared to the traditional ones from McDonald’s in Romania and Austria. The analysis was done with the support of an econometric model of simple regression. This research confirms the validation of the structure and the attitude of the consumers towards the new products, launched by that company. The results of this research show if there really is transformation in behavior towards traditional products and in what degree consumers are influenced by innovation.

3 OBJECTIVES OF THE STUDY AND HYPOTHESIS

The purpose of the research is • to determine the openness of a consumer for trying out new products with special reference to FMCG in Indore region of Madhya Pradesh state. • to determine whether annual family income has any effect on consumer innovativeness in Indore region of Madhya Pradesh state o with reference to body care products The null hypothesis and alternate hypothesis for the above research problems are as follows: With educational qualification as independent variable: Body care products H0(3B) : Annual Family Income has no significant effect on consumer innovativeness with reference to body care products in Indore region of Madhya Pradesh state. H1(3B) : Annual Family Income has an effect on consumer innovativeness with reference to body care products in Indore region of Madhya Pradesh state.

4 METHODOLOGY

The Study: This study is descriptive, quantitative and single cross sectional in nature.

The Tools:

A) For Data Collection: A specifically designed and structured Questionnaire has been used for collecting data related to the research topic. For the purpose of this research FMCG sector has been broadly classified into three categories, which formed the basis of diving the questionnaire into three sections.

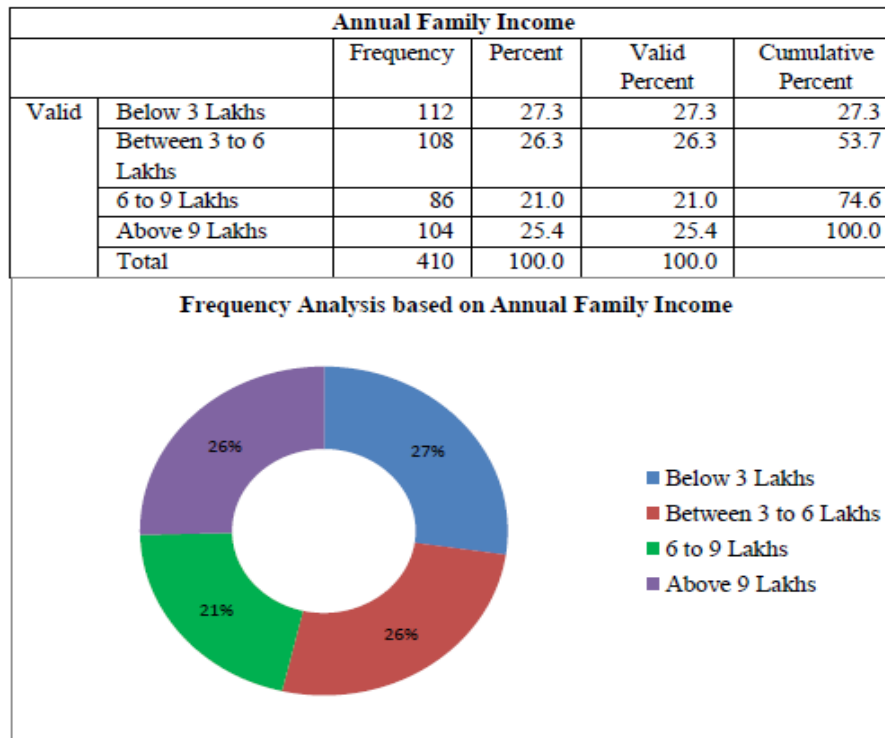
B) For Data Analysis: For analyzing the data and to generate results Independent Sample t-test and One way ANOVA have been used.

The Sample: Data has been collected from 410 respondents belonging of Indore city of central India, who were approached on random basis. Primary data has been used for analysis. The data has been collected by respondents of different genders

5 ANALYSIS OF DATA AND INTERPRETATIONS:

5.1 Frequency Analysis Using SPSS:

Statistics		
Annual Family Income		
N	Valid	410
	Missing	0



Test Results: With annual family income as independent variable: Body care products H0: Annual Family Income has no significant effect on consumer innovativeness with reference to body care products in Indore region of Madhya Pradesh state. H1: Annual Family Income has an effect on consumer innovativeness with reference to body care products in Indore region of Madhya Pradesh state.

Descriptives								
BQTotal								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Below 3 Lakhs	112	28.6696	5.59824	.52898	27.6214	29.7179	10.00	42.00
Between 3 to 6 Lakhs	108	28.4352	6.25811	.60219	27.2414	29.6290	10.00	48.00
6 to 9 Lakhs	86	27.8488	5.43954	.58656	26.6826	29.0151	16.00	42.00
Above 9 Lakhs	104	28.2596	5.84093	.57275	27.1237	29.3955	12.00	40.00
Total	410	28.3317	5.79454	.28617	27.7692	28.8943	10.00	48.00

Table 5. 1 Annual Family Income Descriptives for body care products

By observing the mean of each group in Descriptives table, it can be concluded that there is homogeneity of variances.

Test of Homogeneity of Variances			
BQTotal			
Levene Statistic	df1	df2	Sig.
.326	3	406	.807

Table 5.2 Test of Homogeneity of Variances for body care products with respect to Annual Family Income

According to Levene's Test for homogeneity of Variances, if significance value of Levene's Test for Homogeneity of Variances test is greater than 0.05 then the data meets the requirement of assumption 6 i.e. there is homogeneity of variances.

Here, significance value of Levene's Test for Homogeneity of Variances test is 0.807 which is greater than 0.05 hence the data meets the requirement of assumption 6 i.e. there is homogeneity of variances

ANOVA					
BQTotal					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	34.539	3	11.513	.341	.796
Within Groups	13698.348	406	33.740		
Total	13732.888	409			

Table 5.3 ANOVA for body care products with respect to Annual Family Income

Sig. value ANOVA table is 0.796 which is greater than 0.05 therefore null hypotheses (H₀) is accepted. So it can be concluded that Annual Family Income has no significant effect on consumer innovativeness with reference to body care products in Indore region of Madhya Pradesh state.

5.2 Post Hoc Tests

Multiple Comparisons						
Dependent Variable: BQTotal						
Tukey HSD						
(I) Annual Family Income	(J) Annual Family Income	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound

Below 3 Lakhs	Between 3 to 6 Lakhs	.23446	.78336	.991	- 1.7864	2.255 3
	6 to 9 Lakhs	.82081	.83281	.758	- 1.3276	2.969 2
	Above 9 Lakhs	.41003	.79099	.955	- 1.6305	2.450 6
Between 3 to 6 Lakhs	Below 3 Lakhs	-.23446	.78336	.991	- 2.2553	1.786 4
	6 to 9 Lakhs	.58635	.83948	.898	- 1.5793	2.752 0
	Above 9 Lakhs	.17557	.79801	.996	- 1.8831	2.234 2
6 to 9 Lakhs	Below 3 Lakhs	-.82081	.83281	.758	- 2.9692	1.327 6
	Between 3 to 6 Lakhs	-.58635	.83948	.898	- 2.7520	1.579 3
	Above 9 Lakhs	-.41078	.84661	.962	- 2.5948	1.773 2
Above 9 Lakhs	Below 3 Lakhs	-.41003	.79099	.955	- 2.4506	1.630 5
	Between 3 to 6 Lakhs	-.17557	.79801	.996	- 2.2342	1.883 1
	6 to 9 Lakhs	.41078	.84661	.962	- 1.7732	2.594 8

Table 5. 4 Multiple Comparisons for body care products with respect to Annual Family Income

5.3 Homogeneous Subsets

BQTotal		
Tukey HSD ^{a,b}		
AnnualFamilyIncome	N	Subset for alpha = 0.05
		1
6 to 9 Lakhs	86	27.8488
Above 9 Lakhs	104	28.2596
Between 3 to 6 Lakhs	108	28.4352
Below 3 Lakhs	112	28.6696
Sig.		.746

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 101.443.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

With the help of ‘Multiple Comparison table’ it can be determined if there is a significant difference between any two groups:

- The Sig. value corresponding to ‘Below 3 Lakhs (in first column)’ and ‘Between 3 to 6 Lakhs (in second column)’ is 0.991 which is greater than 0.05 therefore it can be concluded that there is no significant difference in consumer innovativeness of both the income groups with reference to body care products.
- The Sig. value corresponding to ‘Below 3 Lakhs (in first column)’ and ‘Between 6 to 9 Lakhs (in second column)’ is 0.758 which is greater than 0.05 therefore it can be concluded that there is no significant difference in consumer innovativeness of both the income groups with reference to body care products.
- The Sig. value corresponding to ‘Below 3 Lakhs (in first column)’ and ‘Above 9 Lakhs (in second column)’ is 0.955 which is greater than 0.05 therefore it can be concluded that there is no significant difference in consumer innovativeness of both the income groups with reference to body care products.
- The Sig. value corresponding to ‘Between 3 to 6 Lakhs (in first column)’ and ‘Between 6 to 9 Lakhs (in second column)’ is 0.898 which is greater than 0.05 therefore it can be concluded that there is no significant difference in consumer innovativeness of both the income groups with reference to body care products.
- The Sig. value corresponding to ‘Between 3 to 6 Lakhs (in first column)’ and ‘Above 9 Lakhs (in second column)’ is 0.996 which is greater than 0.05 therefore it can be concluded that there is no significant difference in consumer innovativeness of both the income groups with reference to body care products.
- The Sig. value corresponding to ‘Between 6 to 9 Lakhs (in first column)’ and ‘Above 9 Lakhs (in second column)’ is 0.962 which is greater than 0.05 therefore it can be concluded that there is no significant difference in consumer innovativeness of both the income groups with reference to body care products.

6 CONCLUSION

After conducting a thorough research on “Consumer Innovativeness: A study of openness of consumer towards new products with special reference to FMCG sector”, by collecting primary data with the help of well structured questionnaire from Indore region of Madhya Pradesh state and analyzing the data with the help of SPSS, it can be concluded that:

Annual Family Income has no significant effect on consumer innovativeness with reference to body care products in Indore region of Madhya Pradesh state. This states that people of different income group are equally innovative in trying new types of body care products.

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AWARENESS LEVEL OF CONSUMERS TOWARDS ECO-FRIENDLY FMCG PRODUCTS

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Abstract - Customers' perception is changing towards the environment to encourage innovation for conservation and the benefits from this source of innovation are certain to outlive our current generation. Eco-friendly products are those products which are environmentally safe or does not create any threat to environment". Several activities are involved in eco-friendly marketing which includes product modification, packaging and advertising. This research study is based on the FMCG eco-friendly products but specifically on Consumers' Perception towards Eco-friendly FMCG Products. This paper investigates consumer perception and beliefs on environment protection and buying behavior of eco-friendly products.

A quantitative approach was adopted for the study by using a questionnaire, 440 respondents data were collected through internet by using Google.doc surveys. In present study independent samples t-test is used to test to compare the perception, awareness, satisfaction level of respondents with different demographic characteristics like gender, age and monthly family income.

The findings of this work indicate that age has no significant effect on awareness of consumers towards eco-friendly products and availability of the eco-friendly products. Different age groups of consumers are having equal awareness towards eco-friendly products.

Keywords: Eco-friendly products, Perception, Environmental awareness.

1 INTRODUCTION

Consumer Perception Consumer perception is the study of individual customer who is involved in procuring and using goods and services. All the activities associated with the purchase, use and disposal of goods and services, including the consumer's emotional, mental and behavioural responses that precede or follow these activities. Consumer perception is about how customers look at the product, what they expect from the products and from the manufacturers. It is a big task for manufacturer to understand the perception of customers. Consumer perception involves the psychological processes that consumers, make recognizing the needs, finding ways to solve these needs collect and interpret information, make plans, and implement these plans, making purchase decisions and post purchase behaviour.

1.1 Eco-Friendly Products

"Eco-friendly products are products that do not harm the environment whether in their production, use or disposal". (all-recycling-facts.com) Eco-friendly products are usually having basic two goals –maximizing

resource efficiency and reducing waste. Eco-friendly products are manufactured by using environmentally-friendly procedures and toxic-free ingredients. It is certified by recognized organizations like Forest Stewardship Council, Energy star, etc.

1.2 Fast Moving Consumer Goods

Fast-moving consumer goods (FMCG) are products that are sold quickly and at a relatively low cost. In India Fast Moving Consumer Goods (FMCG) is an important and very fast growing sector. Large populations of India are depending on FMCG in one or another way. As per India Info line News Service, Mumbai, January 6, 2016, Indian FMCG sector, which is the fourth largest in economy with market size of US\$ 3.1 billion. Consumers are mainly depending on FMCG sector for their day to day activities. The products like soaps, detergents, tooth paste, food products, beverages, cosmetics and other products comes under FMCG category. (wikipedia, 2019)

2 REVIEW OF LITERATURE

Patnaik et al in their Study the consumer attitude towards green FMCG products are correlated with price, product, place, awareness, brand knowledge, pre-purchase and post purchase behaviour. Nowadays people are careful about their daily product like cosmetics, baby products, body care, food etc. The quality of the products is the most important factor that influences the purchase of green FMCG products.

Pandey et al this research study took place in Delhi NCR Region, researcher analyze the consumer's attitude towards organic food products. In India the concept of eco-friendly food is still in the primary stage. The marketer must create awareness through advertisement and publicity of organic food product, so that the market size of organic food products is increased. The researcher study showed that most of the consumers were aware about the organic food products like better in quality, better in taste, food products free from pesticides, purchased by the publicity through word of mouth. But most of the consumer said that organic foods products are not easily available in market places, more expensive and the information related to eco-friendly foods products is very limited.

Katait innovative study analyzed the Consumer behavior towards green products of FMCG, the authors found that consumers are becoming more concerned and aware about the environment friendly products. Many companies are doing their best by adopting Green Production Process. Consumer attitude is well affected by their product attributes, product knowledge and existing culture.

Unnamalai conducted a study on consumer Attitudes towards Green Fast Moving Consumer Goods with Special Reference to Tiruchirapalli Town. The usage and awareness of green FMCG products is very low among the peoples. Most of the people have no knowledge

about the eco-friendly products. But majority of people are having consciousness about the eco-friendly environment and they are trying to save earth from pollution.

Yusuf et al conducted a study on consumer attitude and perception towards green products. consumers has awareness about the implication of global warming, harmful impact of pollutants, non biodegradable solid waste etc, both consumer and marketer are switching to eco-friendly products and most of companies have accepted their responsibility not to waste the natural resources and not to harm the environment. Samples were selected through random sampling, near about 70 college going students participated in the research. For this sample statistical analysis Pearson correlation was used.

Kumar et al this study aimed to gain knowledge about consumer behaviour towards organic products Consumption and Market potential of the Organic food products. The results concluded that marketing of organic product is very poor and demand for organic product is increases, most of the consumer prefer organic food product. The major reasons are organic food producer are low, sufficient market facility is not there, lack of awareness, few number of shops and so on. But if farmer and government give interest to improve production of organic food product as well as quality, good packaging and market system, it helps to get better standard of living farmer and it helps to government and also it healthy to environment.

2.1 Research Objectives

1. To study the awareness level of Consumers towards green FMCG Products.
2. To find out the Consumer Perception towards environment friendly FMCG products.

3 RESEARCH METHODOLOGY

3.1 Data Collection

Primary data is termed as data collected by the researcher for specific purpose. To analysis of consumer perception towards eco-friendly food products a well framed closed ended questionnaire was filled in by the respondents and the findings are presented as figures and facts found during the analysis. This study is mainly based on the information and data obtained from the primary sources.

3.2 Data Analysis

Statistical techniques were used with the help of Statistical Package for Social Sciences (SPSS) for hypothesis testing. In present study independent samples t-test and One-Way ANOVA is used for hypothesis testing.

Sample Size. For this research, a sample of 440 respondents was selected.

3.3 Gender of Respondents

Gender	No. of Respondents	Percentage
Male	225	51.1
Female	215	48.9
Total	440	100

From the above table it is found that 51.1% representation is obtained from male consumers of Eco- friendly food products and 48.9 % female respondents which are involved in the purchase of Eco- friendly products.

3.4 Hypothesis Testing

Awareness of consumers towards Eco-friendly products

H0 (B2): Age has no significant effect on awareness of consumers towards eco-friendly products.

H1 (B2): Age has an effect on awareness of consumers towards eco-friendly products.

Applying One-Way ANOVA using IBM SPSS statistics 21.0 Software

Descriptives								
BQ TOTAL								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
30-40 years	154	10.3896	2.54197	.20484	9.9849	10.7943	5.00	17.00
41-50 years	63	9.8730	2.33136	.29372	9.2859	10.4602	5.00	15.00
51-60 years	121	10.2397	2.52331	.22939	9.7855	10.6938	5.00	17.00
60 and above years	102	9.8333	2.80764	.27800	9.2819	10.3848	5.00	16.00
Total	440	10.1455	2.57493	.12276	9.9042	10.3867	5.00	17.00

Table 4.1: Age descriptives for Awareness of consumers towards Eco-friendly products

The mean of each group in Descriptives table, it can be concluded that there is homogeneity of variances.

Test of Homogeneity of Variances			
BQ TOTAL			
Levene Statistic	df1	df2	Sig.
1.307	3	436	.272

Table 4.2: Test of Homogeneity of Variances for Awareness of consumers towards Eco-friendly products with respect to age of the Respondents

According to Levene's Test for homogeneity of Variances, if significance value of Levene's Test for Homogeneity of Variances test is more than 0.05 then there is homogeneity of variances.

Here, significance value of Levene's Test for Homogeneity of Variances test is 0.272 which is more than 0.05. Hence there is homogeneity of variances.

ANOVA					
BQ TOTAL					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	24.867	3	8.289	1.252	.290
Within Groups	2885.824	436	6.619		
Total	2910.691	439			

Table 4.3: ANOVA Test Statistics for Awareness of consumers towards Eco-friendly products with respect to age of the Respondents

From the ANOVA table the Sig. value is 0.290 which is more than 0.05. Hence null hypothesis (H₀) is accepted. So it can be concluded that age has no significant effect on awareness of consumers towards eco-friendly products.

5 FINDINGS

Age has no significant effect on awareness of consumers towards eco-friendly products. Different age groups of consumers are having equal awareness towards eco-friendly products.

6 CONCLUSION

The findings of the study clearly confirm that, in Indore most of the consumers have favourable perception towards eco-friendly products. Consumers are aware about environment degradation, global warming etc. Consumers are having more concerned towards the environment and have moderate awareness on Eco-friendly FMCG products. The consumers is buying Eco-friendly products as it is healthy and safe for

the environment and as well as for the human beings. The consumers are also satisfied with the eco- friendly products. The main barrier for buying Eco-friendly FMCG products are too high price as it is compared to non Eco-friendly products price.

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**EVIDENCE BASED MANAGEMENT PROTOCOL IN
TEMPOROMANDIBULAR JOINT DISORDERS: A CURRENT AND
COMPENDIOUS UPDATE**

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Abstract- Optimum health of Temporomandibular Joint is of prime concern for many health care professionals including dental surgeons and it's all specialities as temporomandibular disorders are seen in a lot of individuals nowadays. These disorders can be related to soft tissues or hard tissues within the temporomandibular joint. There are many signs and symptoms associated with TMJ disorders which can be analysed by the dentist. Management of temporomandibular joint disorders can be done through various ways like Topical anaesthetic agents, or even with systemic or oral analgesics, certain physiotherapy exercises to relax the muscles involved with TMJ, Dental management, usage of occlusal splints and surgical alternatives. While searching Evidence based Philosophies the most popular model used is "Biopsychosocial Model". This review provides a brief detail on etiopathogenesis, clinical features and evidence-based approach in Temporomandibular disorder management using the current evidences and studies.

1 INTRODUCTION

Temporomandibular disorders (TMD) is a broad term which consists of various clinical problems such as the temporomandibular joint (TMJ), masticatory musculature, surrounding hard and soft tissue components,

and combinations of these. There are many symptoms associated with Temporomandibular disorders such as decreased mandibular range of motion, TMJ pain, pain in muscles of mastication, locking or deviation of jaw opening, associated joint noise (clicking, popping, or crepitus) with function or generalized myofascial pain¹.

Otolaryngologist JB Costen first described TMD in 1930's when he established the TMJ as a separate source of otalgia. He stated that TMJ problems could be due to structural imbalance between the cranium and the mandible and only a dentist could take care of such TMJ problems². In the recent years, emerging evidence has grown in support of a biopsychosocial model of TMD pain³. The importance of occlusion and equilibrating the occlusion to treat/prevent TMD has been mentioned way back in history of gnathology. TMD is also considered as Musculo-skeletal disorder. TMD is also the main cause of pain of non-dental origin in the oro-facial region including head, face and related structures⁴. There can be various factors responsible for Temporomandibular disorders and various other ways to prevent TMD or to treat TMD's. This article will enlighten the readers about evidence approaches to TMD management and certain factors considered during dental treatment to help in reduction of Temporomandibular disorders.

2 PREVALENCE AND INCIDENCE OF TEMPOROMANDIBULAR DISORDERS

It has been seen that prevalence of TMD is in about 6%-12%⁵ of the population with the peak occurring in age group 20-40 years of age⁶. According to study done in 2015 carried out in India⁷ myofascial pain dysfunction syndrome (MPDS) was reported in 0.8% of the population, internal derangement in 38.3%, and osteoarthritis in 14.6% of the population. Temporomandibular disorders are also more prevalent in women than in men. The reason behind the gender variability is not clear but it has been suggested that it can be due to hormonal influence⁸⁻¹⁰. In patients with TMD increased levels of estrogen have been found.¹¹

3 CLASSIFICATION OF TEMPOROMANDIBULAR DISORDERS

TMD's can be classified into Articular and Non-articular disorders or Intracapsular and Extracapsular disorders respectively¹¹.

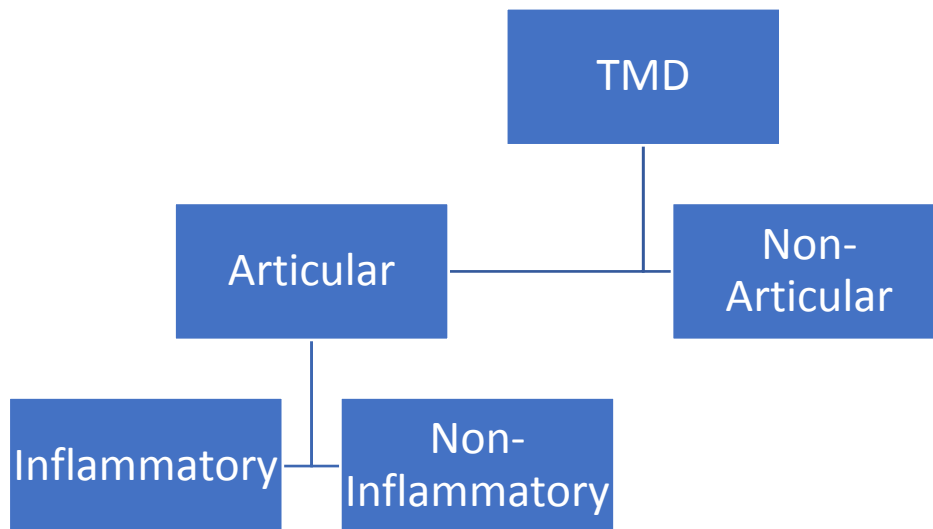


Figure 1 Classification of TMD's

Articular disorders can be subdivided into Inflammatory and Non inflammatory. Inflammatory articular disorders include Rheumatic arthritis, ankylosing spondylitis, psoriatic arthritis, gout, and infectious arthritis. Noninflammatory articular disc disorders include joint damage from prior trauma or surgery due to various reasons, osteoarthritis, or other cartilage or bone disorders.

Nonarticular disorders mostly present as myofascial pain focused to the muscles of mastication. They may also include disorders with chronic conditions such as fibromyalgia, muscle strain, and myopathies. Most myofascial pain and dysfunction (MPD) are theorized to arise from clenching, bruxism, or other parafunctional habits.

3.1 Why do Temporomandibular Disorders occur?

The factors responsible for TMD's can be divided into 3 categories¹²

1. Predisposing factors: These include a combination of morphological, physiological, psychological, and environmental variables which will increase the susceptibility to a certain disease for an individual.
2. Precipitating factors: These include various combinations of trauma, stress, hyperfunction, and possibly failure of natural inhibiting factors, all of which lead to the onset of symptoms.
3. Perpetuating factors: These include poor healing capacity, failure to control etiologic factors, secondary gains from staying sick, and negative effects from inappropriate treatments which will result in TMD's.

So Temporomandibular disorder can occur from combination of these factors and present with various signs and symptoms.

Causes to TMD's are multifactorial, some of them are:

1. Acute trauma to the jaw
2. Trauma from hyperextension
3. Differences in maxillomandibular relationships
4. Comorbidity due to pre-existing musculoskeletal disorders
5. Parafunctional habits (Bruxism or tooth clenching)
6. Emotional distress
7. Iatrogenic causes

4 DIAGNOSTIC PROTOCOLS IN ASSESSMENT OF TEMPOROMANDIBULAR DISORDERS

A. Essential diagnostic aids

1. Case History

Case history involves description and recording of relevant information from the patient or parent in help in overall diagnosis of the case. A proper case history could reveal if the patient has any signs and symptoms regarding the TMD or it could help in assessing if the patient had any history of previous trauma that could have made TMD to aggravate.

A thorough case history would reveal if the patient has any relevant medical or dental history, like degenerative diseases can lead to TMD symptoms or TMD could present with any occlusal interference which can be of dental origin.

2. Clinical examination

A General clinical examination can help in assessing the facial symmetry of the face as asymmetries occur in some cases of TMD's which can be due to swelling or any previous trauma which has resulted in TMJ ankylosis in that area. Auscultation and Palpation of the TMJ is of much importance in diagnosis of Temporomandibular joint disorders. Palpation of TMJ could reveal clicking sound of TMJ or pain on palpation.

Importance of clinical examination lies in assessing the functional occlusion and path of closure of the mandible. Path of closure will reveal if any hinderance is created during path of closure which can help in proper fabrication of treatment plan for the case.

3. Study models

Study models can be fabricated from making of accurate impression of the patients' intraoral structures. With the help of bite registration these models can also be mounted on the articulator which can help in viewing the proper movement of the jaw related to patients existing occlusion.

4. Certain radiographs

Orthopantogram

OPG can help in assessing the teeth present involving third molar and can help in comparing the Temporomandibular joint on both the sides which could evaluate any bony changes in the condylar region if any.

5. Facial photographs

Accurate Extraoral and Intraoral facial photographs could reveal any asymmetry present related to TMD. Left and right profile view can be compared to assess the symmetry on both the sides of the face. Intraoral photographs could reveal any possible interferences present which could lead to disruption of the occlusion.

B. Supplemental diagnostic aids

1. Lateral cephalogram

Lateral cephalogram can reveal relationship of maxillary and mandibular jaw with the cranium base. A proper tracing of the condylar region can be done to view the changes in TMJ region. The major drawback Lateral cephalogram hold in TMD diagnosis is that in the radiograph condyles of both the sides are overlapped over one another which would create a problem in diagnosis.

2. Electromyographic examination

Electromyographic examination can record activity of the muscles which are related to the Temporomandibular joint. EMG examination of Masseter, Temporalis, Medial and Lateral pterygoid can reveal hyperactivity of these muscles which can a factor responsible for TMD's. A proper EMG examination is important to help in accurate diagnosis.

According to a study by Schiffman et al the 12 common TMD include arthralgia, myalgia, local myalgia, myofascial pain, myofascial pain with referral, disc displacement disorders, degenerative joint disease, subluxation and headache associated with TMD.

Traditionally TMD diagnosis was done by TMJ tomograms, Lateral cephalograms, Electromyograms. One drawback they had was that these diagnostic aids provided with 2D image of the TMJ and surrounding structures which was overcome by the newer diagnostic aids.

Recently newer diagnostic aids like CT (computed tomography) scans, CBCT (cone beam computed tomography) have led to a much accurate diagnosis of the disorder. They provide a 3D image of the TMJ with any signs of inflammation and can also assess the volumetric changes of the articular fluid in the Temporomandibular joint.

4.1 Temporomandibular joint disorders Management

TMD's can be both Nocturnal and daytime and can be both throughout the day or in short episodes. More overly, the symptomatic treatment can be helpful in managing TMD in many cases¹³.

Temporomandibular disorders can be managed either by Traditional approach or combining traditional with recent treatment therapies.

4.2 Traditional therapies to treat TMD's

Traditional therapies can be divided into Medications, Dental management, Physical therapies, Surgical management.

1. Medications

A. Oral medications and Topical medications

Most commonly used drugs include nonsteroidal anti-inflammatory drugs (NSAIDs), corticoids, analgesics, muscle relaxants, anxiolytics, opiates, tricyclic antidepressants (TCAs), gabapentin, and lidocaine patches^{14,15,16,17}.

NSAIDs which commonly used are

- Diclofenac (50mg twice/thrice daily)
- Naproxen sodium (500mg twice a day)
- Celecoxib
- Piroxicam (20mg once a day for 10 days)
- Palmitoylethanolamide (300–1,200 mg daily up to 120 days)

NSAIDs have many adverse effects, however, such as exacerbation of hypertension, gastrointestinal effects ranging from dyspepsia to ulceration, and worsening of renal function, which makes diagnosis of an individual case of prime importance.

Topical application of medicines has also proven to be effective. The application of four doses a day of topical diclofenac combined with dimethyl sulfoxide to improve its absorption is recommended¹⁸.

B. Injectable drugs

Some of the studies have shown that the use of injections of the corticosteroid β -methasone or sodium hyaluronate for TMJ pain have proved to be effective. Corticosteroid moreover has anti-inflammatory effect while hyaluronate helps in joint lubrication.

Some studies have stated the efficacy of botulinum toxin (BTX) in treatment of TMD's. Of 5 studies included in a systematic review¹⁹, 2 studies showed positive effect by significant reduction in pain, one study showed similar effects with masticatory manual therapy and the other 2 studies showed no significant differences. Hence more detailed studies are required for analysing effects of injectable drugs in treatment of temporomandibular disorders.

2. Dental management

One of the most common approach for treating TMD is by dental management. Orthopaedic stabilization therapy and occlusal adjustment therapies are mostly carried out in patients with TMD's²⁰. Orthopaedic stabilization can be done by splint therapy while Orthodontics and occlusal adjustments can be used for achieving definitive correct stable occlusion. Splint therapy can provide with conservative treatment in cases with TMD pain associated with bruxism. Occlusal adjustments can help the patient from further damage of the dentition from tooth grinding.

Occlusal splints can help in adjustment of the position of TMJ to a position of mandible in centric relation. Occlusal splints can be fabricated for the patients who have symptoms like TMJ pain or have bruxism habit which can be nocturnal or during daytime. Occlusal splints can help reduction of trauma due to bruxism

3. Physical Therapies

Physical therapy helps in pain relieving, reduction of inflammation and/or restoration of motor function. Many Physical therapies are used in treatment of temporomandibular disorders like Manual therapies, Electrotherapy, Transcutaneous electrical nerve stimulation (TENS), Therapeutic ultrasound, Dry needling (DN) and acupuncture procedures. These therapies have proven to be effective in resolution of chronic TMJ pain mostly by reduction of muscle activity involved in temporomandibular joint. These therapies can also be used in combination like Manual therapies like Joint mobilization or soft tissue mobilization can be followed by acupuncture for more benefits in TMD'S.

4. Surgical Therapy

There are various surgical therapies available for treatment of TMD's. Arthrocentesis based on articular lavage with or without injection of pharmaceuticals and arthroscopy are the two most frequently used approaches for internal derangements of the TMJ or degenerative pathology^{21,22}. It has also been stated that medical management or rehabilitation is much preferred over surgery in cases with internal derangement of TMJ. Moreover, there is growing evidence regarding the benefit of platelet-rich plasma injections over hyaluronate combined with arthrocentesis for TMJ osteoarthritis and it has shown to have some positive effect²³⁻²⁵.

In TMD patient's surgery is rarely needed. One study stated that over 2,000 TMD patients from many practices found that only 2.5% underwent TMJ surgery (1.4% arthrocentesis, 1.0% arthroscopy, and 0.1% open joint procedures)²⁶.

4.3 Biopsychosocial Model for Temporomandibular Joint Disorder Management

Patients with chronic TMD usually are associated with some psychological factor which may aggravate the severity of TMD. Biopsychosocial approach with Cognitive therapy helps in managing the patient's thoughts or behaviours that may exacerbate the pain symptoms. The Biopsychosocial model was proposed by Engle in 1970's²⁷. In 1970's Engle concluded that 'The proposed²⁷biopsychosocial model provides a blueprint for research, a framework for teaching, and a design for action in the real world of health care. Whether it is useful or not, it had to be seen.' This model helps the clinician in treatment of the disease or the

disorder with biological as well as psychological approach which can result in long term benefits to the patient.

According to Engle nothing in nature exist in isolation rather it is always a result of combination of many factors, Likewise Temporomandibular disorders does not exist in isolation but their occurrence can be multifactorial.

The biomedical model is characterized by a different approach that attributes the disease to a single cause located within the body and that considers disturbances of mental processes as a separate and unrelated set of problems. The biopsychosocial model enables the physician to extend application of the scientific method to aspects of everyday practice and patient care heretofore not deemed accessible to a scientific approach.

Weiss²⁸ pointed out that the systems theory is the best approach in explaining the observation in the nature which can be explained by a hierarchical arrangement with larger units (complex) super ordinating to smaller units (less complex). According to this the Single individual (Person) is the highest unit of organismic hierarchy and at the same time the lowest unit of the social hierarchy.

Each level in hierarchy represents an organised dynamic as a whole. Each of them holds their unique qualities and relationship. According to Engel²⁸. Nothing in nature exist in isolation, whether it is a cell or a person, it will always be in the configuration of the system in which it is existing.

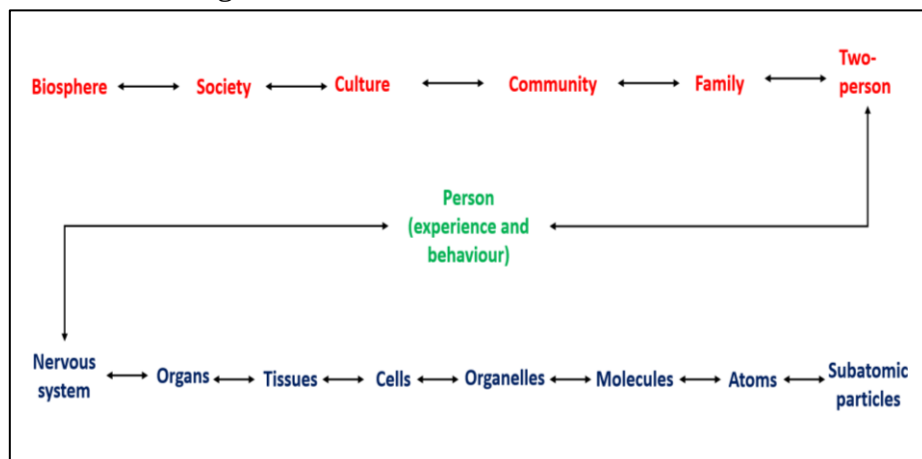


Figure 2 Levels of Hierarchy

It is also stated that the model does not add anything to what is involved in ideal treatment plan of the patient rather it helps the clinician to think rationally and motivates him to be skilful and informed around the psychosocial areas.

Healthcare of patients could improve if all healthcare units were more aware of and used the biopsychosocial model of illness. It underlies

person-centred care which provides an evidence based service to the patient with informed and skilful services by the doctor^{29,30}.

A biopsychosocial model requires collective sharing and working across existing boundaries, which requires trust and sharing among the doctor and the patient and also an agreed understanding of the situation.

Hence patients when treated with combination of biopsychosocial approach and biological approach stand a better chance in long term better treatment results of TMD than those treated only with biological approach.

4.4 Recent Evidences Supporting the Treatment of TMD

In a systematic review and metanalysis by Moraissi et al³¹ in 2017 it was stated that Orthognathic surgery caused a decrease in TMD symptoms for many patients who had symptoms before surgery, but it also created symptoms in a smaller group of patients who were asymptomatic before hence they also stated that more research was needed in surgical field to assess the effect of surgery in TMD.

In a study done by Moldez et al³² in 2018 they stated the effect of injection of sodium hyaluronate or corticosteroids for intracapsular temporomandibular joint disorders where they concluded that sodium hyaluronate had better effect in treating TMD.

In another systematic review by Melis et al³³ in 2019, it was concluded that Oral myofunctional therapy was proved to be effective in reducing the pain intensity due to TMD

In a systematic review done by de Melo et al³⁴ in 2020, they stated that Manual therapy proved to be better in treatment of Temporomandibular disorder than no treatment and even manual therapy combined with home therapies was better than home therapy alone.

Another systematic review which was done by Peixoto et al³⁵ in 2021 stated that traditional acupuncture showed better results and seemed to relieve the signs and symptoms of temporomandibular disorders. Laser acupuncture with occlusal splint also reduced the pain from TMD.

5 CONCLUSION

Occurrence of temporomandibular disorders has increased in recent era and are common due to adverse eating habits, stress, hormonal changes etc. Also, the causes can always be multifactorial. The main aim of the dentist should be providing symptomatic treatment to the patient initially, and then assessing the proper cause through correct diagnostic aids to provide relief to the patient. Dental treatment if needed should be carried out to stabilize the malocclusion which will in turn help in relaxation of muscles in the orofacial area providing relief from TMD's.

The newer Biopsychosocial approach combined with medical treatment guarantees the patient with long term relief from TMJ pain symptoms.

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ARTIFICIAL INTELLIGENCE IN HEALTHCARE: ENHANCING DIAGNOSTIC ACCURACY WITH BIG DATA

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Abstract - This paper explores the role of Artificial Intelligence (AI) in healthcare, with a focus on how big data is leveraged to improve diagnostic accuracy. AI, combined with vast healthcare datasets, has introduced transformative changes in diagnostic methodologies, making it possible to identify diseases earlier and with greater precision. This study examines the current AI-driven diagnostic tools, key algorithms, and case studies in areas like radiology, pathology, and genomics. Challenges related to data privacy, ethical considerations, and implementation obstacles are discussed, alongside potential future advancements in AI for healthcare diagnostics. This paper underscores the importance of integrating AI and big data to achieve efficient, accurate, and cost-effective healthcare diagnostics.

1. INTRODUCTION

The advent of AI in healthcare has revolutionized diagnostics, utilizing big data to enhance accuracy, speed, and reliability in disease detection. As healthcare data continues to grow exponentially, there is a pressing need for advanced diagnostic tools capable of handling large datasets and extracting meaningful insights. This paper aims to explore the ways AI uses big data to improve diagnostic accuracy, the current state of AI-driven diagnostic tools, and the challenges and future opportunities in this domain.

2. ROLE OF BIG DATA IN HEALTHCARE

2.1 Sources of Healthcare Data

Big data in healthcare is generated from various sources, including Electronic Health Records (EHRs), medical imaging, genetic sequencing, patient-generated data, and wearable devices. This wealth of information provides a comprehensive view of patient health, offering data-driven insights into disease patterns and patient outcomes.

2.2 Types of Data and Volume Challenges

Healthcare data includes structured data, like EHRs, and unstructured data, like medical imaging and physician notes. The volume and complexity of this data require sophisticated tools for analysis, storage, and management. AI algorithms are designed to handle such data diversity, finding patterns that might not be apparent through traditional methods.

3. AI TECHNIQUES USED IN DIAGNOSTIC ACCURACY

3.1 Machine Learning (ML) and Deep Learning (DL) Algorithms

- **Supervised Learning:** Algorithms like Decision Trees and Support Vector Machines (SVM) aid in disease classification and prognosis prediction.
- **Deep Learning:** Neural networks, especially Convolutional Neural Networks (CNNs) in imaging diagnostics, have shown exceptional accuracy in recognizing patterns in X-rays, MRIs, and CT scans.
- **Natural Language Processing (NLP):** NLP algorithms extract insights from unstructured data, such as clinical notes, aiding in more accurate diagnostics.

3.2 Predictive Analytics and Data Mining

AI uses predictive analytics and data mining to predict disease likelihood, treatment response, and patient outcomes. These insights are essential in personalized medicine, where diagnostics and treatments are tailored to individual patient profiles.

4. APPLICATIONS OF AI IN HEALTHCARE DIAGNOSTICS

4.1 Radiology and Medical Imaging

AI has significantly improved radiology, with deep learning models that analyze X-rays, MRIs, and CT scans to identify conditions like tumors, fractures, and infections. CNNs are particularly effective in detecting complex patterns within images, making diagnostics faster and more accurate.

4.2 Pathology and Histopathology

AI algorithms assist pathologists by analyzing microscopic images for signs of diseases like cancer. Automated image analysis increases diagnostic accuracy and helps in identifying the disease stage, guiding treatment options.

4.3 Genomics and Precision Medicine

AI-powered tools analyze genetic data to detect gene mutations associated with hereditary diseases. By integrating genomic data with patient history, AI enables precision medicine approaches, which are more accurate in diagnostics and treatment planning.

4.4 Cardiology and Early Disease Detection

AI models analyze data from echocardiograms and wearable devices to identify early signs of heart disease. Predictive models can monitor patients continuously, alerting healthcare providers to potential cardiac events in real-time.

4.5 Remote Diagnostics and Telemedicine

AI facilitates remote diagnostics by analyzing patient data collected through telemedicine consultations and wearable health devices. These tools are especially valuable in rural or underserved areas, where access to healthcare facilities may be limited.

5. BENEFITS OF AI IN ENHANCING DIAGNOSTIC ACCURACY

5.1 Speed and Efficiency in Diagnostics

AI reduces the time required for diagnostics by automating the analysis of large data volumes. This speed is critical in time-sensitive conditions where early intervention can save lives.

5.2 Improved Accuracy and Reduced Human Error

AI systems detect subtle patterns that human diagnosticians may miss, especially in complex data like medical imaging. This precision minimizes the chance of misdiagnosis, improving patient outcomes.

5.3 Personalized Diagnostics and Treatment Plans

AI enables personalized diagnostics by analyzing individual patient data. This approach tailors treatment to specific patient needs, enhancing the effectiveness of therapies and reducing side effects.

5.4 Cost Savings and Resource Efficiency

AI-driven diagnostics reduce the need for repetitive testing, streamline workflows, and optimize resource utilization, making healthcare more affordable and accessible.

6. CHALLENGES AND ETHICAL CONSIDERATIONS

6.1 Data Privacy and Security

The use of personal health data raises privacy concerns, requiring stringent data protection measures. Compliance with data regulations like GDPR and HIPAA is essential to maintain patient trust.

6.2 Bias and Fairness in AI Algorithms

AI models can inherit biases present in training data, leading to disparities in healthcare outcomes. Efforts to ensure fairness and reduce bias are critical for reliable and ethical AI applications.

6.3 Transparency and Explainability

AI models, particularly deep learning, often function as “black boxes,” making it challenging to interpret how decisions are made. Increasing transparency and developing explainable AI (XAI) models are necessary for ethical and trustworthy diagnostics.

6.4 Implementation and Integration Challenges

Healthcare facilities face technical and logistical challenges in integrating AI systems with existing infrastructure. High costs and the need for specialized training further complicate AI adoption.

7. FUTURE OF AI IN HEALTHCARE DIAGNOSTICS

7.1 AI and Real-Time Diagnostics

As AI technology advances, real-time diagnostics will become feasible, enabling instant analysis of patient data for emergency situations. This capability could lead to faster and more accurate decision-making in critical care.

7.2 Integration with 5G and IoT for Enhanced Connectivity

5G connectivity and IoT will support AI-driven healthcare by enabling faster data transfer and real-time remote monitoring. Connected devices can gather patient data continuously, supporting proactive healthcare management.

7.3 Ethical AI Development and Responsible Innovation

Future AI development in healthcare will focus on creating ethical frameworks that prioritize patient welfare and equity. Responsible innovation practices, including transparent algorithms and fair datasets, will enhance AI's reliability.

7.4 AI-Augmented Clinician Support

AI will increasingly augment human clinicians, functioning as an "AI assistant" to support complex decision-making. Rather than replacing clinicians, AI will enhance their diagnostic capabilities and improve patient care.

8. CONCLUSION

Artificial Intelligence in healthcare represents a paradigm shift in diagnostic accuracy, enabling faster, more precise, and personalized diagnostics through big data. While AI-driven diagnostic tools offer substantial benefits, challenges related to data privacy, bias, and integration remain. Continued advancements in AI and big data are likely to redefine the healthcare landscape, making diagnostics more accessible and efficient. Ethical considerations and responsible implementation will be essential to realizing AI's full potential in enhancing healthcare.

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Editors

**Dr. Manoj Kumar Rawat
Dr. Sarita Chourasia, Dr. S.K. Jain
Dr. A. K. Gupta, Prof. Ajay Jain,
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ROLE OF SOFT SKILLS IN ENHANCING THE EMPLOYABILITY IN TOURISM AND HOSPITALITY SECTORS IN INDIA

Sirtaj Kaur, Research Scholar

1 INTRODUCTION

In an increasingly globalized world and the changing paradigm of urbanized living the demand of Tourism and Hospitality has increased manifold the world over. Tourism is now recognized as being an economic activity of many nations in the world. India is second to none in the world in having most attractive tourism destinations for all time for all types of tourists around calendar year. At the same time, the new millennium has witnessed the continued growth of interest in how people spend their spare time, especially their leisure time and non-work time.

India has emerged as an attractive tourism destination for all types of tourists around the year resulting in Travel & Tourism taking its place among the key industries in the economy. It employs a large number of work force and its contribution to national income is also substantial. It has given enormous opportunity for tourism business and lot of scope for establishing service providers like travel agency and tour operators. After necessary knowledge in Travel and Tourism, there is an edge over others in getting jobs of their choice in this sector as this sector is growing very fast and lakhs of manpower requirements have been estimated to come up annually.

The Introductory unit on Soft Skills for Tourism and Travel industry has highlighted the importance of soft skills that will help you to earn an edge in your personal, social as well as professional life. In fact, these soft skills are directly related to your skill to communicate, your personality and will help you to develop a personality suitable for travel and tourism industry. In this direction, Government has taken several steps in past few decades to develop tourism professionals with the importance of Soft Skills to cater the needs of emerging demand for trained manpower for tourism industry

The approach has been to provide a simple and comprehensive outline of many concepts explained in this chapter in detail.

2 HARD AND SOFT SKILLS

In order to become successful in today's competitive professional environment, there is need to learn a right balance of two set of skills. These two skills sets are – Hard skills and Soft skills.

Hard Skills: "Hard" skills are also known as Technical skills. These skills help us to perform well in the job. In the world of work, "hard skills" are that basic technical or administrative procedures which are prerequisite to perform a job. We can learn these from books or from hands-on experience. For example, hard skill for a teacher is comprehensive knowledge of his/her subject. These skills are typically easy to Soft Skills.

Soft Skills: Soft skills are also known as People Skills. These are desirable qualities for certain forms of employment that do not depend on acquired knowledge, rather they include common sense, the ability to deal with people, and a positive flexible attitude to learn, because most of the time the skill sets are brand new to the learner and no unlearning is involved

According to Wikipedia: "Soft skills refer to the cluster of personality traits, social graces, and facility with language, personal habits, friendliness, and optimism that mark people to varying degrees. Soft skills complement hard skills, which are the technical requirements of a job."

Examples of Soft Skills:

- Communication skills
- Problem solving skills

- Teamwork capability
- Negotiating skills
- Self-management
- Time management
- Conflict management
- Cultural awareness
- Responsibility
- Etiquette, Courtesy
- Self-esteem
- Sociability
- Integrity / Honesty
- Empathy
- Work ethic

Soft skills differ from context to context and vary from individual to individual perception. There is also a basic assumption that soft skills are inborn skills, but on a closer examination of these skills it suggests otherwise. While some individuals exhibit these skills naturally, some learn these skills on their own through experience but for a majority of individuals these skills can also be acquired and nurtured over time. Soft skills help one to gain an edge in personal, social as well as in professional life. Many researches have proved that individuals with good soft skills are preferred more for a job than the one who lacks in soft skills. That's why it's so important to focus as much on soft skills training and development as one does on traditional hard skills.

3 IMPORTANCE OF SOFT SKILLS IN TOURISM AND TRAVEL INDUSTRY

In Tourism and Travel Industry soft skills have special relevance. Rather we can say that expertise in soft skills is a basic requirement to become a part of this industry.

This is mainly due to some special characteristics of this industry such as:

- Tourism industry is a people based industry – Hoteliers, Transporters, Travel Agents, Tour Guide and many more jointly play a very key role in making the final product and delivering it to customer. Here soft skills facilitate them to work together and serve the customer happily.
- Tourism is an activity that people undertake for leisure – Role of the service providers are important to provide a pleasant time and a person who has knack in soft skills are very important. For example– A tourist wants to see the beautiful Taj Mahal and books a taxi. The taxi driver arrives two hours late to pick up the tourists, speaks rudely and drives rashly. This overall experience of visit to the Taj Mahal will pale in comparison with a visit to the heritage monument with a punctual, well mannered, caring and soft spoken taxi driver. It means soft skills of people working in tourism industry contribute towards happiness and satisfaction of tourists as much as the tourist attraction.

Thus it can be said that in tourism industry soft skills exceeds hard skills in importance.

4 COMMUNICATION SKILLS – A KEY TO SOFT SKILLS

Among all the soft skills mentioned in the previous section communication skills is most important, since good communication skills are a prerequisite for a range of other soft skills. Communication is a basic activity of human beings undertaken every minute that one is awake. Even now, while reading these lines you are indulging in communication. We can say that the foundation of our society, family, relationships and organization is communication. In order to become masters in soft skills, we have to first get expertise in communication skills. These skills are especially important in tourism and travel industry, where one needs to continuously communicate effectively with different strata of people viz. tourist, airlines people, hotel staff, guide, visa officer, taxi drivers, transporters etc.

4.1 Communication – The Concept

According to dictionary, the English word „communication is derived from the Latin noun ‘**Communis**’ and the Latin verb ‘**Communicare**’ that means „to make common, to transmit, or to impart“. In simple words, communication is the activity in which we share any idea, feeling, opinion and information between two or more persons in a way that both parties have common ground of understanding. Thus in communication three aspects are of utmost importance – transmission of message, listening/receiving of message and understanding of message among parties involved. The transmission can be done by words - spoken or written, by body language or signs. Receiving and understanding means that both the parties have received the same meaning of the message and this can be confirmed with the help of feedback. Once understanding is achieved, communication is complete.

4.2 Process of Communication

As discussed in the above, Communication is a systematic and continuous process and to understand this process lets us take the help of a generic model of communication process.

- **Sender:** The sender of communication is the originator who sets the model into action. It can be an individual or group that has a specific reason to begin the communication process i.e. there is an idea, information, feeling etc. that they wish another to receive. For example: Rahul is working as a Travel Counsellor in ABC Travel Company. A tourist walks in his office and it is now his duty to ask tourist his purpose of visit. It means Rahul has a specific reason to begin the communication process with the tourist.
- **Encoding:** Sender identifies the reason to begin a communication and the ideas in the mind of sender is expressed in the form of a message. This is the next step in communication process, called Encoding. Encoding means converting the idea into a suitable format using verbal as well as non-verbal methods so that the idea in the mind of a sender is expressed. Encoding is always done keeping your audience i.e. who will receive your message. In the example Rahul greets the tourist with a smile on his face – “Good Morning Sir! Welcome to ABC Travel Company. I am Rahul. How may I assist you?” Rahul has used both Verbal (the spoken line) and non-verbal (a smile on his face) channel while encoding.
- **Message:** The information, idea, or concept that is being communicated from sender to the other person is the message. In the example, the lines uttered by Rahul and his facial expression are the message.
- **Channel:** The way or the medium of sending the message is called channel. Medium or channel can be oral, written or it can be non-verbal. In our example, Rahul used both oral and non-verbal channel.
- **Receiver:** To execute any communication, there must be someone to receive the message that the sender has sent. The person who receives the message is called the receiver. In our example the tourist who has entered ABC company is the receiver of the message sent by Rahul.
- **Decoding:** Once a message reaches the receiver, the receiver interprets it from its original form into one that he/she can understand. This process is known as decoding where the received message is being understood by the receiver. In our example, the tourist will interpret the line spoken by Rahul and the smile given by Rahul.
- **Feedback:** Feedback is the response or reply of the receiver after receiving the message. The response will convey whether the message has been understood as desired or the message has been misunderstood/misinterpreted. Feedback is important as the success or failure of communication is decided only by the feedback, since the sender would never know whether the communication was successful without feedback.
- **Noise:** Noise is another important element in the communication process that has direct impact on the success of communication. Noise is

interference or distortion that changes the initial message. It always comes into play during the communication process and is also referred to as barriers of communication. It can be physical, like any other sound that subdues the message when it is being said, or it can be related with language like if the vocabulary used within the message is beyond the knowledge range of its recipient. To make communication effective one should try to reduce noise. For example - while Rahul was speaking to the tourist, at the same moment tourist's phone had rung then it would become a physical noise or barrier.

Thus process of communication is a continuous, creative and two-way process where sender and receiver keep changing their roles.

4.3 Types of Communication

You are familiar with the communication process. The types of communication process based on the medium of expression. The different types of communication can be Verbal and Non – Verbal Communication

4.3.1 Verbal Communication

Communication process where the communicator uses words as medium is known as Verbal Communication. Communicator uses language that has been designed, developed and propagated by humans. An effective verbal communication is a two-way process that means speaking and listening are both done at the same time. Verbal communication can be further divided into two groups:

(I) Oral Communication

Oral communications are the messages that come through words spoken by speaker. It is almost instantaneous, quick, least expensive, convenient form of expression and presentation.

Examples of oral communication are – face to face communication, speech, telephonic conversation, etc. In tourism and travel industry telephonic and face to face conversation are frequently used.

(ii) Written Communication

The communication which we do by means of written symbols or words is called written communication. This requires preparation as one has to plan it properly before writing for ethnical, legal and/or business communications. In tourism industry business communications such as letters, circulars, office memorandums, fax messages, newsletters, brochures, manuals, reports, house journals, magazines, etc. takes place in writing. In this age of technology new types of written messages like emails, short messaging service (SMS, instant messaging etc.). have become very common and popular.

4.3.2 Non-Verbal Communication

According to Professor Albert Mehrabian, body language accounts for 55% of the first impression, 38% comes from tone of voice, 7% comes from our actual words. Thus it is very important that we should learn about the communication which is not verbal, that is non – verbal communication. In case, we are not using word than how do we communicate? You must have used the nodding of head from side to side to say „no" or up and down to convey „yes". This is nonverbal communication also known as sign language.

Nonverbal communication is the act of giving or exchanging information without using any spoken words.

Types of Non – Verbal Communication

Non-verbal communication has different types. A brief description of these is given below:

(i) Body Language: The study of the movements of our body parts like eyes, head, hands, legs, sitting style, walking style etc. is known as body language. We can fake our words to conceal our true inner feeling but our body movements convey the inner feeling going in our mind accurately. For example, when your mother is upset with you, she can convey this feeling to you without uttering a single word. As a rule, body language does not lie or mislead unless someone has mastered the art of deceit or camouflaging. Although it is not a manmade language, we can still interpret it after studying this language for many years. The different aspects of Body Language are:

(ii) Language of Distance: The study of how people recognize and value the physical spaces around them is known as language of distance. Language of distance takes into account body spacing between two individual as the physical distance between two people can be correlated to the relationship they share be it personal or social.

These are of four types:

- a) **Intimate Zone:** Distance between spouses, children, parents, very close relatives and friends.
- b) **Personal Zone:** Distance between individuals during business gatherings, social functions and get-togethers.
- c) **Social Zone:** Distance between strangers or occasional visitors.
- d) **Public Zone:** Distance between speaker and audience.

Language of distance is helpful for maintaining proper distance in all interactions. For example, while speaking to a customer, one should remain only in the personal or social zone. Further, it is to be noted that distance between individuals is also affected by the culture of the people involved.

(iii) Language of Time: Language of time is the study of the use of time in a nonverbal communication. The way one individual perceives and value time, structure time and react to time is a powerful communication tool, and it also convey about our personality traits. Time perceptions about any individual include punctuality, willingness to wait, and interactions.

In order to have effective communication one should pay due attention to both verbal and non-verbal communication.

4.4 Barriers to Communication

Barriers to communication refers to incomplete communication process, wherein the message you convey to someone or a group of people is ambiguous i.e. not clear. Thus, the message received is not same as the message sent. Barriers to communication can occur at various stages of the communication process and are usually of three types. The types of barriers are discussed below:

(i) Language / Semantic Barrier: Language is the main medium of communication and can become a major barrier when we either use vocabulary which others do not know or use language in a wrong way. It can happen in three ways:

- (a) **Using Jargons:** Jargons are words specific/ typical to a particular profession. Almost all the professions rely heavily on jargon and have their own „language“ which is not known to the general population, and this can act like a barrier.
- (b) **Acronyms and abbreviations:** These are short forms and can eliminate receivers who are not familiar with their meaning.
- (c) **English Language:** English has been the dominant business language. Yet for non-native English speakers even if they know the language, speaking too fast and use of slangs can make communication in English difficult.

(ii) Cultural Barrier: Culture means an accumulation of values, forms of expression, beliefs and language. It shapes one's interpretations of different events of life and thus cultural assumptions can cause communication problems.

(iii) Psychological Barriers / Difference in Perception: No two people are same as they vary in their knowledge, experience, attitude, emotion, belief, values, etc. Thus it is difficult for people to tune to the same wavelength while communicating with each other. Different reasons that causes psychological barrier are:

- (a) Emotions:** These are powerful communication filter, as receivers may think with their emotions i.e. through colored glasses. Strong emotions can either prevent reception or distort the strength of the message.
- (b) Attitude:** Attitude also act as barriers to effective communication as negative and positive attitudes can create resistance or bias to a message.
- (c) Inattention:** At times we do not listen, but only hear, especially when we multitask. For instance, if a visitor comes to you at the same instance when you are answering the phone, then it is important to excuse yourself from the person on the phone so that exclusive attention can be given to the visitor or you may request the visitor to wait for some time.

4.5 Effective Communication

Understanding the various barriers to communication is first step towards effective communication. It leads us to find out ways and means of overcoming these barriers. American Management Association has formulated the following commandments for effective communication:

- I. Clarifying ideas before communication.
- II. Know purpose of your communication.
- III. Understand physical and human environments of communication.
- IV. Consult others in planning communication.
- V. Take care of contents and overtones of communication.
- VI. Convey value of communication to the receiver.
- VII. Do follow up action.
- VIII. Understand the importance of communication.
- IX. Your actions should be congruent with communication.
- X. Practice good listening – Good Listening is the basic pre- requisite for effective communication.

4.5.1 Listening

A close synonym of listening is hearing. Hearing is any sound that goes through the auditory nerves or sound waves as they enter the ears while hearing with comprehension is listening. We should listen to understand and respond as listening is a sure short solution of overcoming barriers to communication. By following the golden rules of listening we can adapt good listening:

- Stop talking
- Put the person at ease
- Show the person you want to listen
- Remove distractions
- Empathize
- Be patient
- Hold your temper
- You cannot listen if you are talking.
- Help a person feel free to talk, create a permissive environment.
- Look and act interested, listen to understand, not to oppose.
- Don't doodle, tap, or shuffle papers, shut the door if necessary to achieve quiet.
- Try to see the other person's point of view.
- Allow plenty of time, do not interrupt, don't start for the door or walk away.
- An angry person takes the wrong meaning from words.

5. PERSONALITY

The concept of personality is one of the major topics of interest for some of the top psychologist. We will define it from the view point of social attractiveness of an individual not from the scientific view point. The word 'personality' has its roots in Latin word 'persona' which means a mask. In old days in order to represent qualities of a typical character of drama on stage masks were used.

Personality in general terms means the unique set of qualities (i.e. physical, mental and emotional attitudes, values, interests) that make you different from others. Personality is actually how you present yourself to others and how people define you. Your personality is everything about you.

Personality includes way of thinking, feeling and behaving. Personality embraces moods, attitudes and opinions and is most clearly expressed in interactions with other people. It includes behavioral characteristics that distinguish one person from another and that can be observed in people's relations to the environment and to the social group.

5.1 Determinants of Personality:

Each individual has unique personality. There are certain factors which shape personality of individual called determinants of personality. A survey of works of different psychologist brings forward a plethora of determinants of personality. Here to keep things basic we will discuss the generic determinants of personality These are:

1. Heredity
2. Culture,
3. Family Background
4. Our Experiences through Life
5. The People we interact with.

1. Heredity: Heredity as the passing on of physical or mental characteristics genetically from one generation to another. We inherit certain traits, such as the color of our eyes, the shape of our face and body from our father, grandfather and great grandfather. Mainly these four aspects of personality we inherit i.e., body build, physical attractiveness, physical defects and health conditions from our ancestors. Most people are born with a mixture of traits. Heredity forms your basic personality. And then the effects of our environment add to our personality development. Environment includes everything and everyone around us. Environment may help bring out certain traits more than others. The other four determinants we will study now constitute our environment.

2. Culture: Culture can be defined as the ideas, customs and social behavior of a particular people or society. We learn values and inclination from our culture and it shapes our behavior. Behavior defines our personality. Thus people born in different cultures tend to develop different types of personalities. In India we can find diversity in cultural backgrounds and each culture has some general features that highlight personality of people of that culture in general. For example, people from Gujarat are more enterprising, people from Haryana are daring and people from Bengal are creative and have great intellectual bend. Also it is not necessary that all people belonging to a culture showcase the similar personality trait but in general according to culture the dominating personality trait is found in majority of people.

3. Family Background: Family is the smallest unit of society. Family is a group of people related by blood or marriage. The foremost influencer after heredity to shape personality of a baby is family. Many aspects of family like background and education of parents, socio-economic status, the number of children in the family and birth order and extended members of the family such as uncles and aunts influence the shaping of personality to a

considerable extent. Think once your liking –disliking, way of problem solving, way of expressing your feelings etc. All are one in other way a reflection of what you have learned from your family.

4. **Experiences in Life:** One of the famous quotes by Julio Caesar - “Experience is the teacher of all things” best explains this determinant of personality. Your personality might have kindness as a trait but repeated experience in your life where you felt cheated due to kindness can influence this personality trait for future. Suppose three such incidents happened to you with three different individuals in the past few months where you have given money but they never came back to you. Thus, certain personality characteristics are molded by frequently occurring positive or negative experiences in life.
5. **People We Interact with:** “A Person is known by the company he or she keeps” is a common proverb. We interact with an array of people in our life like – neighbors, teachers, classmates, schoolmates, friends, cousin, colleagues, boss and even strangers etc. People who are alike us in attitude and value we persuade them and associate with them. Even we change our behavior to get accepted and associated with them whom we like. For instance, we may have to become less aggressive, more cooperative to work successfully in a team etc. Thus, our personality becomes shaped throughout our lives by at least some of the people and groups we interact with. In summary, our personality is a function of both heredity and environment (external factors) that shape it and keep it shaping.
6. **Personality Development:** The above discussion on determinants of personality brings to light an age old debate that whether personality is natural or nurtured. In this regard, the central view supported by some psychologist is that each individual is born with basic personality. To cope up with the challenges offered by external environment individual strive to change and develop personality in meaningful ways throughout the lifespan. Thus, personality development is a continuous and multi-faceted process which requires asset of skills that need to be learned and at times unlearned.

The need to develop your personality in line with personal and professional requirements underlines the process of personality development. This is true particularly in the present times where sea-change has occurred in the realm of industries, where now only technical knowledge of doing things is not the sole criteria of selection and where wide cluster of skills is required to cater to the changing demand of industry. In this assortment of wide cluster of skills, the social attractiveness of personality is paramount important.

Hence it is clear that an intelligent individual can identify the expectations of the profession he/she wants to pursue and work on the desired personality traits. This will help him/her to have a well-developed conducive personality and earn competitive edge over others. It is more relevant in Tourism Industry where a well-developed personality having high social attractiveness is more imperative and demanded than any other skill set.

Tourism is a people to people industry where the service provider is an integral part of the tourism product. For example: the comfort of five-star hotel room like high quality bed and linen, best of antiques in room, international quality good food, costly furniture etc. are useless if the people serving in hotel lack professional serving attitude, manners, communication skills and have poor hygiene sense etc. Thus, essentially we can say that to have a happy customer (tourist) at the end of the day the people serving in tourism industry should have:

1. Positive Attitude to work.
2. Well Groomed Personality to create first impression.
3. Social Etiquettes & Telephonic Etiquettes.
4. Professional Body Language.

Thus, these areas turn into the key aspects of personality which require to be developed to have a desired personality for tourism industry.

Positive Work Attitude:

Attitude is another stimulating and mystifying subject of interest to many researchers as well as psychologist. Attitude and personality has a deep relationship as attitudes play a major part in determining a person's personality. That is why it is important to know what attitude is, how attitude affects personality and how to have positive attitude at your workplace. Attitude is how we look at things, events, people around us and it all starts inside our head. We can focus it on whatever we want-either on good or bad, positive or negative, problem or opportunity. Thus, by changing our focus (i.e. attitude) we can change our personality.

Power of Positive Attitude:

The power of positive attitude has been reinforced by a study of Harvard University also which says that the main driving force to get a good job in eighty-five percent cases is attitude and remaining fifteen percent is the technical know-how. Thus positive attitude enhances our personality traits and lifts our personality to a more attractive level both in personal as well as professional arena of life. Furthermore, following points highlight the power of positive attitude:

1. A positive attitude triggers our enthusiasm.
2. A positive attitude enhances our creativity.
3. A positive attitude makes good things happen.

6. POSITIVE WORK ATTITUDE

A positive attitude is a virtue for one's personality. But to be always positive at your workplace or society is not very easy. Every day we face many ups and downs especially at work place. Sometimes we feel positive and sometimes we feel negative. It becomes necessary for us to handle these ups and downs positively. Following strategies can help us to have a positive work attitude irrespective of any circumstances at work place:

1. **Examine Your Attitude Regularly:** Every day one should examine his/her attitude towards work, co-workers and boss whether it's positive or negative. Try to solve the problems by adjusting your attitude or if required by even changing your attitude from negative to positive.
2. **Balance Work with Personal Life:** Another strategy is to have a mix of fun and work. For this you should establish your priorities in life. Priorities mean something that is more important than other things. At home family should be priority and at work place office work should be priority. We should not think about work when at home and also should not allow family concerns disturb our office work. Setting priorities and meeting them successfully make our attitude more focused and positive.
3. **Focus on the Positive:** Always focus on your strengths and successes even if you are not able to be successful in all aspects of your work and in your relationships in the job.
4. **Communicate:** Communication is lifeline of all relationship. When communication stops, miscommunication begins and negativity spreads. Thus it is very important to communicate effectively as well as listen patiently. You should be able to make other understand what you want to say and at the same time understand properly what they want to communicate. Practice good listening and communication skills every day.
5. **Turn Unexpected Changes into Opportunity:** Change is inevitable and change always bring friction. Human beings soon adapt themselves to a routine and any change in it brings negative reactions. Example – Change of Boss or co-worker or job profile. But one can learn to accept change and remain positive. Focus on what one can learn from this change and see the change as an opportunity to learn new things and grow.
6. **Educate Yourself:** One should be well –versed in one's job only then one can enjoy it. One should put effort to educate oneself in all areas where improvements are required. Even if you know your job well always try to

update your knowledge and learn new things. Be a lifelong learner. The more you learn, the more confident you will be.

- 7. Maintain Your Interest:** A new job means new challenges and many new things to learn. But with passage of time the challenges become routine affairs and you start feeling bored and negativity increases. Thus, you should look for ways to regain the interest. Take new initiatives and invent new ideas for doing routine tasks.
- 8. Maintain a Sense of Humor:** Humor can help you to overcome tension at work and see the lighter side of the things. Having a sense of humor does not mean joking or clowning around. Having a sense of humor means developing the ability to see positive things and lessen the tension in environment.
- 9. Take Care of Your Health:** There is a direct relationship between healthy habits, productivity and positive attitude. A person who has habit of exercising daily will definitely have good health and high productivity at workplace. Such individual will have high positive energy and attitude towards everyone in the office. Thus poor health habits can affect your job performance and your attitude.
- 10. Dress for Success:** Last but not the least. How you dress and how you carry yourself reflects your attitude. In fact, this is one of the most important areas of personality development

7. CREATING FIRST IMPRESSION & GROOMING

Often you have heard the famous phrase – ‘First impression is the last impression’. Impression is an idea, feeling or opinion about something or someone, especially one formed without conscious thought or on the basis of little evidence. Trustworthiness and confidence are leading trait of our personality then we earn a long lasting relationship. And these two traits are conveyed not on the basis of one’s intelligence or experience, rather than on basis of one’s attire and grooming level. Thus one has to work on these two aspects of one’s personality to make first impression extraordinary.

Attire / Clothing: Attire means the way we dress up. The way we dress up show our attitude towards life. It is very important to wear clothes which convey positive about us. The thumb rule is that we should adapt ourselves to the dress-code of the work place. When we follow the dress –code of the industry than we project an image which gel with the image and work culture of the work-place. In tourism industry it is very important because the way we carry ourselves convey the image of the company as well as the quality of service. Thus, at the work place what we wear indicates towards our professionalism. Also two types of clothing are common in tourism industry – Business Formals (generally Monday to Thursday) and Business Casual (generally Friday).

Grooming: The second important area which helps you to create a first good impression is grooming. It is imperative to take care of your overall appearance which includes neatness and cleanliness of body and hair. It also includes how we manage accessories which we put up with our clothes like belt, shoes, purse, watch, jewelry etc.

Daily grooming is a must –must especially for work place. Your health, as well as the health of others, depends on your practices of personal cleanliness. Also, if we are not well groomed then even the costliest clothes do not help a person to create a good impression. Overdo of make-up and use of accessories can destroy the most professional attire. Thus, to have a true professional formal look at workplace one has to take care of many do’s and don’ts of dressing and grooming. The following general grooming tips help you to be professionally groomed:

1. **Hair:** Clean and neatly styled, no wet hair, no over the top colors or hairstyles. For Men go for a shorter haircut, and trim chest hair (no hair visible at the neckline!).
2. **Shoes:** Polished and in good condition.

3. **Nails:** Clean, trimmed, neatly manicured. For women no extreme colors or length.
4. **Cosmetics:** Makeup should be conservative, aim for a natural, polished look.
5. **Perfume/Cologne:** Use very little or not at all, clothes should be odor free (no smoke smell!)
6. **Facial Hair:** Clean shaven or trimmed very short and neat.
7. **Tattoos:** Cover all tattoos if possible. No Tattoo should be visible.
8. **Piercings:** Remove all facial and body piercings. For women one earring per ear and for Men no earrings allowed.
9. **Back-packs:** Do not take a back-pack to an on-site interview.
10. **Purse:** A small, conservative handbag or business tote bag is acceptable. Bag should coordinate with shoe color.

The above details in attire and grooming when taken care of help you to create a positive professional first impression and in this way your battle is half won in the beginning.

8. BASIC SOCIAL ETIQUETTES

Another area which helps us to define and shape your personality is Social Etiquettes. Etiquette when defined most simply means respect, good manners and good behaviour we project in our social settings be it office, friends or family. It is not just each of these things, but it is all of these things rolled into one.

Work /Office Etiquette

These days' office is the place where we spent more waking hours of a day as compared to our home. Office environment and office people have become a vital part of our life and shape our success in life. It has become imperative to treat our office people and office environment a notch better than family.

1. Be timely: To be punctual at work and meetings is an important attribute of one's personality. It shows that you value other's time. Also one should complete work assignments on time.

2. Be polite, pleasant and courteous. Treat others the way you want to be treated.

3. Learn office politics. One should understand the story of office and role played by different employees. Utilize effective listening skills to discover appropriate office behaviour. Pay attention to the way things are done.

4. Understand the four unwritten rules of business:

- a. The Boss is the Boss: right or wrong, the boss always has the last word.
- b. Keep the boss informed. Good or bad, you don't want the boss to listen information mentioned from an inappropriate source.
- c. Never go over the boss' head without telling him or her first.
- d. Make your boss look good. Promotion and opportunities arise when you help the organization reach its goals.

5. Adopt a can-do attitude. This highlights the positivity of your personality. Those who accept challenges as opportunity can display creativity and become valuable.

6. Be flexible. Not necessary that everything that happens in the office is liked and accepted by you. Sometimes you can have a difference of opinion about a change but at that time it should have flexibility. By remaining flexible and implementing change, you gain a reputation as a cooperative employee.

7. Give credit to everyone who made a contribution to a project or event. In this way you earn good reputation and at the same time you will also enjoy credit by others.

8. Do not differentiate people by position or standing in a company. Thus, by following more and more business etiquette you will be able to create a good impression about your personality. These visible signals are essential to your professional success.

Business Telephone Etiquette

In tourism industry telephone is the most used way of communication with customer, supplier as well as within the office. The way telephone call is answered

create the image of the company. One can enhance their professional reputation through polite and effective telephone manners. It has been proved that if we cannot handle telephone calls professionally then people think twice before doing business with the company. That's the reason these days' companies have standard operating procedure of handling phone calls in which these aspects are most important:

1. Answering the call
2. Making the calls
3. Taking a Message
4. Leaving a Message

Answering the Telephone:

- Answering promptly that is allowing no more than two or three rings before picking up the handset. An immediate response says a lot about you and promotes good public relations.
- Answering with a smile which the caller will hear it in your voice. A cheerful voice begets a happy caller or listener, and a favorable impression is created.
- Speaking in a warm, audible, clear voice at a moderate phase so that the caller can follow the conversation.
- Not eating, drinking, smoking or coughing while talking into the mouthpiece. If you have to cough, excuse yourself first, cover the mouthpiece and cough away from it.
- Always sound professional, pleased to hear from someone and ready to deal with their concerns.

Making Telephone Calls:

- The impression you create on the telephone reflects not only your personality but also the image of your company, organization or employer. Try to phone when you know it is convenient for the other person and confirm that they are able to speak.
- Always identify yourself and your company immediately. This information makes you sound confident and in control and enhances your chances of being put through promptly to the person you're trying to reach.
- If you make a long distance call and the other person is not available, you should try again. Do not leave a message that the person should phone you.

When leaving a message:

- Give full details so that the person who returns your call can get in touch with you.
- The first name and surname are important, as is the reason for the call.
- If you want to offer or sell the person something does not leave a message; rather phone back later. Ask when it will be convenient to speak to the person and call back at that time.

When taking a message:

- Keep the following at hand at all times: a pen, a message book, a calendar and a dairy (in case appointments have to be made).
- Take messages carefully and write down all the details in your message book for the possible future reference.
- Note for whom the message is intended plus the full name and title of the person who called. Ensure that you have the correct spellings of all names and surnames. Record the date and time of the call.
- Obtain their telephone number and code as well as the extension, and ask until what time their call can be returned.
- Note the name of the organization or business they represent, as well as the purpose of the call.
- In the case of an urgent message, take the caller's home or cell phone number.

- For safety sake, leave the handwritten message on the person's desk.
- Thus, when one handles this mode of communication effectively in office then problems are solved easily, productivity and customer satisfaction is achieved. Also, your positive image is created, professional worth increases in office as well as with customers.

9. POSITIVE BODY LANGUAGE

It is the study of movements of our body parts like eyes, head, hands, legs, sitting style, walking style etc. is called body language. It is also called Gestural Communication or Kinesics. It truly depicts the inner feeling going in our mind. We can fake our words to conceal our true inner feeling but our body movements convey it. Thus, we should know how to depict a positive body language so that we give impression of a well-developed personality. We have to work on following areas of body:

1. **Eye contact:** Eye contact is the first thing that people look for when they meet us first and good eye contact will give them a feeling of comfort and genuine warmth in your company, maintaining good eye contact shows respect and interest in what they have to say. Lack of eye-contact signifies inattention and lack of interest.
2. **Posture:** Getting your posture right will automatically make you feel more confident. And when you feel good other people pick up on that. When we feel down we slouched over with your shoulders drooping down and inward. This collapses the chest and inhibits good breathing, which in turn can help make you feel nervous or uncomfortable.
3. **Head position:** With our head position we convey many things. When we are confident and self-assured we keep our head level both horizontally and vertically, when we project ourselves authoritative our head is in straight position. Conversely, when you want to be friendly and in the listening, receptive mode, tilt your head just a little to one side or the other
4. **Arms:** One of the most interpreted body parts in body – language is arms. It gives away clues as to how open and receptive we are to everyone. We should always keep our arms out to the side of your body or behind your back. It shows openness and ready to receive new ideas. In general terms the more outgoing you are as a person, the more you tend to use your arms with big movements. Crossing your arms is a no-no in meetings or at interview as it can be interpreted as being passive, aggressive or closed to suggestion.
5. **Legs:** Legs again convey a lot about our inner feelings as these are farthest point from brain and difficult to control consciously. The way our leg moves convey our state of mind. When we are nervous, stressed or being deceptive our legs tend to move around a lot more than normal. Also the way we cross our legs and where we cross it at the knees or ankles. Crossing of legs shows that the person is defensive. Also on the legs depend the angle of your body in relation to others. It gives an indication of your attitude and feelings towards them. We angle inward toward people we find attractive, friendly and interesting.
6. **Hand gestures:** With hands we make numerous gestures and each conveys definitive meaning. Some are:
 - a. Palms slightly up and outward is seen as open and friendly.
 - b. Palm down gestures are generally seen as dominant, emphasizing and possibly aggressive. This palm up, palm down is very important when it comes to handshaking and where appropriate we suggest you always offer a handshake upright and vertical, which should convey equality.
7. **Mouth movements:** Our mouth movements can give away all sorts of clues about us. The most expressive part of mouth is lips. When we twist them to the side when we're thinking or sometimes we use this movement to hold back an angry comment that we don't wish to reveal. There are also different types of smiles and each gives off a corresponding feeling - A full smile with the lip coming above the teeth shows genuine joy and a smile that does not

reach the eyes is NOT a smile but manipulation. A full smile is one of the most positive body gestures.

By working on above said components of body language we can project a positive body language. When we project a positive body language our personality becomes more charismatic. In fact, positive body language is reflection of one's positive attitude towards life and ability to project openness of one's personality

10. Summary

This chapter has introduced the concept of soft skills and hard skills. You have come to know that to become successful in tourism industry you need expertise in soft skills. It highlights that among all Soft skills, Communication skills, Personality development are pre-requisite to gain edge in tourism industry. We have learned the step by step process of communication for getting your message to others. Types of communication teach you that while communicating one should take care of both verbal and non-verbal communications. In order to communicate effectively, one should try to minimize the barriers to communication which can happen at any stage of communication process. By becoming a good listener, you will be able to achieve up to a limit the skills required for becoming good communicator.

Personality development is a cautious and continuous effort of individuals to inculcate attributes like positive attitude, etiquettes and positive body language in their personality so that they achieve new heights in Tourism Industry. Tourism industry is a people to people, intangible and glamorous industry which demands professionals which have a right blend of hard skills and soft skills. It has described in the simplest way the importance of personality and how it is formed. It also explains that with our efforts we can develop our personality as desired. For it, we need to develop positive attitude. We need to take care of our looks and grooming and learn the etiquettes of work place and telephone handling. Further, learning of positive body language helps us to put up a charismatic personality. All this makes us employable for tourism industry and help us to achieve new heights in the tourism industry

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A STUDY OF INDO-SAUDI ARABIA BILATERAL TRADE RELATIONS

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Abstract - As India and Saudi Arabia raise their global standing based on their strong economic performance, they are increasingly being recognized as emerging global players. The two nations continue to strive for economic growth and regional peace and recognize the potential benefits of forming a strategic partnership. India under Prime Minister Narendra Modi has showcased a greater intent to reach out to the world, and this is most pronounced in India's proactive engagements with the Arab Gulf, especially the United Arab Emirates (UAE) and Saudi Arabia. India's relations with this predominantly Muslim region are historical, but they have flourished in the past two decades based on commercial ties and mutual interests. Of late, Indo-Saudi relations have started to acquire a strategic dimension due to recognition of the mutual security concerns emanating from jihadist terrorist threats and a desire to realize the huge economic potential of significant investment opportunities as well as India's need for energy security.

1 INTRODUCTION

India and Saudi Arabia enjoy cordial and friendly relations reflecting the centuries old economic and socio-cultural ties. The establishment of diplomatic relations in 1947 was followed by high-level visits from both sides. King Saud visited India in 1955 and the Prime Minister Jawaharlal Nehru visited the Kingdom in 1956. The visit of the Prime Minister Indira Gandhi to Saudi Arabia in 1982 further boosted the bilateral relations. The historic visit of King Abdullah to India in 2006 resulted in signing of 'Delhi Declaration' imparting a fresh momentum to the bilateral relationship. The reciprocal visit by Prime Minister Dr. Manmohan Singh to Saudi Arabia in 2010 raised the level of bilateral engagement to 'Strategic Partnership' and the 'Riyadh Declaration' signed during the visit captured the spirit of enhanced cooperation in political, economic, security and defence realms. The visit of the then Crown Prince, His Royal Highness Prince Salman bin Abdulaziz Al-Saud, Deputy Prime Minister and Minister of Defence of the Kingdom of Saudi Arabia (now King) to India in 2014 has further deepened the relations between our two countries. The highly successful visit of Prime Minister Narendra Modi in April, 2016 has consolidated the domains of the existing partnership. The conferring of the highest civilian honour on Prime Minister Narendra Modi by the Saudi King is an indication of the importance it attaches to its relations with India. Further, the 'State Visit' honour accorded to the visit of the Saudi Crown Prince Mohammad bin Salman to India in February, 2019 cemented the ties in diversified fields. The announcement on Saudi investments of worth US \$ 100 billion in India; increase in Hajj quota to 2, 00, 000; release of 850 prisoners; proposal to set up a high-level mechanism at the leadership level; and identifying India as one of the Kingdom's 8 Strategic Partner Countries under 'Vision 2030' clearly earmarks the growing bilateral ties in an upward trajectory.

Bilateral Trade: The trade cooperation is perhaps the most active and significant component of the Saudi Arabia and India relationship. A pattern of interdependencies is created as the two regions have expanded their traditional trade ties into a sustainable partnership. Saudi Arabia today is our 4th largest trade partner (after China, USA and UAE). Due to energy (oil and LPG), balance of trade (BOT) is in Saudi Arabia's favor; services provided by the Indian workers, who remit approximately \$12-15 billion annually, almost equalizes the balance of payment (BOP).

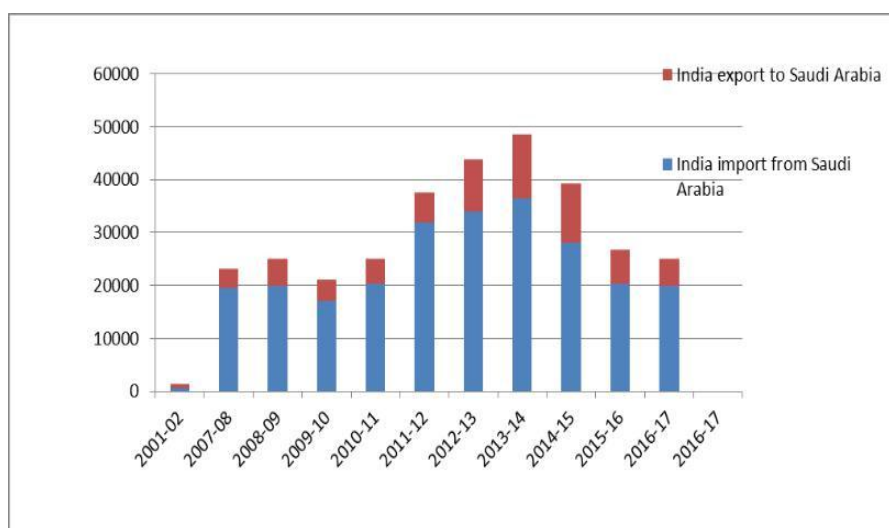
India's imports from Saudi Arabia (\$US millions)

2001-02	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
621	19,470	19,973	17,098	20,385	31,818	33,998	36,404	28,108	20,321	19,972

India's exports to Saudi Arabia (\$US millions)

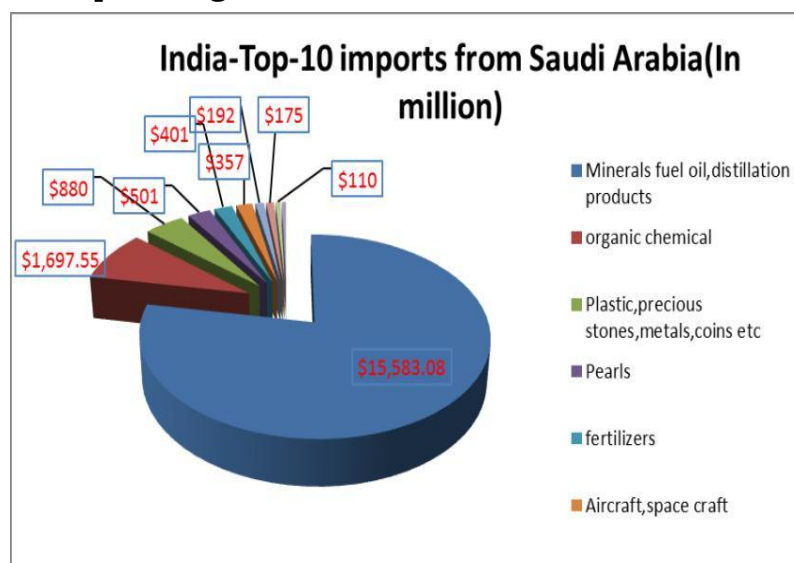
2001-02	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
823	3,711	5,110	3,907	4,684	5,683	9,786	12,219	11,161	6,394	5,110

During this period, our imports from Saudi Arabia reached USD 19.97 billion, showing a decline of 1.7% over previous year(USD 20.32 billion) and in 2015-16 import was USD 20.32 billion, registering a decline of 27.71% over 2014-15 (USD 28.11 billion) where as our exports to Saudi Arabia reached USD 5.11 billion, showing decline of 20.08% over previous year(USD 6394) and in 2015-16 it was USD 6.40 billion registering a decline of 42.71% over previous year (USD 11.16 billion). Import from Saudi Arabia in India averaged 47.40 INR billion from 1991 until 2017, reaching an all time high of USD 36.4 Billion in March 2014.

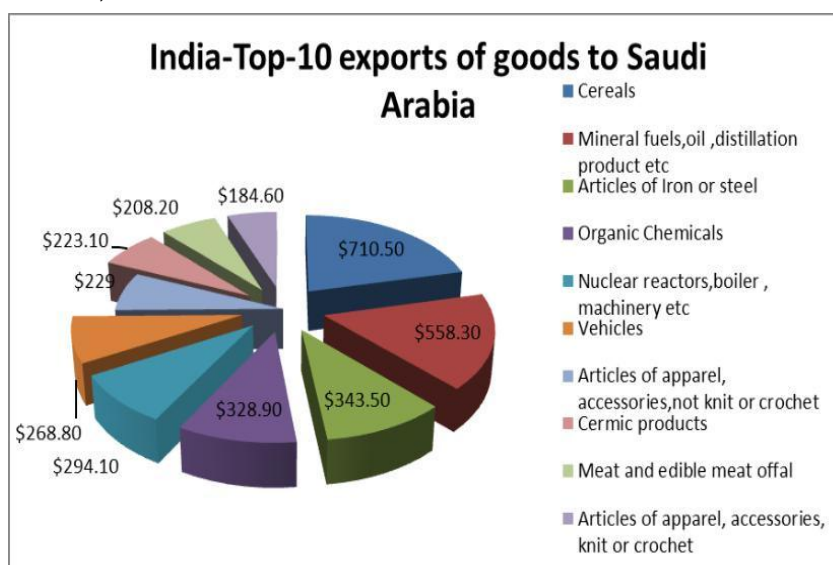
Total Trade India and Saudi Arabia(\$US millions)

The value of India Saudi Arabia bilateral trade during 2016-17 decrease to USD 25.082 billion, a 6.5% fall from 26.082 billion and 2015-16 decreased to USD 26.71 billion, a 31.97% fall from USD 39.27 billion in 2014-15. The decline can be attributed mainly to low petroleum and commodity prices and lower global demand. Saudi Arabia is the 8th largest market in the world for Indian exports and is destination to More than 2.44% of India's global exports. On the other hand, Saudi Arabia is the source of 5.34% of India's global imports. For Saudi Arabia, as per 2015 data, India is the 4th largest market for its exports, accounting for 9.43% of its global exports. In terms of imports by Saudi Arabia, India ranks 7th and is source of around 3.43% of Saudi Arabia's total imports.

India's top 10 imports of goods from Saudi Arabia as follows.



It is very clear Mineral fuel oil is top most import product from Saudi Arabia. In India, we produce only 22 percent of our mineral fuel requirement and the rest is imported at a huge cost. The Kingdom is India's economic partner in the major imports of mineral fuel and oils make Saudi Arabia as India's 4th largest trading partner. The important sector that boosts Indian economy is the mineral sector and although the value of mineral production is increasing at a gradual pace, which cannot be fulfilled unless, India makes stronger bi-lateral relationship foundations in the Middle East. Apart from Mineral fuel we import organic chemical, Plastics, Pearl, fertilizers, Aircraft etc.



India is one the leading exporters of cereals and the second largest producer of rice. Being agriculture –driven country, India depends largely on its produce of cereals and so does the importer country such as Iran, Saudi Arabia, Indonesia, UAE, and Bangladesh. According data India exports 12.79% to Saudi Arabia of its export. In addition India imports small amounts of refined products but is a large exporter. This is due to a number of large refineries in India, which buy the crude oil from producers, refine it within India, then export the surpluses. (Sheetal Varshney 2018) Joint Statements/Bilateral Agreements/MoUs:

The bilateral Agreements and MoUs signed are as follows:

Joint Statements:

1. Signing of 'Delhi Declaration' in 2006 during the visit of King Abdullah; it laid the roadmap for bilateral cooperation;
2. Signing of 'Riyadh Declaration' in 2010 during Prime Minister Dr. Manmohan Singh's visit to Riyadh. It raised the level of interaction to 'Strategic Partnership' in the political, economy, security and defence realms;
3. Joint Statement during the visit of His Royal Highness Crown Prince Salman bin Abdulaziz Al- Saud, Deputy Prime Minister and Minister of Defence of the Kingdom of Saudi Arabia to India in February 2014;
4. Joint Statement during the visit of the Hon'ble Prime Minister of India to the Kingdom of Saudi Arabia in April 2016.

Agreements/MoUs:

1. MoU for Foreign Office Consultations;
2. MoU on the Establishment of Joint Business Council between Council of Saudi Chambers of Commerce and Industry (CSCCI) and Federation of Indian Chambers of Commerce & Industry (FICCI);
3. Bilateral Promotion and Protection of Investments (BIPA);
4. Agreement on Avoidance of Double Taxation and Prevention of Tax Evasion (DTAA);
5. MoU on Combating Crime;
6. Agreement in the field of Youth and Sports;
7. MoU of Scientific and Educational Co-operation between the Ministry of HRD, India and Ministry of Higher Education, KSA;
8. Extradition Treaty;
9. Agreement on Transfer of Sentenced Persons;
10. MoU for Cooperation in Peaceful Use of Outer Space;
11. Agreement on Scientific and Technological Cooperation;
12. MoU between Centre for Development of Advance Computing (C-DAC) and King Abdulaziz City for Science & Technology (KACST) on cooperation in Information Technology and Services;
13. Agreement on News Cooperation between Saudi Press Agency (SPA) and Press Trust of India (PTI);
14. MoU on Cultural Cooperation;
15. Agreement on Labour Cooperation for Domestic Service Workers Recruitment;
16. MoU on Defence Cooperation;
17. Agreement on Labour Co-operation for Recruitment of General Category Workers;
18. Technical Cooperation Program between the Bureau of Indian Standards (BIS) and the Saudi Standards, Metrology and Quality Organization (SASO);
19. Cooperation Programme between the Indian Council of World Affairs (ICWA), India and Prince Saud Al Faisal Institutes of Diplomatic Studies (PSAIDS), Saudi Arabia;
20. Executive Program for Cooperation in the Field of Handicrafts between the Export Promotion Council for Handicraft (EPCH) in the Republic of India and Saudi Commission for Tourism and National Heritage;
21. MoU between Financial Intelligence Unit - India and the Financial Intelligence Unit-Saudi Arabia concerning Cooperation in the Exchange of Intelligence related to Money Laundering, Terrorism Financing and Related Crimes;
22. Framework for Investment Promotion Cooperation between Invest India and the Saudi Arabian General Investment Authority (SAGIA);

Economic & Commercial Relations: Saudi Arabia today is our 4th largest trade partner (after China, USA and Japan) and is a major source of energy as we import around 17 % of our crude oil requirement from the Kingdom. In

2017-18, the India-Saudi bilateral trade has increased by 9.56 % to US \$ 27.48 billion. During this period, our imports from Saudi Arabia reached USD 22.06 billion, registering a increase of 10.50 % over previous year (USD 19.97 billion) whereas our exports to Saudi Arabia reached USD 5.41 billion registering an increase of 5.88 % over previous year (USD 5.11 billion). The current bilateral trade (April- Oct 2018 provisional figures) is valued USD 19.64 billion. The business and visit visa fees for the Indian nationals were decreased and fixed on reciprocal terms.

The Progressive Development of India- Saudi Arabia Relations In January 2006, King Abdullah became the first Saudi monarch to visit India in 51 years. Thus began what both sides generally regard as “a new era” in the bilateral relationship. The late King’s visit culminated in the signing of the historic Delhi Declaration (2006), which imparted fresh momentum to the relationship and supplied the framework for developing more expansive ties. Four years later, then-Prime Minister Manmohan Singh traveled to Saudi Arabia, where the two sides’ agreed to elevate their bilateral engagement to a “Strategic Partnership,” articulated in the Riyadh Declaration (2010). Crown Prince and now King Salman’s trip to India in 2014 sealing deals in the energy, business and defense sectors — yet another milestone in the progressive development of bilateral ties. The most recent major thrust forward in the bilateral relationship came when Indian Prime Minister N. Modi paid a two-day visit to the Kingdom in April 2016. The Joint Statement issued during the visit emphasized the two sides’ desire to harness each other’s potential for mutual gain. It declared their interest in increasing cooperation in a variety of economic and cultural spheres, including defense and security, energy, trade and investment, education and research, technology transfer, Diaspora relations, and cultural and people-to-people ties. The two sides also agreed to pursue cooperation in the peaceful uses of space, cyber and maritime security, and counterterrorism, counter-extremism and de-radicalization. Trade and Investment Trade and commerce has long been one of the strongest components of the bilateral relationship. Today, Saudi Arabia is India’s fourth-largest trading partner and eighth-largest export market. During the 2000s, bilateral trade experienced sustained growth, peaking at \$48.6 billion in 2013-14. Since then, however, bilateral trade has plummeted, totaling just \$26.6 billion in 2015-16. This sharp decline in bilateral trade is largely attributable to sluggish global demand, which has resulted in a drop in petroleum and commodity prices. However, insofar as India-Saudi trade relations are concerned, the rate of decline in non-oil trade and thus in India’s exports to Saudi Arabia has been even more precipitous than that of Saudi Arabia’s (primarily petroleum) exports to India. Although due to energy (oil and LPG), balance of trade (BOT) is in Saudi Arabia’s favor; services provided by the Indian workers, who remit approximately \$12-15 billion annually, almost equalizes the balance of payment (BOP). (Zakir Hussain 2017).

2 INDIA AND SAUDI ARABIA: A STRATEGIC PARTNERSHIP

Relations between India and Saudi Arabia have come a long way from the Cold War-era dynamics, when the two nations found themselves pursuing different foreign policy priorities and seldom crossed paths. The post-Cold War global changes mandated adjustments to new realities, and in response, India and Saudi Arabia started to carefully build close relations.

At the early stages they avoided discussing delicate issues, especially Pakistan and Muslims in India, in order to build trust, and instead focused on economic issues. The possibilities and opportunities available in the fields of business, trade, and energy made it possible for India and Saudi Arabia to develop close links while avoiding tricky political issues. The increased trade and commercial ties and a flourishing service sector in Saudi Arabia created opportunities for Indian workers, who rushed to the kingdom to earn a better livelihood. The increasing size of the Indian expatriate population also helped in confidence building. Once the contentious issues could be sidelined, political contacts were nurtured by both sides, leading to a significant turnaround in bilateral relations in the mid-2000s, especially with the visit of King Abdullah in 2006—this was the first visit by a Saudi king since 1955. While trade and commerce intensified, India and Saudi Arabia also started consultations to improve security and defense ties. India, which was facing security threats from local extremist organizations and cross-border terrorism, found a willing partner in Saudi Arabia in its efforts to curb illegal activities, including organized crime, the financing of terror, and radicalization. The two nations signed an extradition treaty and an MoU on defense cooperation, which led to the Saudis' extradition and deportation of a number of Indian nationals who were accused of involvement in illegal activities and terror financing, which provided the impetus for a strengthening of cooperation in the areas of security and defense. With the changing geopolitical situation and the rise of global terrorist networks threatening peace and stability in Middle East and South Asia emerging as a common concern, India and Saudi Arabia are now looking to further strengthen their security and defense ties through cooperation in the areas of conducting counterterrorism, combating radicalism, and sharing intelligence. This is an important area of focus, and it forms the bedrock of the strategic partnership. Undoubtedly, this is important because both India and Saudi Arabia are faced with strong threats from global terrorist organizations who have targeted civilians and the innocent all over the world, including in India and Saudi Arabia. The strategic partnership is intended to achieve closer intelligence sharing and better coordination against online radicalization and to combat terrorism and achieve peace and stability in both regions. The other area where India and Saudi Arabia are looking to enhance cooperation is bilateral investments. India has been making significant efforts to ease bureaucratic bottlenecks and attract foreign direct investments (FDIs) that will attract Saudi investments in particular. India is a growing market, and there are vast opportunities in a variety of areas, including the infrastructure, building, construction, transport, education, health care, and the service sector. In fact, India is emerging as one of the favorite destinations for FDIs, and since 2014, the overall FDI inflow has almost doubled: The annual FDI in India in the year 2013–2014 was US\$36 billion, in 2014–2015 it grew to US\$45 billion, in 2015–2016 it reached US\$55 billion, and it crossed the US\$60 billion mark in 2016–2017.⁷⁸ This rapid increase indicates that the overall market confidence in India is on the rise, and with the enactment of further measures to ease the establishing business and making of investments, the annual FDI is expected to increase even further. Saudi Arabia, which has large stores of sovereign funds, has an opportunity to invest in the growing Indian market, which offers long-term investment possibilities, has a built-in shock-absorbing system, and can provide the necessary skilled manpower for foreign investors. Saudi businesses will find

India as an attractive destination because it offers huge returns on account of being a large market, and despite some remaining problems (which the current government is focused on removing), cost-benefit assessments reveal a positive situation. At the same time, the diversification efforts in the Kingdom of Saudi Arabia are creating opportunities for Indian businesses that will contribute in strengthening bilateral relations, and indeed, the numbers of Indian businesses and workers engaged in the Saudi market is on the rise. Indians are not only the largest expatriate community; they have also proven to be peaceful and enterprising. (Md. Muddassir Quamar 2018).

2.1 Objectives of the study

- To find out the relation between indo-Saudi economical and trade relations
- To find out the bilateral trade relations between indo- Saudi
- To fine out the recent years India-Saudi Arabia bilateral trade has grown enormously, In 2019, Saudi Arabia ranked four amongst the leading trading partner of India and on the flip side; India was the seventh largest trading partner of Saudi Arabia.
- This paper explores the major trends of bilateral trade between the two nations and tries to scrutinize the features and challenges that arose out of this trade intensity and resulted in a mutual benefit of both state during the period of 2014-19.

3 CONCLUSIONS

Over the span of a mere decade, the India-Saudi Arabia relationship has been transformed from a transactional relationship to a strategic partnership. Accordingly, the scope of cooperation has widened not just within traditional areas such as energy, migration, and trade but has expanded to other sectors, including investment, health, pharmaceuticals, IT, ICT, and space. India and Saudi Arabia have also reached a greater understanding on security and defense matters. Importantly, India and Saudi Arabia seem to have reached the point where, unlike in the past, they are both determined not to permit the further development of ties between them to be bracketed by their relations with third countries (e.g., Iran or Pakistan)

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COMMUNICATION SKILLS AS A CRITICAL STRATEGIC FACTOR IN DESIGNING A CAREER IN ENGINEERING & TECHNOLOGY

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Abstract- “Man is responsible for developing the art of communication but himself is the biggest hurdle in an effective communication.”

Today humans are living in the Information Age and world of communication. An effective communication involves effort from both the sender of the message and the receiver. And it's a process that can be fraught with error, with messages muddled by the sender, or misinterpreted by the recipient. When this isn't detected, it can cause tremendous confusion, wasted effort and missed opportunity.

The advances of communication technology have saturated the public's capacity to absorb information. The world today look forward to effective communication in various aspects of life whether it is Education, Science, Arts, Health care, Commerce, Sales /Marketing & advertisement.

A study of communication skills among the engineering students shall pave a way towards better understanding about the gaps between demand & supply and the necessary corrective actions to be taken which shall help engineering students to take on challenging global careers & competitions in general. An in depth probe into the various aspects of communication, scope and application of the same in the current & future scenario becomes crucial & necessary & shall provide an insight into the communication process.

1. INTRODUCTION

“The ability to communicate is the primary factor that distinguishes human beings from animals and it is the ability to communicate well that distinguishes one individual from another.”

The phenomenon of global economic growth is rapidly facilitating an economy of globalization. The process through which geographically confined economy is undergoing metamorphosis into a global one is featured by issues of cultural exchange, education, in this phenomenon; population mobility is also one of the causative factor. Communication plays a crucial role of a lubricant in the globalization, some languages have attained & proved to posses exceptional power and coverage. These ‘Power Languages’ offer a competitive advantage to the learners as well as the those who enjoys a flawless command.

The need & demand of the rapidly changing scenario of globalization & its effects on the world of education, keeping the engineering students under scanner, the scenario highlights some important issues.

In India like other educational arena, including the engineering students, it is comparatively easier to acquire degree as compared to earlier days, this has provoked a severe competitive environment to grab a job. In current scenario & the times to come, at the job marketplace, only degree is not going to be the criterion of employment but the criterion of fetching a good job opportunity is decided by the way an engineering graduate is equipped with the skill set. Needless to say that the skill set basically includes technical knowledge but also one of the most crucial criterion of today's employment i.e the expertise & ability of a prospective employee to communicate within & outside the organization.

Hence, the ability to speak optimally, meaningfully, reasonably, clearly so as to be able to invite appreciable attention is one of the very important skills. Command over language & communication is now emerging as an issue of competitive advantage.

Communication skills are more important to job success than are specific technical skills (Becker & Eckdom (1980).

A study by Darling and Dannels (2003) reported that the types of communication which the engineers rated as most important included message construction skills, teamwork, negotiation, and asking and responding to questions.

Oral communication skills were ranked as the most important factor in helping graduate students obtain employment (Winsor, Curtis, & Stephens).

Communication is considered a critically significant skill for successful careers. The requirements at the job marketplace has necessitated English & communication skills among fundamental competencies for an engineering graduates.

The quality of communication of an engineering professional shall decide his future escalation in the career.

The two phenomenon of 'Rapid Globalization on one part & parallel 'Urbanization' i.e migration of people particularly from rural area to the urban area has its own requirements. 'Rapid Globalization & 'Urbanization' are demanding more from professional courses like engineering, medical or like many, The students migrating to the urban area are in dire need to learn & develop the way they speak & communicate. The engineering students from the rural backdrop have to fight many battles, they have to undergo a thorough evolution & transformation into the urban environment, & break their shell of inferiorities (if any), while making themselves believe that they have got the capability to acclimatize in the urban settings & working environment.

2. ENGLISH-AS A LANGUAGE OF COMMUNICATION

'The importance of a language is not just in how many people speak it but in what it is used for.'

The global & domestic platform is witnessing an explosion of commercial activities involving interaction between two different cultures, languages, beliefs, tradition & psychological backgrounds. Today English has emerged as a dominating & popular tool of communication among the global community. English is not the most widely spoken language in the world in terms of the number of native speakers. English is as a world language, because less than fifteen percent of the world population uses English. The widespread usage of English earned it a credit of being a "Global language" of the modern times, presently it is most taught 'Second Language' across the world.

English is capable to enable students to communicate with the international world & follow the development in technology. It is the language of business, profession & government, even in some countries where it is a minority language. It is the language of communication even where it is not a native language.

It is a matter of grave concern that there is a quality gap in the English spoken among the Engineering students and actually what is required for them to evolve as a globally competitive professional. Despite being talented, some Engineering students may be threatened to be losing in the competition because of their lack of fluency in the Queen's language.

In view of the growing demand of spoken English among technocrats in the private sector. The Engineering graduates are expected to be able to prepare for the cut-throat competition ahead. Presently, English as a subject was taught in first and second semester in state Engineering colleges.

Engineering students are considered to be having lack of fine spoken English skills, and one can find colleges full of students who understand the technical subject matter more thoroughly but are not well versed with spoken English, whether they work harder to overcome the language barrier.

3. CONCLUSION

Communication in technical colleges is one of those courses that are essential for all the students and professionals. With the advent of new technologies the world is shrinking into a global village. Therefore the need for an

effective communication is becoming all the more essential while the students feel the need for communicating successfully through oral & written media in their academic tasks. Every day professional face the challenges of communicating effectively in their work place. Technical communication plays an important role in an organization, whether it is a business enterprise, an industry or an academic institution. All managerial & administrative activities involve communication be it planning, organizing, recruiting coordinating or decision making. Communication serves as an instrument to measure the success or growth of an organization. The various types of communication not only help an organization to grow but also enable the communicators to develop certain attributes.

It appears that the Engineering students need not to be blamed for their lack of spoken English skills, Instead it appears imperative for the colleges and universities to monitor & ensure the quality of English spoken. The universities & institutes are required to keep English under the spot light in the Engineering curriculum.

Engineering students not only are required to justify the technical requirements of their profession but are expected to perform various job functions like letter Writing, maintaining office records, drawing up tender notices, writing technical reports, communicating with sub-ordinate staff and/or laborers and with superiors.

Therefore a quality communication skill level is the need of the hour which requires improvement in the knowledge of the Language, comprehension and its application. They should possess power of oral communication through effective use of body language and necessarily puts knowledge to practice through exposure in varied forms. Unfortunately majority of professionals lack a proper insight into the critical role of communication for a successful career, thus they restrict themselves to groom themselves well to suit the communication needs pertaining to their profession. Higher the hierarchical altitude higher is the need of proficiency in communication. An expertise in communication supports an engineering professional to gather information, analyzing, interpreting the data & then communicating the required strategic action to the concerned people.

In today's global world, the importance of English can not be denied and ignored since it is the most common language spoken everywhere. With the help of developing technology, English has been playing a major role in many sectors including medicine, engineering, and education, which is the most important arena where in today's context of globalization, technology transfer it is needed. Particularly, as a developing country, India needs to make use of this world-wide spoken language in order to prove its international power.

This can merely be based on the efficiency of tertiary education. Consequently, English should be the medium of instruction at universities in India for the following three reasons:

1. Finding a high-quality job,
2. Communicating with the international world, and
3. Accessing scientific sources in the student's major field.

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CLOUD COMPUTING OPPORTUNITIES, RISKS AND CHALLENGES WITH REGARD TO INFORMATION SECURITY

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Abstract- Small and Medium scale Enterprises (SMEs) are key economic growth drivers in the African sub region. Over the years, the information technology (IT) needs of these SMEs have resulted in increased requirements for enterprise IT solutions that are more efficient and have high availability and scalable over time. Cloud computing presents such solutions that can be of immense benefits to SMEs. Three cloud service providers and fifty SMEs were used for data collection. The outcome of the research indicates that SMEs adopting cloud computing services will see improved service delivery and increased efficiency and productivity. The main concern of users in the cloud environment is data security and privacy. Security and privacy within and outside the cloud is shared responsibility of service providers and users. These concerns could be mitigated by ensuring that effective security controls are put in place by both parties. This research allows for informed decision to be made about the security risks and benefits of using cloud computing.

Keywords: Cloud Computing, SMEs, Security Benefit.

1. INTRODUCTION

In today's highly competitive business environments, businesses are finding ways and means to operate efficiently so as to cut cost and maximize profit. A new paradigm of computing, cloud computing has emerged to change the old ways of computing. Cloud computing has emerged as one of the enabling technologies that allows the Information Technology world to use computer resource effectively and more efficiently. One of the most frequently cited reasons offered by businesses for adapting a Cloud application is that, cloud services are accessed and paid for as and when you need it. This is also achieved without the need for any major investment in IT infrastructure and skills.

Small and medium scale enterprises which do not have the financial power to invest in ICT infrastructure can take advantage of the numerous services that cloud computing offers. Cloud computing provide business opportunities for up and coming and established entrepreneurs who can invest in acquiring servers as well as data storage computers to provide cloud services. On the other hand, businesses can take advantage of the numerous services that cloud computing offers to gain the competitive edge. Governments and non-governmental organizations are betting that cloud-based technology can help transform their economies and societies, which will translate into improvements in education, public health, and the environment.

2. PROPOSED WORK

The main objectives of this thesis are to highlight the concept of cloud computing and the associated opportunities, security risk and challenges for small and medium scale industries.

These include;

- To identify the security benefits and challenges of moving corporate data into the cloud in the developing world.
- To identify opportunities that exist in the market.
- To give recommendations on best practices of moving into the cloud.

The chief concern in cloud environments is to provide security around multi-tenancy and isolation, giving customers more comfort besides "trust us" idea of clouds. There has been survey works reported that classifies security threats in cloud based on the nature of the service delivery models of a cloud computing system. With public disclosure laws in place, breaches of private information of

clients can cause damage to the firms' reputation and lead to governmental sanctions

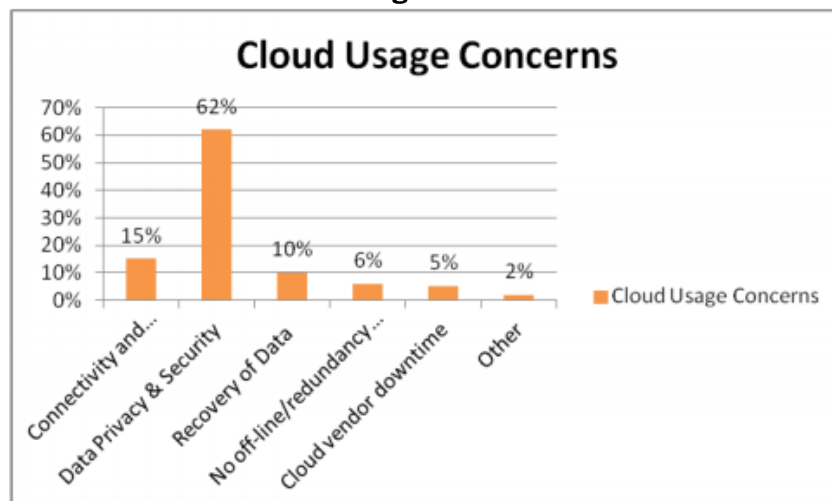
By subscribing to the cloud, consumers will be giving up some control to an external source. Cloud consumers are both excited and at the same time nervous at the prospects of security challenges Cloud computing brings. They are excited by the opportunities to reduce capital costs the chance to divest themselves of infrastructure management, and focus on core competencies. Again the agility offered by the on-demand provisioning of computing and the ability to align information technology with business strategies and needs more readily makes it more attractive to cloud consumers. However, users are also very concerned about the risks of Cloud Computing 27 |

Page in terms of security and the loss of direct control over systems for which they are nonetheless accountable. (Cloud Security Alliance 2009) For many organizations, hybrid cloud architecture has been way to take advantage of the benefits of public cloud computing resources without compromising on security or operational control and yet the challenges and concerns over how to integrate with cloud environments and maintain control over security and performance continue to inhibit broader adoption. For this reason, issues around migrating application systems to the cloud and satisfying the needs of key stakeholders should be explored.

Data security in the cloud is a shared responsibility for both users and service providers. The fundamental issue is the loss of hands-on control of system, application, and data security. Researches have shown that one of the greatest concerns of enterprises about moving into the cloud is security. As more enterprises adapt cloud computing, huge amount of data is committed into the cloud and cloud environment over years have become fertile grounds for malicious attackers to exploit.

- Secure data transfer.
- Secure software interfaces.
- Secure stored data.
- User access contro

Figures 1



3. CONCLUSIONS

Cloud computing offers numerous advantages that Small and Medium scale enterprises can benefit from. These benefits are achieved through cloud's economies of scale and flexibility. The prevailing situation in terms resource availability and IT needs of SMEs makes cloud computing the obvious choice for SMEs. The key conclusions of this research is that, SMEs adopting cloud computing services will see improved service delivery and increased efficiency and productivity. This will eventually translate into good returns on investments. However, there is the need for

massive awareness to be created by service providers to enable SMEs take advantage of the benefits that cloud computing offers. The flexibility offered by cloud computing has its own associated risks and challenges.

This study has explored the benefits of cloud computing and the various security challenges associated with it. The main concern of users in the cloud environment is data security and privacy. The huge amount of data and resources available in the cloud makes it a more fertile ground for attackers exploit. However, cloud-based defenses can be more robust, scalable and cost-effective for SMEs. The onuses lie on both cloud service providers and users to ensure effective security within and outside the cloud. This paper allows for cloud users to make informed decision before moving organization's data into the cloud by know the risks involved and taking the necessary precautions.

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BOOK REVIEW ON SELECTION DAY BY ARAVIND ADIGA

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Abstract - Selection day is a fiction based novel written by the Booker Prize winner "Aravind Adiga". Sports are one of the most popular genres where a lot of youngsters attempt to create their career. Cricket is one of them. And in India cricket has a whole new level from the very beginning of this game. Hence, it has a massive impact on the people of India. Selection Day is a novel where cricket is emphasised and the struggle is portrayed by the lead character of the story until his selection. Throughout the journey, life gives him different tastes to depict reality. This article focuses on the storyline of selection day and further, covers the review of the books by different critics. The outcomes show that the novel is dark sided yet a very powerful story signifying hard work, determination, self-respect etc. in the story.

Aravind Adiga was born in south of India in Chennai in 1974. He spent his childhood days in Mangalore. For higher studies he went to Columbia University in New York and Magdalen College at Oxford. His works as a writer appeared in publications of New Yorker, the Sunday Times, the Financial Times, and the Times of India. He wrote his first novel The White Tiger in 2008 and won the Man Booker Prize for fiction. Then after, he published Last Man in Tower in 2011. His latest work is reflected in the Selection Day which he wrote in 2016.

Aravind Adiga's novels fall fundamentally into two classifications, social and personal. He has concentrated on the sufferings, wretchedness and discouragement of the dejected because of the misuse of the oppressed residents of the Indian Society. Strict negative faith, medieval framework, the spot of ladies in the general public, destitution, craving and misuse are a portion of his normal subjects. In the entirety of his novels Aravind Adiga sends a social message to the individuals of India relating to present day Indian Society and how the destitute individuals make due in thrashing neediness.

The novel "Selection Day" starts with a concise preamble where a little youngster depicts the numerous preferences he experiences throughout his life, including his more established sibling's perspiration, which is the perspiration of dread, telling the storyteller that his sibling has been at cricket training with his dad. The story at that point hops to three years before selection day, when new players will be picked for proficient cricket crews. Manjunath Kumar, known as Manju, lives with his more seasoned sibling Radha and their dad Mohan, in a solitary room in Mumbai. Mohan is fixated on cricket and has been preparing the two his children in the game since they were exceptionally youthful. They are extremely poor, and their mom left the family soon after they moved to the city from a little town.

Mohan accepts achievement in cricket for his children is the family's way out of destitution. He prepares the young men in capricious and unusual manners he has created himself. Mohan favors Radha, asking that he turns into the best cricket hitter ever, and that Manju turns into the second-best. The young men exceed expectations, and can go to the Ali Weinberg International School so they can play on the school's cricket crew. There they draw in the consideration of a headhunter for the Mumbai Cricket Association, Tommy-sir. Tommy-sir acquaints the Kumars with a well off man named Anand Mehta. Mehta accepts the young men will turn out to be enormous stars in the game, and offers to help the family monetarily in return for a sovereignty on their future profit in the event that they become proficient cricketers.

The sponsorship bargain changes the lives of the Kumars. For a year they proceed to practice and set aside the cash that Mehta pays them, and afterward they can bear to move from their dim one-room loft to a house in suburbia. Another kid joins the school group, Javed Ansari. Javed is comparable to the Kumar young men,

in spite of the fact that Radha remains the recognized best at the school. Radha brings a young lady home. When Mohan gets back home and discovers only them in the house together, he is angered and assaults the young men. They siblings safeguard themselves, and their dad ends up in the clinic with a messed up leg. Manju covertly wishes to seek after non-cricket interests, uncovering to Javed that he needs to be a researcher and not an expert competitor. Javed uncovers he is additionally uninvolved in cricket, and urges Manju to seek after his own fantasies and not those of his dad. Manju, be that as it may, is skilled physically and fears his determined dad, thus keeps on improving in cricket, and in the long run becomes viewed as a superior player than his sibling. Manju is offered a grant to the school. Radha starts to straightforwardly despise his sibling.

Selection day shows up, when players can go for the expert groups and possibly dispatch their expert vocations. Both Manju and Radha give it a shot; Manju, notwithstanding not being keen on cricket, performs well and is chosen, yet Radha, who needs nothing else throughout everyday life, can't set aside his anger and hatred and does inadequately. Radha attacks another player in his displeasure, and escapes the city to get away from the police. Radha makes a beeline for the family's old town.

Manju, upset, goes to Javed's condo and swears he will never play cricket again. Javed solaces Manju, and the young men become friendly. Similarly as they appear to be going to kiss, nonetheless, Manju has a fit of anxiety and flees. He comes all the way back and advises his dad he will keep on playing. Manju is chosen to play for the Under-19 class and plays splendidly for a long time. He is then chosen by the Mumbai proficient group and plays for a few additional years. Radha comes back from the town, yet sits idle, upheld by cash that Manju gives him and living in sharpness. The siblings have nothing to do with their dad. Manju's heart is never in cricket, and his playing is dull; he is in the end moved to a curiosity alliance and afterward terminated when he is only 27 years of age. The Cricket Association enlists him as a headhunter/scout, in any case. Tommy-sir has died, and Javed brings home the bacon as a grifter in the wake of endeavoring to turn into an on-screen character. The entirety of the characters appear to think about how being compelled to seek after things they didn't need and surrendering to their outrage has left them in unremarkableness.

Keshav Guha one of the most popular critics has reviewed the work of Aravind Adiga in Selection Day. Keshav has highlighted the role of each character in the story and compared it to the social as well as political aspect of any human being. He also referred the story as completely narrative which accordingly can be seen by his review on this novel as he mentions about Manju and Prithvi in form of narration regarding their excellent batting in cricket. Keshav throws some light on the hard work of the lead character in the story and at the same time highlights the darker side when Radha loses his chance for selection in the cricket team by the coach. It can be said that Keshav focused mainly on the characters of the story. His review covers positive aspect of the story where long struggle and hardwork leads to achievement of goals. Hence, reviews from Keshav promote mankind depicting their strong and fruitful relations among the living society.

M. Sneha emphasized more on marginalization in the story of Selection Day. She focussed more on the origin of the lead characters of the story i.e. Mumbai. Sneha's views on the novel comprises of challenges faced by any individual in achieving their goals. Her critical reviews depict that she is more concerned regarding the availability of resources and exposure of any sport in slum areas. Most of the people belonging to such areas are not able to recognition for their skills and ability to be a perfect player. Sneha also focussed on the behaviour and attitude of a person. Her view on Radha shows that nervousness, anger, etc, can ruin anyone's dream if not controlled properly. Sneha completely understands the gravity of cricket in India and how popular this game is, which attracts a lot of youngsters to choose it as a career. Hence, she relates the possibility of becoming a cricketer, if the person has

sufficient funds to spend. This reveals the dark truth that skill and hard work has not much importance until you have a strong financial background.

Samra Saeed criticizes the novel as „narrative“ in nature. According to Saeed, the complete storyline is in form of “ordered episodes”. However, Saeed primarily mentions about the darker aspect of the novel. The story has both positive as well as negative aspects, though the point of focus done by Saeed is on the negative side. As mentioned by Saeed in her reviews on Selection Day, that Manjunath, the lead character of the story has developed negative attitude towards life. The character is always suspicious about every everyone and has no social contact with anyone. Hence, it can be said that, Saeed highlighted the aftereffects of story. The adult Manjunath is left alone isolated from the world and has all kinds of negative thoughts in mind which can be clearly observed from the reviews of Samra Saeed.

Selection Day might be considered as a time lapse novel where the scenario of Indian cricket is depicted in late 1980s. Reviews from **Monika Agrawal** shows that, there is a vast difference in the cricket society in the present time compared to that of 1980s. The resemblance of reality by means of fiction is very defined by Adiga in his work; critic review from Monika. This shows that, Monika is focussed on the bitter truth in the Indian society where a sport like cricket is used as a means of business rather than sports. Her reviews reflect pessimistic side of the novel where cricket is ruined by corrupt officials and higher authorities. Hence, it can be said from the reviews of Monika that, cricket is a popular game in India. A lot of young people get chance to play for their nation. Yet, the negative side of this sport still remains unrevealed.

Annalisa Quinn put her views on the on the structure of novel. She reviews mainly on the sequence of sentences used in the novel and refers it to as „laserlike“ sentences. Quinn focussed basically on the literature of the novel. Besides, the story line and the characters portrayed, she reviewed the formation of sentences, meaning of words and selection of words done in the novel. According to Quinn, Adiga has very excellent taste in making sentences, as a lot of meaning and reality is reflected in very minimal and selective words. One of the other aspects reflected by Quinn is the strong and bold image depicted by Javed in the story. Quinn keenly analyses when Javed advices as “not to be slave” to Manju. Quinn shows the brighter side where a person should maintain his self respect no matter how adverse is the situation.

Adiga's recommendation to the country with respect to protection of the intensity of the young is profoundly honorable. He verbalizes through his portrayal, infiltrating and perceiving examinations of what inconveniences Indian governmental issues, society and the economy and encourages what should be done and set it straight. The characters of Aravind Adiga an excess of genuine, his characters and circumstances are additionally genuine than otherworldly. His portrayal in the Selection day is quite appreciable. He depicts the dark side of a system and struggling nature of the characters in the novel. He also focussed on the positivity by showing the persistence and perseverance of the main character until he achieves his dreams. The critics and reviewers have given mixed thought on this novel. Selection day is a novel based on fiction which shows the reality of the everyday life.

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THE DISCOVERY OF INDIA

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About the Author:

The Discovery of India is, in fact, the invention of Nehru's rich and graceful personality. It gives us glimpses into the manifold aspects of this great man symbolised for several years the youth of our rejuvenated race awakened after long slumber. What was the essential self of Pandit Nehru? He was an official accidentally as he himself confessed, a thinker and a humanist by instinct, a patriot who fought without rest or respite for freedom till it had been realised.

He wasn't an erudite scholar, yet his versatile genius had much to show professional historians, sociologists and economists. He had no literary ambitions, yet he displays altogether his writings rare literary merits and flavour. It's this many-sided and rich personality of Pandit Nehru, one among India's greatest men that we discover within the Discovery of India.

About the Book:

The Discovery of India considered as an entire may be a curious jumble of historical facts, philosophical speculations and reflective essays on divergent themes couched in pleasant prose often rising to poetic heights. It's a thesis on Indian culture and history by the catholic and cosmopolitan mind of Nehru. He approaches India sort of a "friendly foreigner", appreciates her wisdom, condemns her follies and studies her past to form it a spring-board of action, to push and direct the present of history in creative future channels. But it's impossible to count it entirely as a book of history or culture, for what interests us more within the Discovery is its intimate autobiographical tone, its lucid style and literary graces, above all, its expression of the ideas and opinions, tastes and temperament, refined sentiments and noble passions of our beloved leader and therefore the chief disciple of Gandhi.

Book Review:

Considered as a book of history the invention has many merits, but also a couple of failings. It is often understood and appreciated as an introduction to the cultural history of India, as a study of the varied phases within the gradual development of the national mind from the first dawn of civilization to the feverish, twentieth century when British India stood at the edge of liberty and lightweight. It's only a general introduction meant for the overall reader. Nehru isn't a tutorial historian, and his aim isn't to narrate the facts of history with meticulous care. He's rather a philosopher of history, and his aim is to form constructive suggestions on the idea of historical knowledge. To a philosopher of history the longer term counts; the past only provides light and knowledge for the skilful shaping of the longer term events. But his knowledge of the past must be sound, and his attitude thereto dispassionate; he may omit minute details, but he shouldn't misunderstand the most facts of history, for otherwise all his futurist conclusions could also be falsified. Nehru is well-qualified for such a task—the task of the narration and interpretation of history. His reading is vast and versatile; his approach is sane, sympathetic and objective; his account of the national events is sincere and faithful; his judgment is sound, and his suggestions are progressive. Only here and there we feel that he's driven by certain innate prejudices and dominated by pragmatic considerations. For instance, he paints British India because the darkest period of Indian history. Here the prejudices of a patriot fighting British Empire mar the judgment and objectivity of a historian. British were a democratic people, and despite our exploitation by them, they need done us much good. Is it not significant that India was awakened into modernity and largely free of the self-forged shackles of slavery and

superstitions within the British times only? Within the Moslem period to stay the lamp of culture ever burning, the pandits of the Northern India had to migrate to the South. Yet they might not save from the sweeping destruction all that need to be saved. Under the Afghans fearless thought and expression became impossible for such an extended period that the shortage of inquisitiveness which Nehru such a lot deploras became a permanent nature of Indian people, and therefore the cultural life came to a standstill. The stupor broke under British, India recovered her lost confidence and stimulated to new activities altogether directions. Cultural renaissance and movement for freedom started. Yet Nehru is a smaller amount sympathetic to British than to the Afghan rulers of India. Why? Subtle dislike for British is patent within the chapters delineating and discussing British India. Such prejudice, however slight, is undesirable during a historian or a philosopher of history.

Nehru says that Afghans after being settled in India were Indianised. The very fact is that they never were. They didn't, of course, just like the British drag away India's wealth into a far off country. But they lived during a conquered country just like the robbers who also ruled. Ruling over India from Delhi doesn't Indianise them. They considered themselves the Moslem masters of Hindu population. They identified themselves with the wandering tribes of Arabia, and hated the culture of India. The Afghan period within the history of India is that the darkest period, the amount of chaos where might passed as right, where brutal bloodshed of kafirs who refused to be converted was the sole ideal.

What does jajia tax signify? Hindus for being what they were had to pay taxes and pay heavily. Afghans physically lived in India, but their spiritual home was abroad. Their descendents continued to cherish an equivalent mentality till India was divided and Pakistan came into existence. The roots of Pakistan were deep within the minds of Indian Moslems, and after the division of India nobody will accept as true with Nehru in maintaining that Afghans, their descendents, their convert followers were ever Indianised. Nehru reaches the extremity of naivete and wishful vision when he describes lusty Allauddin Khilji's forced marriage with the kidnapped queen of Karna Dev Vaghela of Gujarat, and his son's similar marriage together with her daughter, as a symbol of synthesis between Afghans and Indians.

Can Nehru really be so naive? I don't think so.

Here may be a plain distortion of facts and blatantly wrong interpretation of history. It had been perhaps because he was over-anxious to prove that each one foreign invaders including Afghans succumbed to the fascination of Indian civilization and her absorbing power, even once they didn't, perhaps because the Hindu-Moslem problem at the time the invention was written had become very acute. The pragmatic politician in Nehru perhaps feared that his frank and fearless treatment of Moslem period in India might aggravate the strain which already existed, for he knew that the Moslems identified themselves with their invader ancestors like Ghoris and Khiljies, and their criticism by him may embitter them against him. The pragmatic consideration has dominated Nehru here. But what could also be pragmatically right can't be justified in an honest historian.

But such instances are rare where a historian's objectivity in Nehru suffers. He has never had scholastic claims on history. Besides, we don't read the invention for the historical information it contains. We read it precisely for the savour which his pleasant personal touches increase it. His mystic love for India often gushes forth disturbing his detachment which nonetheless he manages to stay up. His humane patriotism while defensive of India isn't offensive to others. Objective sympathy is elevated into positive favour for India against the attacks on her. But generally it doesn't seriously injure or distort the facts of history, for with him sentiments are always guided and restrained by reason. Often he condemns in harsh words the follies and pitfalls of India. But one who loves has also the proper to be harsh and important. Nehru has achieved mystic identification with India, and thru him it seems because it were she is becoming self-conscious, introspective and important of herself. All this makes the invention far more than mere cultural

history. Whether it's really a discovery of India or not it's for the specialised scholars of history and culture to make a decision. To us, to a general reader, it's really the invention of Nehru's large, comprehensive and catholic self—the self that has read widely, thought deeply and lost itself through love within the lives of the oppressed many India. Its power and appeal which are literary in character, and it evokes emotional response from us. Therefore it need to be considered as a book of literature also, and judged accordingly from its criteria. Prof. C. D. Narasimhaiah rightly observes:

“The Discovery isn't merely a chronicle of historical events or a treatise of Indian culture, it's a bit of literature conceived and executed by one who is perhaps India's greatest writer of English prose.” (Foreword, India Rediscovered, Oxford University Press)

Nehru never presumed that he was writing literature. His purpose within the Discovery was to get India for himself, and he tries to realize it with all his power and penetration. But while at the work of writing, the unconscious artist in him possesses all his other faculties so completely that he instinctively displays literary excellences. The invention can't be classed into one particular branch of literature. It's a formless piece written with no literary intentions. The scholars of literature study it even as they study Ruskin's *Unto the Last* or Gibbon's *Decline and Fall of Roman Empire* or Russell's or Radhakrishnan's philosophical works, all of which have literary appeal but aren't composed with literary intentions.

The Discovery has the weather of autobiography in it, within the autobiography which was written some ten or twelve years earlier, we see how a toddler of Motilal grows into a distinguished personality whose whole being expands, embraces and becomes one with India, whose voice becomes the articulate utterance of her vaguely felt dreams and aspirations. Only the primary half the autobiography deals with the facts and events of his personal life. The last half turns into the chronicle of the days and deals with the national events and freedom struggle. It's because his individual existence merges into the collective existence of his poverty-struck fellow-creatures reeling under the foreign yoke. He had nothing to mention about his own life. He had much to mention about the lifetime of India.

In The Discovery we discover the further developing and deepening of an equivalent self of Nehru. Here he travels into the past to reach the roots of his existence, his India, and writes what he finds from the twilight past stretched up to the entire dark of antiquity. It's during a way an extension and continuation of his autobiography. Only it's a more mature and more comprehensive work than the sooner one.

First chapter:

The first three chapters of the book are an outright autobiography. Nehru is imprisoned within the Ahmadnagar Fort while the country is struck with famine and therefore the world is torn in war. In leisurely mood he rambles into the past of India and her present, reflects on life's philosophy and therefore the way forward for democracy, and begins writing.

Second chapter:

Within the second chapter he narrates the events of his life after his term of imprisonment at Almora in 1935, the illness and death of his wife, his journey to Switzerland and back from there.

Third chapter:

“The Quest” the third chapter is that the real beginning of the invention of India. Still, even here he's busy clearing his approach of India, her appeal to him, and lapsing another time into the stray reflections on nationalism and internationalism, his journeys and general elections. The primary three chapters thus have distinctly autobiographical content and flavour.

Even afterwards Nehru continues to be the centre and therefore the style autobiographical. The sole unity which the book has is that the unity imparted by his personality pervading all throughout. We see his vision and learn his views. There's never a straightway developing and to the purpose method in Nehru's writings. He frequently digresses and forgets the most thread. He narrates the past, but leaps back to present drawn by a remotely relevant thought current. He considers India, but in slow and pleasant digression would retreat into himself and continue thinking aloud as if lecture himself. He freely rambles now in past, now in present and dreams of the longer term. He not bothered by the sense of a unified mode of writing and thus doesn't care to avoid the irrelevant. He's aware that he himself is more interesting to his readers than the merits of his writing. Consequently every felt thought and emotion of Nehru finds expression in thousand threads loosely kept together. We feel that Nehru is talking bent us in confidence all that he knows and every one that he feels. Except within the first three chapters the invention doesn't relate the events of Nehru's life. Yet it's autobiographical for it reveals his inner existence and clears many facets of his personality.

Nehru displays within the Discovery the qualities of a master essayist, because it doesn't have wholeness and harmony of one literary piece, a number of the portions are intended to be and may easily be treated as separate, disconnected essays. If they're omitted from the book, it'll not suffer. No context is required to read them separately and luxuriate in.

Some of the essays are reflective and thought-provoking. The past in its reference to this is one such. Nehru ponders here over past and present and realises their relationship. There are aphoristic sentences here which stick fast to the mind, and which are the results of the ripened wisdom of a contemplative mind.

"The past becomes something that leads up to this, the instant of action, the longer term something that flows from it; and everyone three are inextricably intertwined and interrelated." (The Discovery of India, Signet Press, p. 7.)

The essay Religion, Philosophy and Science is more profound and philosophical. Nehru isn't a professor of philosophy like Dr Radhakrishnan. Yet his insight in philosophy is rare and memorable. Consider for instance the subsequent passage within the above quoted essay:

"Truth as ultimate reality, if such there's, must be eternal, imperishable and unchanging. But that infinite, eternal, unchanging truth can't be apprehended in its fullness by the finite mind of man which may only grasp, at most, some small aspect of it limited by time and space, and by the state of development of that mind and therefore the prevailing ideology of the amount.

Because the mind develops and enlarges its scope, as ideologies change and new symbols are wont to express that truth, new aspects of it come to light though the core of it's going to yet be an equivalent. And so, truth has ever to be sought and renewed, reshaped and developed, so that, as understood by man, it'd confine line with the expansion of his thought and therefore the development of human life. Only then does it become a living truth for humanity, supplying the essential need that it craves, and offering guidance within the present and for the longer term."

And here he apprises science:

"Science ignored the last word purposes and checked out fact alone. It made the planet jump forward with a leap, built up a glittering civilization, opened innumerable avenues for the expansion of data, and added to the facility of man to such an extent that for the primary time it had been possible to conceive that man could conquer and shape his physical environment. Yet.....there was some essential lack and a few vital element was missing. There was no knowledge of ultimate purposes and not even an understanding of the immediate purpose, for science had told us nothing about any purpose in life."

How simply and delightfully he's writing! Such essays have depth, but no jarring jargon. The essays The Upanishads, The Bhagavadgita, The Epics, History, Tradition and Myth, Six Systems of Philosophy, etc., have similar taste and elegance.

There are essays on social and economic themes too. He had thoroughly understood the defective social found out of India and her deplorably backward economy. He had also discovered the causes of such defects, and was anxious to vary society and advance its economy. The idea and Practice of Caste may be a sociological essay, well-informed and well-studied. Here he considers the origin and development of class structure in India from mere vocational divisions into rigid walls dividing man from man, joint family with all its advantages and drawbacks. The Destruction of India's Industry and therefore the Decay of Her Agriculture, The Economic Backwardness of India, India becomes for the primary Time a Political and Economic Appendage to a different Country, etc., are the essays on Economics. They're as technical as they're interesting, and that they display Nehru's sound study and understanding of Indian economy.

Then there are vivid and pleasant pen-portraits within the Discovery. He recalls from the misty past India's great heroes and saints and re-creates them before our mind's eyes. See for instance the subsequent portrait of Buddha colored with Nehru's personal emotions:

"Seated on the lotus flower, calm and impassive, above passion and desire, beyond the storm and strife of this world, thus far away he seems, out of reach, unattainable. Once more we glance and behind those still, unmoving features there's a passion and an emotion, strange and more powerful than the passions and emotions we've known. His eyes are closed, but some power of the spirit looks out of them and an important energy feels the frame. The ages roll by and Buddha seems not thus far away after all; his voice whispers in our ears and tells us to not run far away from the struggle but, calm-eyed, to face it, and to ascertain in life ever greater opportunities for growth and advancement."

Here is that the portrait of Vivekananda, the leonine Sanyasin of the resurgent India:

"He was a fine figure of a person, imposing, filled with poise and dignity, sure of himself and his mission, and at an equivalent time filled with a dynamic and fiery energy and a passion to push India forward. He came as a tonic to the depressed and demoralised Hindu mind and gave it self reliance and a few roots within the past."

There are similar portraits of Chanakya and Chandra Gupta, Asoka and Akbar, Ramkrishna Paramahansa and Rabindranath Tagore and lots of others.

Nehru had the guts of a poet although he was eminently a person of action and a politician. His essay like prose narration achieves lyrical heights whenever soft and subtle emotional states are aroused in his mind and expressed with unaffected spontaneity.

The portrait of Buddha just quoted is nice and poetic. Within the following passage Nehru's robust optimism and love of life finds unforced expression; the stream of life despite its evils seem beautiful to him:

"The stream of life goes on in spite of famine and war, filled with its inherent contradictions, and finding sustenance even in those contradictions and therefore the disasters that follow in their train. Nature renews itself and covers yesterday's battlefield with flowers and green grass, and therefore the blood that was shed feeds the soil and provides strength and colour to new life. citizenry with their unique quality of possessing memory survive in their storied and remembered pasts and rarely catch up to this in 'The worlde that neweth every daie.' which present slips into the past before we are hardly conscious of it.....Winged victory ends during a welter of blood and dirt, and out of the heavy trials of seeming defeat the spirit emerges with new strength and wider vision. The weak in spirit yield and are

eliminated, but others carry the torch forward and hand it to the quality bearers of tomorrow.”

The same passage cast into suitable verse would be a soft and good lyric. But if metre is not any necessity of lyric, this certainly is one. There are innumerable such passages within the Discovery where sentiments mingle with ideas and essays become poetry. Death in famine for instance is described as “a slow creeping thing of horror with nothing to redeem it, life, merging and fading into death, with death searching of the shrunken eyes and withered frame while life still lingered for a short time.” (ibid, P. 2) The moon is “a reminder of the loveliness of this world, of the waxing and waning of life, of sunshine following darkness, of death and resurrection following one another in interminable succession.”

In The Discovery facts, thoughts and feelings co-exist and make a kind of artistic harmony. Honeyed muse makes whatever Nehru writes pleasant and interesting. He writes English with exceptional mastery, grace and ease. Although he's a devotee of words, his style doesn't suffer from verbosity. It's always limpid, lucid and unaffected. Words are at his command, and he employs them to present his sincere thought and knowledge within the clearest language. He never aims at artificial glow or forced great thing about words, and is as simple and unassuming in writing as he was in life. The famous dictum “style is that the man” is true a minimum of within the case of Nehru. Let me sum up now within the same note with which I started: the design alongside the content makes the invention of India actually the invention of Nehru's rich and graceful personality.

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CONCEPTUAL STUDY ON OBJECT RECOGNITION USING LOCAL BINARY PATTERN

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Abstract- It need been a few a considerable length of time foundation subtraction strategies were set under use to dream picture requisitions to movement identification. However, the vast majority of the routines miss the mark of giving fine comes about because of progressive backgrounds, brightening variation, noise, and so forth throughout this way, observing and stock arrangement of all instrumentation may be enha. Uniqueness of the proposition is development of unfaltering foundation starting with a feature continuation. In the editorial, proposition will be will create an enduring foundation representational starting with An certain feature spin-off. The foundation is updated with respect to landing about every outline. To identifying moving objects, those constructed foundation need been compared with different frames of the feature continuation. For this, that foundation model may be created utilizing blending of neighborhood double example (LBP) Furthermore Gaussian averaging. Gaussian averaging utilizes distinctive structures that happen for time with limits the underlying lushness of the foundation. Likewise, spatial locale from claiming hold will be utilized by LBP. Those anticipated proposition relies for patio-temporal structures happening with period on manufacture suitability model foundation. Viability of the anticipated proposition will be secured toward contrasting those results with a portion of the existing cutting edge foundation subtraction techniques with respect to open standard records.

Keywords: Gaussian model · nearby double example · object identification.

1. INTRODUCTION

Element identification for object starting with feature sequels [1] is An real challenge On image transforming workstation dream. Exact distinguishment for movement On Questions will be crucial for a few provisions of counterfeit consciousness Furthermore image transforming. Dynamic object identification is, no doubt utilized extensively in the territories such as robotics, action distinguishment [2], feature reconnaissance [3], walk face-based mankind's distinguishment [4], and so forth throughout this way; observing and stock arrangement of all instrumentation may be enha. Diverse item identification routines for the most part utilized need aid foundation subtraction, span differencing, and optical stream. Out from claiming these, foundation subtraction need been those the greater part acknowledged Furthermore well known technique to identifying a object.

Foundation subtraction constitutes from claiming two essential steps- background demonstrating and subtraction [5]. Span differencing strategy for item identification employments a reference foundation picture for comparing frames. Places, the place transforms are seen are recognized concerning illustration progressive article on account of outline differencing. In the foundation subtraction (BGS) model recommended Eventually Heikkila Olli [6], both the ideas about outline differencing Furthermore foundation overhauling required been utilized. Previously, this, foundation is updated as stated by present span. In any case this foundation model may be unbending against non-static background, noise, and brightening variety.

In view of this concern, Wren et al. [7] recommended a adaptable BGS technique by method for running Gaussian Normal. In this scientists need spoken to foundation autonomously during each pixel position by correcting a Gaussian (probability dissemination function) over an arrangement for first frames. Toward method for force examination from claiming each pixel positions in the stamped span and the ensuing Components from claiming Gaussian, the positions of the dynamic Questions clinched alongside a span need aid accomplished. Something like that as to model a foundation correctly, a multi-esteemed foundation plan will

be required. Stauffer Grimson [8, 9] anticipated a plan the place numerous Gaussian need aid used to model pixels during a particular position about a picture span.

This system provides for moved forward brings about non-static experiences may be found adaptable Furthermore hearty. From claiming late, this model might have been changed incorporating element textures to identifying progressive Questions starting with non-static experiences [10]. From these, it cam wood a chance to be finished up that those routines specified previously don't think about spatio-contextual data to identifying transforms Furthermore would pixel built. Such a spatio-contextual BGS plan that utilization non-altering textural property, LBP histogram need been scrutinized done [11]. Starting with these analyses, it will be self-evident that Different strategies to item identification applying foundation subtraction required been recommended eventually a few examiners in the range about image transforming.

Likewise on account of everything, these calculations need their favorable circumstances and drawbacks. It might make brought with An Decision that, to great foundation subtraction techno babble to a chance to be designed, it obliges development upgrading of a unfaltering foundation which might embody those foundation of a feature. It must also recognize the impact for clamor Also dynamic foundation. In this worth of effort that is proposed, exertions need been taken to blend the profits of Gaussian model built foundation development and the perfect for nearby double design to non-static item identification from a feature spin-off. In this way the model cam wood be termed Likewise a patio-temporal model.

Here, the proposition will be a pioneer BGS strategy with identifies non-static Questions starting with static also progressive experiences. Uniqueness of the model will be over creating an enduring spatio-temporal foundation plan from An certain feature continuation which proficiently illustrates those features from claiming foundation in the sight. It may be Additionally recognized that those anticipated model offers finer results against little varieties in light, noise, Furthermore progressive foundation. The viability of the plan suggested need been secured by analyzing for the BGS models utilizing threshold, and two distinctive gaussian mixture models.

The perception may be that this proposition offers superior Conclusion in examination for different existing techniques viewed as. Likewise Questions for A feature are generally moving objects, this sort of variability transforms are pretty obvious. At a item shifts from person span on an additional for those observable pathway of a camera, picture of an substance might progress fundamentally. Recorded The following would those trademark tests of foundation subtraction are element Background, Occlusion, Clutter, Camouflage, vicinity of Shadow, movement of the Polaroid feature clamor.

2. PROPOSED ALGORITHM

Here the proposal is a contemporary Background subtraction model that is capable of detecting dynamic objects in a video sequel by proficiently lessening the consequences of illumination difference, camera jitter, and moving backgrounds within the sequel. Here, in this projected model, the background is created by scrutinizing series of linearly dependent precedent image frames by means of Gaussian Mixture Model and Local binary pattern.

2.1 Local Binary Pattern

For composition matching clinched alongside machine vision, a standout amongst those fundamental quality descriptor will be neighborhood double design (LBP). It may be an intense method for composition portrayal. LBP driver tags pixels of a scene Eventually thresholding those zone (neighbors) from claiming each pixel alongside the white collar esteem Eventually arraying the Conclusion with double codes [12, 13]. Nearby double example need couple striking properties similar to gray scale invariance, non-parametric computational simplicity, brightening invariant and helter skelter discriminative.

Those fundamental person need eight pixels as neighbors, which would effectively far reach with hold numerous a greater neighborhood with any number for pixels. For LBP, a center pixel is taken Furthermore its m neighbors need aid acknowledged. Afterward the distinction between working pixel Furthermore its m neighbor pixels are registered to get those M-bit double number. In that neighborhood quality may be short of what vital pixel, the quality is 0 and generally 1. From this emerged 2M discrete decimal values for double design. The transform is Likewise illustrated in the figure underneath. The worth of the white collar pixel will be 7. Here we compares starting with those upper pixel Also administers An clockwise course will blanket every one its neighbors.

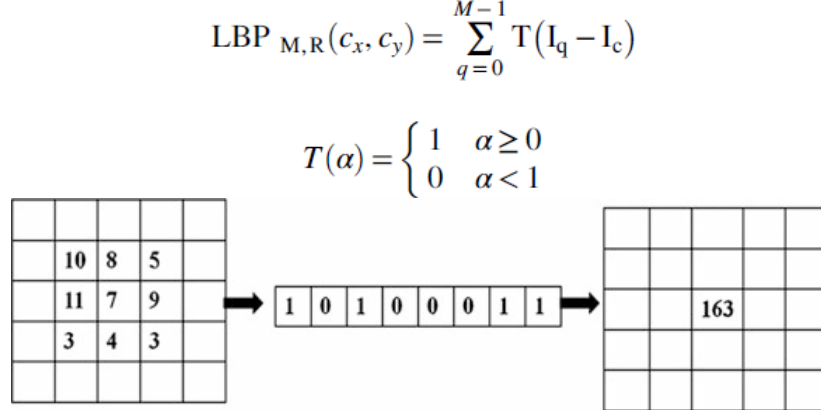


Fig. 1 Local binary pattern

Here I_c is the central pixel value with co-ordinate (c_x, c_y) and I_q is the neighboring value of the pixels in a circle of radius 1 unit (Fig. 1).

2.2 Background Construction

The elementary step to whatever frontal area division technique is foundation development. The consistent quality of the foundation model constructed chooses correctness of object identification. The accurateness for division gets defiled on the foundation constructed may be corrupted by clamor. Indeed that dynamic foundation lessens the personal satisfaction of fragmented closer view. Hence, it will be precise vital on place dependent upon a energetic foundation development plan to exact moving item identification. In the anticipated proposal, those model foundation is constructed toward taking under account those arrangement for picture frames that need aid formerly accessible.

That way idea of the recommended fill in is the subordinate pixels from claiming comparable composition in the foundation during a sure position of the picture that takes after Gaussian appropriation toward transient span. This plan is constructed utilizing force qualities for these dependant pixels. The reliance of pixels is checked utilizing LBP histogram. To this reason, in the anticipated proposition we have used LBP histogram will check if the pixel in a specific position of the foundation model framed is dependent on the pixel in the proportional position in the succeeding picture frames. At first we situated the principal outline concerning illustration foundation.

$$\mu(\gamma, \delta) = I_1(\gamma, \delta)$$

Here $\mu(\gamma, \delta)$ is the background model and $I_1(\gamma, \delta)$ is the first frame. We test the similarity between the pixels at location (γ, δ) using the following steps.

- **Step 1:** Construct the LBP histogram for each pixel using binary masks for background image and target image. LBP histogram for each pixel is computed over neighboring pixels in a circular region.
- **Step 2:** Find the similarity between target histogram and background histogram corresponding to the pixel value (γ, δ) . The similarity between the histograms can be find out using the concept of correlation

$$D(H_t, H_b) = \frac{\sum_x (H_t(x) - \bar{H}_t)(H_b(x) - \bar{H}_b)}{\sqrt{\sum_x (H_t(x) - \bar{H}_t)^2 \sum_x (H_b(x) - \bar{H}_b)^2}}$$

Here $D(H_t, H_b)$ is similarity measure, H_t is the target LBP histogram corresponding to particular pixel (γ, δ) , and H_b is the background LBP histogram corresponding to the same pixel (γ, δ) .

- **Step 3:** If the value of $D(H_t, H_b)$ does not deviate from 1, then it means the pixels are similar, and the corresponding pixel is taken as of backgrounds. If a pixel in the position (γ, δ) is noticed alike with the constructed background then the model background is updated by taking into consideration the notion of Gaussian averaging. Background can be updated using the given formula,

$$\mu_t(\gamma, \delta) = \frac{(i-1) \left(\mu_{(t-1)}(\gamma, \delta) \right) + I_t(\gamma, \delta)}{i}$$

Where i correspond to the number of dependant pixels already occurred at location (γ, δ) at time t , $I_t(\gamma, \delta)$ is intended frame and the background created is $\mu_{(t-1)}(\gamma, \delta)$. Background model is kept same, if it is observed to be independent.

$$\mu_t(\gamma, \delta) = \mu_{(t-1)}(\gamma, \delta)$$

$$var(\gamma, \delta) = \frac{1}{i} \sum_{k=0}^i |I_t(\gamma, \delta) - \mu_t(\gamma, \delta)|^2$$

Where $var(\gamma, \delta)$ represents the variance for pixel location (γ, δ) .

2.3 Moving Object Detection and Background Updation

Updation of the background frame is necessary to acclimatize the reference image with the variations in the background scene. In order to detect a moving object precisely, it is essential to create a fresh background image all over again. As a result, the method of updating background is one of the main processes in dynamic object detection. This is performed using background subtraction. It is necessary to take out the exact figure of dynamic objects in a scene. Here, for recognition of non-static objects firstly we take the background as initial frame. The pixel can be categorized as background or object, at any time t . Object can be represented as 1 and background can be represented as 0.

$$R_{t+1} = \begin{cases} 1 & \text{if } abs\left(\frac{I(\gamma, \delta) - \mu_t(\gamma, \delta)}{\sqrt{var(\gamma, \delta)}}\right) \geq T_h \\ 0 & \text{Otherwise} \end{cases}$$

Here the absolute value is represented by abs . At times the detected region is not connected so for better result we have used some morphological techniques. Threshold represents a manually given threshold value. The concept of morphological closing on an image is used in the proposed work to remove small dark spots and connect small bright cracks. Updation of background is the next stage of background subtraction. In this proposal, the updation of the background model at each time $(t + 1)$ has been performed as below,

$$\mu_{(t+1)}(\gamma, \delta) = \begin{cases} \eta I_{t+1}(\gamma, \delta) + (1 - \eta) \mu_t(\gamma, \delta) & \text{if } R_{t+1}(\gamma, \delta) = 0 \\ \beta I_{t+1}(\gamma, \delta) + (1 - \beta) \mu_t(\gamma, \delta) & \text{Otherwise} \end{cases}$$

$$var_{(t+1)}(\gamma, \delta) = \begin{cases} \eta (I_{t+1}(\gamma, \delta) - \mu_t(\gamma, \delta))^2 + (1 - \eta) var_t(\gamma, \delta), & \text{if } R_{t+1}(\gamma, \delta) = 0 \\ \beta (I_{t+1}(\gamma, \delta) - \mu_t(\gamma, \delta))^2 + (1 - \beta) var_t(\gamma, \delta) & \text{Otherwise} \end{cases}$$

Where $var_t(\gamma, \delta)$ represents the variance of Gaussian model at pixel location (γ, δ) . η represents the constant value that varies from 0 to 1 and changes with every frame, is the ratio of total number of background pixels by total number of pixels. In order to adjust swiftly for the pixels identified as background and gradually for the pixels identified as foreground, β has to be much lesser than η and β usually is zero.

3. EVALUATION

Those anticipated proposition may be executed clinched alongside python for Open CV and is run on Intel center i3 for Ubuntu os Also 4 gb ram. For ascertaining viability of the anticipated method, trials have been conveyed out ahead four feature sequels. The decided feature sequels would 'Water Surface', 'PETS2006', 'Traffic' 'Curtain'. Thus as to real the anticipated proposal, outcomes attained starting with those system may be compared for two separate gaussian calculations [14, 15] thresholding system.

To article identification Toward method for manual threshold strategy [1], those item On an proposed outline could be recognized by bringing under attention those supreme distinction of foundation & planned span manual thresholding takes after. Here, 0 on 255 is those reach about edge worth. In the test distinctive edge qualities are recognized. To begin with Gaussian mixture algorithm is dependent upon two papers. Z. Zivkovic's "Improved versatile gaussian mixture model to foundation subtraction" in 2004 [14] Also "Efficient versatile thickness estimation for every picture Pixel for the assignment about foundation Subtraction" to 2006. A fundamental characteristic of the calculation may be that, for every pixel, it opts for the suitability amount from claiming gaussian appropriation. Second calculation may be An gaussian Mixture-based division algorithm. It might have been acquainted in the paper "An progressed versatile foundation mixture model for ongoing following with shadow detection" Toward p. Kadew Tra Ku Pong Also r. Bowden to 2001 [15].

3.1 Qualitative Assessment

The foremost instance that is appraised in this analysis is PETS2006 video sequel. The video is taken from a railway station and depicts the area throughout a day.

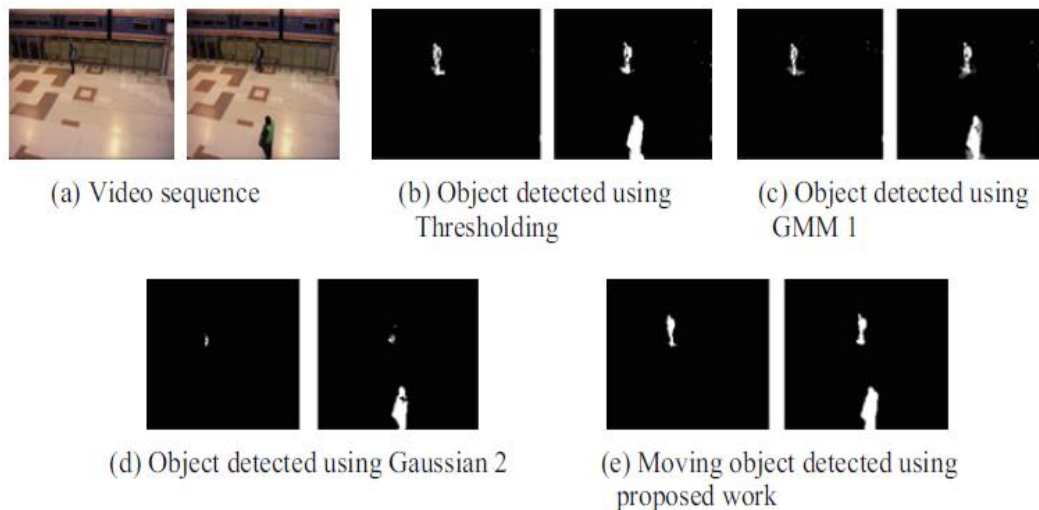


Fig. 2 PETS2006 video

GMM-1method moving water surface dishonestly distinguished concerning illustration moving article. GMM-2 detects those moving item yet the result is not exact contrasted with suggested fill in. The third sample that is appraised on our dissection will be shade feature spin-off. Non-static foundation brightening variety would the features for this feature arrangement.

At last we are acknowledged movement feature grouping. This feature succession may be loud Also Polaroid jitter Additionally viewed as occurring in this feature arrangement. Clinched alongside our suggested worth of effort we would utilizing spatio-temporal technique so the issue for Polaroid jitter might be fathomed. Due to Polaroid jitter existing calculations for example, thresholding, GMM-1, Furthermore GMM-2 dishonestly identify the moving item. On account of GMM-1 due to commotion and poor picture caliber practically of the bit from claiming foundation is distinguished Likewise shadow.

4. CONCLUSION AND FUTURE WORK

In the paper, that proposition of a new patio-temporal foundation subtraction plan may be anticipated. Those recommended calculation acknowledges the spatial Furthermore fleeting majority of the data on recognizing exact state of non-static object starting with a feature spin-off. Nearby double example provides for the spatial data and Gaussian averaging provides for those fleeting majority of the data. In the anticipated system we at first develop a foundation model Eventually utilizing LBP histogram similitude. The moving object in the planned outline is perceived utilizing Gaussian parameters toward thinking about it for foundation model constructed.

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ANALYSIS OF ICT PROJECT MANAGEMENT

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Abstract:- Building venture the board requires viable coordination and cooperation between different task individuals. It very well may be accomplished through constant correspondence stream between all. In present situation, it tends to be accomplished through selection of Information and Communication Technologies (ICT). Development industry essentially contains little and medium ventures (SMEs). Likewise, ICT reception has been delayed in the business. Examination is required to evaluate the variables that influence ICT selection at the three degrees of industry, association and individuals, with center around SMEs. This paper talks about a part of the examination attempted to consider these components and issues with regards to Indian development industry. A questionnaire survey was conducted and through quantitative data analysis the extent of adoption of formal Project Management processes, ICT adoption for these processes and factors including perception based factors affecting ICT adoption were studied. Results of data analysis includes identification of issues that require action at the three study levels. The results can be generalized for other countries with due considerations, specifically for countries where the construction industry is similar to Indian construction industry in terms of working methodologies or for large countries.

Keywords:- ICT Building project management SMEs Indian construction industry.

1. INTRODUCTION

Effective structure venture the board requires a joined exertion of the task group. Yet, the most notable individual is the undertaking chief, who needs to plan, track and screen the task and organize between the whole venture colleagues for fruitful venture conveyance. This relates straightforwardly to the powerful correspondence, which is generally accepted to be urgent for additional effectiveness gain in development [5]. Assortment, investigation and continuous correspondence of data is fundamental for the fast location of time, cost, degree and quality deviations from arranged execution and ideal dynamic for reacting to issues, questions and deviations recognized from the arranged exhibition.

At present, the correspondence issues between the colleagues are frequently a reason for venture delays, costly adjusting and building absconds [5] and with customary devices of correspondence, the task chiefs regularly lose the capacity of convenient change the executives. Utilization of Information Communication Technologies (ICTs) gives chances to constant access of data to all and improves coordination and joint effort between the undertaking colleagues. Its advantages remember an expansion for the nature of archives and speed of work; better budgetary control and correspondences, and more straightforward and quicker admittance to normal information just as a reduction in documentation blunders [20] as utilization of mistaken information can bargain the booked consummation of a task and lead to wastage of assets [14].

In the current situation, associations and venture group structures in the development business are getting progressively intricate. Therefore, continuous data stream is basic to an associations' capacity to be adaptable, lithe and serious [11]. Corresponding to extend the board there is additionally a requirement for a framework that gives shared venture data, investigation instruments to break down the data, a communitarian foundation to deal with the progression of data, a multi gadget admittance to the relating data and a framework that guarantees the ingenuity of the hidden data among the members [9].

ICT tools and technologies provide these facilities. But, construction industry has been slow in adopting ICT and often available and easily accessible technology is not being utilized to the full extent. This is reflected both in the literature and practice [3]. At all stages of a building project, information is generated, stored and communicated by all the supply chain members. So, to have effective

communication, all the members should follow the accepted methods of communication or communication protocols. Also, at any time, each construction organization is involved in more than one project and is a part of more than one supply chain [1].

This unique nature of the construction industry necessitates that the communication protocols are adopted by the industry as a whole and do not remain project specific. Thus, in multiple enterprise scenario of the construction industry, ICT adoption for building project management would be effective if all the project team members uniformly adopt it and the methodologies or protocols are defined for its uniform uptake in the industry. People, who are a part of different project team organizations, manage projects and the project team organizations are a part of the construction industry.

So, the communication protocols have to address technical, managerial and people issues and are to be implemented at the levels of industry, organizations and projects or people. The protocols are required to be specifically aligned for requirements of SMEs as construction industry primarily comprises small and medium enterprises (SMEs). One of the most important issues that hinders the growth of SMEs in a globalized scenario is that of access to appropriate technology when technology upgradation is the key to face global competition [19].

It is easier for large firms to be involved in the development and adoption of the emerging technology whereas SMEs have difficulty in dedicating resources to research, development and training. In many SMEs, the use of IT will depend upon whether or not the firm has recruited a recent graduate with IT skills. The large companies on other hand, would invariably have staff with IT skills and would have invested in the necessary technology [14].

Consequently requirement is to study the factors that affect ICT adoption by SMEs for building project management. These issues can be addressed by global research, but also require clear understanding of the management and communication processes followed by SMEs of each distinct regional area or country. The research discussed in this paper studies these issues with respect to the Indian construction industry.

2. LITERATURE REVIEW

Development is a data subordinate industry. The measure of data created and traded during a task lifetime is significant. Hence, it is basic that the data trade is overseen as proficiently as conceivable [12]. Specialists in scholastics and the business have featured the advantages of embracing ICT for development venture the executives like: more extravagant data to help dynamic, venture data acquired faster, improved correspondence, closer connections, improved data stream, more noteworthy administration control and getting topographically scattered gatherings to cooperate [3,4,7].

Be that as it may, a great part of the structure data is as yet traded by traditional human correspondence and printed copy drawings and records, prompting mistakes in drawings and archives, since such a correspondence isn't constant correspondence. In a study led in a main development association, it was discovered that 30% of the considerable number of inquiries that originated from the building site administrators to the planners were identified with the irregularities in drawings from the compositional, basic, and mechanical fashioners [10].

A review in the UK development industry indicated that most task data is right now put away utilizing a blend of paper and electronic media, with just one out of six undertakings overviewed, utilizing electronic frameworks as the essential mode for data stockpiling. The study additionally featured a few varieties in the degree of IT mindfulness in various pieces of the gracefully chains of the development ventures [14]. Components influencing ICT selection have been contemplated. In an overview led to evaluate the status of ICT selection in the Australian development industry, it was discovered that yearly turnover of an association affects the take-up of ICT and preparing execution in ICT for an association.

Also, not having an ICT professional at site or within ready access was a strong influential barrier to the uptake of ICT on projects since adequate support to construction site processes is important for collaborative use of ICT in the construction projects. Onsite work conditions may sometimes permit only the use of wireless or portable devices. However it must be recognized that portable and handheld devices simply cannot handle computationally heavy jobs due to their specific hardware configurations [9]. Internet helps in effective collaboration and coordination between project team organizations. Its use as a communication medium can help information-transfer occur faster and more effectively and can provide new opportunities for the development of distributed systems that can cross organizational boundaries and can offer a unique opportunity for teamwork and workflow automation [20].

E-mail services have been considered an important communication method. But, in a survey 65% respondents maintained that although e-mail does enable some degree of global team working, it can never replace interpersonal team working [2]. In a way that also explains why telephone calls sometimes follow the e-mails. Networks are important components for implementing integrated technology solutions. Internet or Intranet gains importance not only for organizing, storing, searching and retrieving information but also for sharing information in an organization in all the directions, i.e. upward, downward and laterally. In this scenario, 'Infrastructure surety' including safety, security, reliability, integrity, authentication, protection and operational assurance assumes significance [11].

Web based project management system combines the power of project management systems with the Web, making the details of the project available to anyone from anywhere and overcoming the problems of timely updates, multiple copies and real time project schedule updates [9]. Most of the organizations are adopting these services because their competitors are influencing them or they are being forced to adopt it by their clients. Utilization of these technologies in the construction industry and primarily in the multi-enterprise scenario of project management requires readiness not only within one organization, but also within all the organizations involved in the construction processes [20].

Researchers have highlighted that effective utilization of these technologies requires equal consideration of people issues along with the technological issues [5,11,14,15,21]. It has also been found that 80% to 90% of IT projects in general do not meet their performance objectives, with the main reasons not related to technical issues [21]. Also, any 'new' connections and networks (social and technical) that develop as a result of the introduction of individual ICTs will be far more effective if they are somehow interconnected with existing, locally appropriate systems and structures [15]. Empirical research is required to holistically study the factors affecting ICT adoption in the multi-enterprise scenario of building project management.

Pena-Mora and Tanaka [10] have identified Environmental Scan and Internal Scrutiny as the first two steps for such a study. 'Environmental Scan' would include understanding of the factors, issues and industry drivers for ICT adoption at the industry level and would provide the basis for strategic planning and implementation of ICT at the organization and industry levels. It would also identify the possible benchmark practices for organizations. 'Internal Scrutiny' is at the organization level. It involves analysis functions at inter and intra organization levels, and present ICT adoption for these processes and functions.

The results of the Environmental Scan would help in establishing benchmark practices for continuous monitoring of ICT adoption within an organization and at the industry level. The construction industry predominantly comprises SMEs, which are typically defined by the number of people they employ. SME sector is highly heterogeneous comprising tiny unorganized enterprises to modern and more organized enterprises. Globally there is no clear definition of SMEs. For the construction industry, Love et al. have identified SMEs as employing less than 250 staff and Sturges and Bates [14] have identified SMEs as having staff up to 299.

3. RESEARCH METHODOLOGY

The examination point of the investigation revealed in this paper was to create conventions for viable appropriation of ICT for Building Project Management by Small and Medium Enterprises (SMEs) in the Indian development industry. It required ID of the conventional Project Management measures received and the degree of ICT selection for these cycles; investigation of components including discernment based elements influencing ICT reception and investigation of causal connections between these elements. The investigation is comparable to SMEs, since they comprise a basic and significant job in the development gracefully chains. A portion of the elements could be estimated quantitatively, however a few variables like individuals level components required subjective appraisal.

Thus, the research methodology divided the research into quantitative and qualitative research and the research focused on collecting and analyzing both, quantitative and qualitative data in the study in a sequential manner (sequential mixed methods approach). Such a methodology helps in using different methods for different purposes in the study and enables triangulation to take place at the results formulation stage [17]. The purpose of this sequential mixed methods study was to start with pragmatic assumptions; obtain statistical, quantitative results from a broad sample of organizations to analyze or study research variables at industry and organization levels and then to follow up with selected organizations and projects to study the research variables at the levels of organization and people.

This paper discusses a component of the quantitative analysis stage of research conducted to assess extent of ICT adoption in the Indian construction industry for administrative processes as well as Project Management processes. Data for quantitative analysis was collected through a questionnaire survey conducted in the Indian construction industry. Data analysis identified issues that require action at the three study levels of industry, organization and people and other issues that required qualitative study.

4. QUESTIONNAIRE SURVEY

The unit of investigation for the overview was an association overseeing building ventures and the example populace was little and medium endeavors (SMEs) in the Indian development industry. In light of the writing audit, for the exploration study, a SME was characterized as an association with staff up to 250. Study was directed across India to limit the local inclination. Review test was chosen from the Yellow Pages and the Notified arrangements of Professional bodies and falls under the gathering of Purposive Sampling. So as to sum up the outcomes, it is important to choose an example that is a genuine portrayal of the populace.

Thus, those organizations were included in the sample, which were either managing building projects after being appointed as the Project Managers or had the authority to manage their projects if a Project Manager was not appointed formally. Therefore three groups of organizations were included in the sample: builders including contractors who construct and manage their own projects; project management consultancy organizations which are formally appointed as project managers on building projects, and architectural organizations which manage small to medium size building projects since on many such projects, project managers are not formally appointed. Targeted respondents were the senior level executives in the organizations.

Section I of the questionnaire contained questions that assessed:-

- the organization size in terms of turnover and staff strength,
- organization's area of expertise and primary mode of project execution,
- project team structures in terms of geographical separation of project team organizations,
- ICT maturity of the staff and the organization, and
- mode of communication adopted for general administration processes.

Section II was a tool for mapping:-

- building project management (PM) processes adopted by the organizations,
- assessment of IT tools and technologies adopted for these processes, and

- extent of ICT adoption for each identified PM process.

The PM processes were divided under four groups: Time Management, Cost Management, Project Administration and Resource Management, and Communication Management processes. Section III assessed the perception of project managers regarding following factors affecting ICT adoption for building project management:-

- benefits,
- barriers,
- enablers and
- industry drivers.

Qualitative perceptions analysis is converted into quantitative values with the help of a five point Likert scale.

5. ANALYSIS

Reactions of each gathering of information from the survey were tried for unwavering quality through Cronbach's alpha. The qualities were more noteworthy than 0.7, which is adequate ([8] referred to in [6]). Levin and Rubin [25] have shown that there is no single norm or general degree of essentialness for testing the theories [16]. Level of criticalness utilized for information investigation in this exploration is 0.05, which is the most widely recognized level utilized, or the certainty level is 95% for example pb0.05. All the associations saw that ICT appropriation for building venture the board prompts noteworthy advantages.

31 perceived benefits were identified from the literature review and after discussions with the experts in the industry and academics. Perceived benefits were grouped under measures of project success, effective team management, effective use of technology and increased efficiency of the organization. Perceived importance of the identified benefits was measured at a 5 point Likert scale, with 1 and 5 corresponding to 'not important' and 'most important' respectively, whereas 3 corresponded to 'moderately important'. Scores for identified 31 benefits were aggregated and t-test was conducted. All the four groups of benefits were considered equally important.

5.1. Status of ICT adoption in the industry

IT foundation at site has been seen as a significant empowering agent for compelling ICT reception for building venture the board. In any case, information investigation indicated that despite the fact that in larger part of the overviewed associations, over 80% of office staff approached PCs, in just about 20% associations over 80% site staff approached PCs. Investigation of the above information conveyance prompted the investigation of connection between 'level of site staff with admittance to PCs' and 'degree of utilization of ICT'. Single direction ANOVA test was led to evaluate the noteworthiness of 'Progress in level of utilization of ICT' with 'Change in level of site staff with admittance to PCs'.

The results were found significant. This analysis further supports the perception that adequate IT infrastructure at sites is an important enabler for effective ICT adoption for project management. Rate of increase of ICT adoption in last 5 years has been found significant. But majority of the respondent organizations did not have a communication management strategy and data analysis summarized that SMEs use of ICT for building project management has not reached a high maturity level, since their use of ICT is primarily project specific and not organization specific.

Issue that the extent of ICT adoption on the building projects is primarily defined by the clients' requirements and this factor was studied further. Effective adoption of ICT for Project Management requires collaborative use of ICT between different organizations. But, it was found that the collaborative use of ICT is less as compared to internal use of ICT within the organizations. Data was collected for communication methods utilized for each identified Project Management process. Communication methods were categorized as through hard copy, hard copy and e-mail and only e-mail with scores 1, 2 and 4 respectively.

Communication was categorized into four groups:-

- within office
- between office and site
- between office and clients or consultants
- between office and contractors or material suppliers.

Further, to represent the usage of multiple communication methods for a process, respondents could identify different communication methods utilized for different percentage of projects, through a five-point interval scale. Use of ICT was found in decreasing order among the 4 categories of communication as listed above and the ranking was found significant through Non Parametric Freidman test.

Further, results of the first two groups were summarized as 'Internal use of ICT within organizations' and the results of the last two groups were summarized as 'External or collaborative use of ICT'. It was found that only in about 3% (4 no.) of the surveyed organizations, external or collaborative use of ICT was more than the internal use of ICT. But, in rest 97% (145 no.) of the organizations, internal use was significantly more. Through Wilcoxon signed ranks test, this analysis was found significant.

5.2. Factors affecting ICT adoption

As examined in the prior areas of this paper, IT framework at destinations was broke down as a significant empowering influence for powerful ICT reception for venture the executives. Information examination indicated that SMEs with higher turnover have higher appropriation of ICT. Additionally, information examination indicated that these associations don't see 'starting expense and cost of refreshing IT foundation' as high positioned hindrances for successful reception of ICT for building venture the board.

However, these are seen as high positioned hindrances by different SMEs. Information investigation likewise indicated that degree of ICT selection for building venture the executives varies for three gatherings of test associations for example PMCOs, Builders and Architectural associations and diminishes in a specific order. One reason for this, recognized after information investigation is the distinction in the degree of formal undertaking the board measures received by these gatherings of associations.

5.3. Issues to be addressed

Respondents were asked to list any capacity, functionality or performance issues, which need to be addressed for head office and site office IT systems. It was an open-ended question included in the questionnaire to identify issues other than those addressed in the questionnaire, but required to be addressed regarding use of ICT tools and technologies. 30% organizations identified issues for head offices and 30% for site offices. Table 2 shows the identified issues. Study of the identified issues indicates that managerial or strategic planning issues as well as technical issues require attention at the organization level, for effective use of ICT infrastructure.

6. DISCUSSION

Poll review was directed at the association level. Yet, the review was directed across India. Subsequently, the outcomes can be summed up at the business level. Above talked about investigation prompted the recognizable proof of issues that require activity at the degrees of industry, association and individuals. Study shows that despite the fact that inside SMEs, associations with higher turnover have higher appropriation of ICT, still degree of utilization of ICT is essentially characterized by the customers' necessities, which could be the venture customers or the enormous associations sub contracting SMEs. Huge associations and expert bodies need to adopt a supportive of dynamic strategy, to set up strategies for appropriation of higher ICT innovation and to set up benchmark rehearses for utilization of ICT for building venture the board, so degree of ICT reception by SMEs becomes association explicit and doesn't remain task or customer explicit.

As the study of Industry drivers shows that at present there is increased construction activity in the country driving high use of ICT and there is also increased involvement of geographically separated agencies, this is the scenario in which benchmark practices for use of ICT should be established. Also, National level bodies should set up forums for providing consultancy to SMEs for adopting appropriate technological solutions for the remote project sites. Building project management requires collaborative working and collaborative use of ICT. But, data analysis shows that the collaborative use of ICT is significantly less as compared to the internal use of ICT in the Indian construction industry.

ICT adoption for building project management differs for three groups of respondent organizations; and majority of the SMEs perceive 'initial cost and cost of updating IT infrastructure' as a high ranked barrier affecting ICT adoption for building project management. These issues require action at the Industry level as the supply chain issues for collaborative working are required to be addressed at the national level. Through education programs and training facilities, ICT capabilities of SMEs need to be improved; SMEs need to be trained in formal project management processes; and cost of IT infrastructure should be made affordable for SMEs through incentives.

But, some of these issues also require strategic initiatives from the senior management of the SMEs. SMEs should strategically plan for the future use of ICT by their organizations. The plans should be aligned with their business plans. Strategic initiatives are required at the industry level to minimize the effect of people level issues by educating and training people. It would help in modifying work processes and increasing inter-sectoral interaction of professionals with other sectors or industries having similar work practices.

The results of the component of the research study discussed in this paper or the issues that require action at the levels of industry, organization and people were identified for the Indian construction industry but can be generalized for other countries with due considerations, specifically for countries where the construction industry is similar to Indian construction industry in terms of working methodologies or for large countries. Data analysis also included study of perception based data as well as study of causal relationships between quantifiable factors.

Qualitative stage of research included case study analysis and studied identified issues in depth. Triangulation of the results of all the research components led to the development of a benchmarking framework for measuring ICT adoption for building project management and protocols for enhancing effective adoption of ICT for Building Project Management by Small and Medium Enterprises (SMEs) in the Indian construction industry. Further research components and results are discussed by the authors in other supporting papers. As discussed earlier in the paper, literature review did not indicate any industry wide initiative in India to study ICT adoption by the construction industry. Thus, these results provide a guideline at the national level.

7. CONCLUSIONS

Building venture the board requires viable correspondence the executives between all the task colleagues prompting required coordination and joint effort. In the current situation when associations and venture group structures are getting intricate and venture colleagues are topographically isolated, utilization of ICT gives the capacity to accomplish compelling correspondence. Yet, powerful usage of these advances requires its selection at the business level. Dominant part of the associations in the development business is SMEs and exploration is required to examine the variables influencing ICT appropriation by SMEs. Above examination uses 'natural sweep' at the business level and 'inside investigation' at the association level to consider these components as for Indian development industry.

Data collection has been done through a questionnaire survey conducted in the industry and data analysis has been done through parametric and non-parametric statistical analysis. Results identify and categorize issues that require actions at the three study levels of industry, organizations and people and also

suggest actions to be taken at the levels of industry and organizations. The issues identified after discussed quantitative analysis are technical, managerial and people issues and have been further studied by the authors in depth through qualitative analysis conducted through case study analysis. The results are applicable for Indian construction industry, but can be generalized for other countries after due considerations.

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A STUDY ON N-HEPTADECANOIC ACID ISOLATED FROM WENDLANDIA THYRSOIDEA LEAVES: A REVIEW

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Abstract:- In this paper isolation, characterization in vitro living assessment examine of n-heptadecanoic corrosive starting with methanol extracts for Wendlandia thyrsoidea abandons need been conveyed crazy. The antimicrobial study of the separated compound indicated guaranteeing movement against b. Subtilis, p. Aeruginosa, e. Coli Furthermore An. Flavus with MIC going between 25 to 30 µg/mL. The cell reinforcement outcomes uncovered that, those disengaged exacerbates exhibits direct radical searching Furthermore ferrous particle chelating capacity with IC50 qualities 231. 93±4. 81 Also 214. 78±2. 22 µg/mL individually.

Keywords:- Wendlandia thyrsoidea, Leaves, n-heptadecanoic acid, Antimicrobial, Antioxidant.

1. INTRODUCTION

Unsaturated fat acids bring different parts altogether units Furthermore they are essential similarly as a hotspot for vitality Likewise structural parts of cell membranes and as indicating atoms and the greasy liver assumed an key part in the safe framework of the existing Mobile. In late A long time the far reaching Scrutinize worth of effort conveyed crazy around part of greasy liver in the safe framework of the body, as an aftereffect they distinguished that 'lipid domains' clinched alongside cell division membranes comprise from claiming lipid pontoons Also caseload, which are Exceptionally composed microenvironments with a few vital capacities Furthermore Additionally distinguished the vicinity about intracellular lipid bodies, probable to hold numerous precursors for those fast processing of eicosanoids inside incendiary cells, separated starting with these some atomic receptors actuated Toward unsaturated fat acids need been characterized^{1,2}.

On the other hand them over intake of fatty acid leads to the accumulation of fat in the body, which in turns leads to cardiovascular diseases and cancer^{3,4}. In the past ten years, due to the over population and globalization, the demands for the fossil fuels dramatically increases. In order to decrease the cost, to meet the fuel need and to minimize the air pollution, biodiesel production that is mainly methyl esters of fatty acids has been increased. Moreover, there is also concern about the stress on vegetable oil supply across the world as food as more vegetable oil resources are diverted toward production of bio diesel.

The W. thyrsoidea plant belong to the family Rubiaceae. In Kannada the plant is commonly called as Neeru pale. Which is used in ethno medicine for the treatment of constipation, asthma, tooth ache, skin diseases and also this plant is used in the treatment of jaundice. The plant has antimicrobial and analgesic activities⁶, the pet-ether, ethyl acetate and methanol extracts of W. thyrsoidea have antimicrobial and analgesic activity⁷. The methanol extract of flowers of W. thyrsoidea possess antioxidant and antimicrobial activity⁸. In the present study we have isolated n-heptadecanoic acid from methanol extracts of W. thyrsoidea leaves and the isolated compound were screened for their antimicrobial and antioxidant activity.

2. MATERIALS AND METHODS

2.1 Collection and identification of plant

The solid abandons were gathered starting with haniya, Shivamogga (D), Karnataka, india. Legitimacy of the plant might have been affirmed as w. Thyrsoidea by Professor, section of connected Botany, Kuvempu University, Shankaraghatta. An voucher example (KU/SD/HN115) might have been stored over section about connected herbal science herbarium, Kuvempu school.

2.2 Extraction and isolation

Abandons were differentiated from unwanted materials, brushed, shade dried also powdered mechanically. 1000 Gm. From claiming abandons powder might have been defatted utilizing petroleum ether Furthermore concentrated for refined methanol Also twofold refined water in soxhlet mechanical assembly. The extricate might have been sifting through Whatmann no. 1 channel paper and amassed during 400 c's to vacuo utilizing rotating streak evaporator. Those acquired residues were designated concerning illustration w. Thyrsioidea methanol extricate (WTME) w. Thyrsioidea watery extricate (WTAE) individually.

2.3 Isolation of pure components form methanol leaves extracts of W. thyrsioidea

WTME was successively extracted with pet ether, chloroform and ethyl acetate. The solvent partition was repeated until the solvent in the thimble becomes clear indicating the completion of extraction process. The ethyl acetate fractions were dissolved in 50% aqueous methanol and the solution was taken in a separating funnel. To the funnel a mixture of 10mL n-hexane and 15 ml of chloroform were added and shaken well for 10 min. the two layers are separated and dried over anhydrous sodium sulphate and process is repeated several times.

The partial extracts are represented as aqueous methanol extract as AME and hexane chloroform extract as HCE. HCE extract (6 g) was chromatographer on silica gel column. Stepwise gradient elution was carried out using pet ether followed by ethyl acetate, chloroform and methanol. Hundred and twenty fractions (20 mL each) were collected and TLC screened on silica gel plates. Similar fractions were combined and concentrated. Fractions from 2 to 8 showed similar spot on TLC, and were mixed and concentrated (compound 1) (60 mg). Fractions from 9 to 21 showed similar spot on TLC, and were mixed and concentrated (compound 2) (150 mg). Fraction from 28-32 showed similar spot on TLC, and were mixed and concentrated (compound 3) (130 mg).

Fraction from 42-49 showed similar spot on TLC, and were mixed and concentrated (compound 4) (120 mg). Fraction from 51-63 showed similar spot on TLC, and were mixed and concentrated (compound 5) (150 mg). Fraction from 67-82 showed similar spot on TLC, and were mixed and concentrated (compound 6) (110 mg). Fraction from 86-103 showed similar spot on TLC, and were mixed and concentrated (compound 7) (190 mg). The colour, yield and solubility of isolated compounds were tabulated in the Table 1. Compound 2 were again chromatographer on silica gel column, eluted with petether- ethyl acetate (9:1) to afford pure compound 2 (9 mg). The isolated compound were subjected to spectroscopic analysis and it confirms that the isolated compound 2 is n-Heptadecanoic acid.

Table 1: Colour, Yield and Solubility of isolated compounds

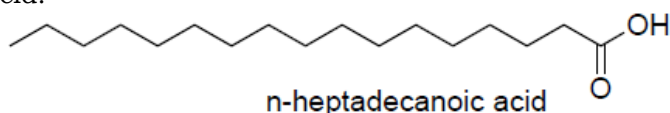
Compound code	Yield (mg)	Colour	Solubility
Compound 1	60	Amorphous white solid	Ethyl acetate, chloroform
Compound 2	150	Amorphous white solid	Ethyl acetate, chloroform
Compound 3	130	Amorphous white solid	Ethyl acetate, chloroform
Compound 4	120	Amorphous light yellow solid	Ethyl acetate, chloroform
Compound 5	120	Amorphous light yellow solid	Ethyl acetate, chloroform
Compound 6	110	Amorphous brown solid	chloroform
Compound 7	190	Amorphous brown solid	chloroform

2.4 Spectral analysis of compound 2

Compound 2 were characterized by comparing the melting point, IR, NMR and mass spectra with authentic n-Heptadecanoic acid. The melting point was compound 2 found to be 60-63°C and it is good agreement with the authentic n-Heptadecanoic acid melting point. The IR spectrum showed the characteristic absorption band at 2918 cm⁻¹ for C-H stretching in CH₃ group, a sharp absorption band at 1703 cm⁻¹

indicated the presence of carboxylic C=O group. ¹H NMR spectrum of compound 2 showed quadruplet at δ 0.82 ppm is due to terminal methyl protons.

The multiplet at δ 1.20 ppm was assigned to aliphatic protons and the singlet at δ 11.89 ppm was assigned to carboxylic acid proton. Further, ¹³C NMR spectrum of compound 2 confirmed the proposed structure by appearance of signal at δ 174.39 ppm due to the C=O group of carboxylic acid and another signals ranging between at δ 39.48 to 13.88 ppm correspond to aliphatic carbons. Mass spectrum of compound 2 displayed a molecular ion peak at m/z 271 [M⁺] corresponding to the molecular mass of the compound. On the basis of all these facts, the isolated compound 2 from *W. thyrsoidea* was confirmed as n-Heptadecanoic acid.



n-Heptadecanoic acid (**2**); white amorphous solid, mol. formula: C₁₇H₃₄O₂; m.p. 60-63°C; IR (KBr, ν cm⁻¹): 2918 (C-H str in CH₃), 2899 (C-H str in CH₂), 1703 (C=O), 1302 (C-O); ¹H NMR (400 MHz, DMSO, δ, ppm): 11.89 (s, ¹H, carboxylic acid OH), 2.13 (m, 2H), 1.45 (t, 2H), 1.20 (s, 26H, CH₂×13), 0.82 (q, 3H); ¹³C NMR (125 MHz, DMSO, δ ppm): 174.39 (C=O carboxylic acid), 39.48, 33.62, 31.30, 28.76, 24.47, 22.08, 13.88; MS (LCMS): m/z 271 [M⁺].

3. PHARMACOLOGY

3.1 In vitro antibacterial and antifungal activity

Antimicrobial exercises of the exacerbates were tried against four bacterial strains four contagious stains utilizing agar great dispersion method⁹. Know bacterial strains were administered looking into supplement agar medium toward ±37°C Furthermore contagious strains were administered once potato dextrose agar (PDA) toward ±25 °C. Those test exacerbates were disintegrated in DMSO with get a centralization for 1000 µg/mL Also 100 µL from claiming this example might have been stacked under the wells about agar plates straightforwardly.

Plates inoculated with the bacteria were incubated at 37 °C for 24 h and the fungal culture was incubated at 25 °C for 72 h. All determinations were done in triplicates. Ciprofloxacin (500 µg/mL) and fluconazole (500 µg/mL) were used as standard drugs for antibacterial and antifungal activities respectively. Minimum Inhibitory Concentration (MIC) was performed by serial broth-dilution method at different concentrations like 250, 500, 750 and 1000 µg/mL. After the incubation period, the Minimum Inhibition zone at which the microorganism growth was inhibited was measured in mm.

3.2 Antioxidant activity

1,1-Diphenyl-2-picrylhydrazyl (DPPH) radical scavenging activity

All the synthesized compounds were screened for free radical scavenging activity by DPPH method. In brief, compounds in methanol at different concentration (20-100 µg/mL) were added to each test tube and volume was made up to 4 mL using methanol. To this, 3 mL of 0.004% DPPH in methanol was added and the mixtures were incubated at room temperature under dark condition for 30 min. The scavenging activity on the DPPH radical was determined by measuring the absorbance at 517 nm. Radical scavenging activity was calculated using the formula:

$$\% \text{ of Radical scavenging activity} = \left(\frac{A_{\text{control}} - A_{\text{test}}}{A_{\text{control}}} \right) \times 100$$

3.3 Metal chelating activity

The chelating activity of the synthesized compounds and standard (EDTA) with ferrous ions was estimated by reported procedure. Briefly, 3mL of sample solution at different concentrations (20-100 µg/mL) was taken and 0.05 mL of 2 mM FeCl₂ was added. The reaction was initiated by adding 0.2 mL 5 mM ferrozine, mixed vigorously and incubated at room temperature for 10 min. Absorbance of the

solution was measured at 562 nm. The percentage of inhibition of ferrozine-Fe²⁺ complex formation was calculated from the formula:

$$\% \text{ of inhibition} = \left(\frac{[A_{\text{control}} - A_{\text{test}}]}{A_{\text{control}}} \right) \times 100$$

4. RESULT AND DISCUSSION

Aliphatic carboxylic acids would for the most part viewed Likewise unsaturated fat acids Also they changing hydrocarbon lengths during person limit of the chain joined on terminal carboxyl assembly at alternate end. Those unsaturated fat acids need changing living work like, they included in the lipids structuring Toward reacting with glycerol in plants, animals microorganisms, they fundamental fabricating squares for living membranes, they go about as long haul vitality stockpiling and in addition for those precursors from claiming eicosanoid hormones.

To evaluate the biological potentiality of n-Heptadecanoic acid, the compound was screened for their antibacterial and antifungal activity by agar well diffusion method. Furthermore, to quantify the antimicrobial potency of these extracts which showed good zone of inhibition was studied for MIC. The investigation revealed that, extracts showed varying degrees of activity against all the tested microorganisms.

Table 2: Minimum inhibitory concentration of n-Heptadecanoic acid

Compound	Minimum inhibitory concentration (µg/mL)							
	Antibacterial				Antifungal			
	<i>B.s</i>	<i>P.a</i>	<i>S.t</i>	<i>E.c</i>	<i>A.f</i>	<i>C.a</i>	<i>M.g</i>	<i>A.t</i>
n-Heptadecanoic acid	25	25	-	30	30	30	-	-

The antibacterial results showed that the n-Heptadecanoic acid showed good zone of inhibition against *B. subtilis* and *P. aeruginosa* with MIC value 25 µg/mL and it promising activity against *S. typhi* and *E. coli* with MIC value 30 µg/mL. The antifungal results showed that n-Heptadecanoic acid showed promising activity against *A. flavus* with MIC value 30 µg/mL and showed less activity against *C. albicans*, *M. griseous* and *A. terreus*. Now a days search for a safer new molecule with antioxidant potentiality is a very active domain of research, since they can protect the living tissue of the body from free radical damage and they retard the progress of many chronic diseases such as cancer, diabetes and vascular diseases.

The results of antioxidant activity of isolated compound were tabulated in DPPH radical scavenging ability was measured by quenching of stable DPPH radical, purple color solution changes to a stable yellow on reacting with an antioxidant. The n-Heptadecanoic acid showed promising radical scavenging activity with IC₅₀ values ranging 231.93±4 µg/mL as compared to the standard. In nature, iron can be found in either ferrous (Fe²⁺) or ferric ion (Fe³⁺) form. In living systems ferrous iron can facilitate the production of reactive oxygen species; hence the ability of substances to chelate iron can be a valuable antioxidant. The compound showed promising chelating activity with IC₅₀ values ranging 214.78±2.22 µg/mL as compared to the standard.

Table 3: Antioxidant activity of n-Heptadecanoic acid

Compound code	IC ₅₀ µg/mL	
	DPPH scavenging	Metal chelating
n-Heptadecanoic acid	231.93±4.81	214.78±2.22
std	40.38±1.50*	35.27±3.27**

5. CONCLUSION

In this article we are disconnected the n-heptadecanoic corrosive from methanol extracts for w. *Thyrsoida* abandons also their antibacterial Furthermore antifungal movement were screened to their antimicrobial movement. DPPH free radicle searching furthermore ferrous chelating capability was used to screen the cell reinforcement movement. Clinched alongside blackout the abandons for plant

Wendlandia thyrsoidea rich on greasy liver we recommended that the abandons of plants utilized Likewise hotspot of unsaturated fat acids. Furthermore A percentage concoction change in the disconnected mixes might improve the living action.

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A REVIEW ON E BANKING SERVICES PROVIDED BANKS IN INDIA

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Abstract - The banking system plays very important role to develop an economy by enabling it to be competitive and strong enough to face the financial crises and hence forms the core of money market. The banking structure of every economy is going to change with the changing environment. In Indian context, there were two phases of nationalization, introduction of RRBs, entry of private sector banks and foreign banks and now ebanking are some major changes that affect the structure as well as functioning of the banks from time to time. Indian banking too has proved many changes in response to the world economy where liberalization, privatization, technology introduction, that is, computerization are the major effects of globalization.

1.INTRODUCTION

1.1 Indian Banking: An Overview

Indian banking is the lifeline of a nation and its people. Banking has helped in developing vital sectors of the economy and to usher in a new dawn of progress on the Indian horizon. The sector has translated the hopes and aspirations of millions of people into reality. Today, Indian banks can confidently compete with modern banks of the world. [1]

2 EVOLUTION OF INDIAN BANKING INDUSTRY

Banking in India originated in the first decade of 18th century with the General Bank of India coming into existence in 1786. This was followed by Bank of Hindustan. Both these banks are now defunct. After this, the Indian government established three presidency banks in India. The first of the three was the Bank of Bengal in 1809, the other two presidency bank, viz., the Bank of Bombay and the Bank of Madras, were established in 1840 and 1843, respectively. The three presidency banks were subsequently amalgamated into the Imperial Bank of India (IBI) under the Imperial Bank of India Act, 1920 which is now the State Bank of India (SBI). A couple of decades later; foreign banks like Credit Lyonnais started their Calcutta operations in the 1850s. That time, Calcutta was the most active trading port, mainly due to the trade of the British Empire and due to which banking activity took roots there and prospered. The first fully Indian owned bank is the Allahabad Bank, which was established in 1865. By the 1900s, the market expanded with the establishment of banks such as Punjab National Bank (PNB), in 1895 in Lahore and Bank of India (BOI), in 1906 in Mumbai, both of which were founded under private ownership. The Reserve Bank of India (RBI) formally took on the responsibility of regulating the Indian banking sector from 1935. After India's independence in 1947, RBI was nationalized and given broader powers. As the banking institutions expand and become increasingly complex under the impact of deregulation, innovation and technological up gradation, it is crucial to maintain a balance between efficiency and stability. During the last 40 years since nationalization tremendous changes have taken place in the financial markets, as well as in the banking industry due to the financial sector reforms. The banks have shed their traditional functions and have been innovating, improving and coming out with new types of services to cater emerging needs of their existing and new customers. Banks have been given greater freedom to frame their own product policies. Rapid advancement of technology has contributed to significant reduction in transactional costs, facilitated greater diversification of portfolio and improvements in credit delivery of banks. Prudential norms, in line with international standards, have been put in place for promoting and enhancing the

efficiency of banks. Despite this commendable progress, serious problems have emerged reflecting in a decline in productivity and efficiency and erosion of the profitability of the banking sector. There has been a decline in the quality of loan portfolio which, in turn, has come in the way of bank's income generation and enhancement of their capital funds. Inadequacy of capital has been accompanied by inadequacy of loan loss provision resulting into the adverse impact on the depositors' and investors' loyalty. The Government, therefore, set up the Narasimham Committee to look into the problems and recommend measures to improve our financial system; this has resulted into the transformation of our banking industry. The banking industry is entering a new phase, where there is increasing competition from non-banks, not only in the domestic market but also in the international markets. The operational structure of banking in India is expected to undergo a deep change during the next decade. With the upcoming new private sector banks, the private banking sector has become enriched and diversified with focus on wholesale as well as retail banking. The existing banks have wide branch network and geographic spread, whereas the new private sector banks have massive capital, lean personnel component, the perfection in developing good financial products. The banking system in India is prospering also due to the combined efforts of cooperative banks and regional rural banks (RRBs), which are expected to provide an adequate number of effective retail outlets to meet the socio-economic challenges in the next two decades.

The electronic age has also affected the banking system, leading to an increase in the number of electronic transactions. However, the development of electronic banking has also led to new areas of risk such as data security and reliability, requiring new techniques of risk management. [2]

3 STRUCTURE OF INDIAN BANKING INDUSTRY

Computerization in banking industry has become very important in recent years. Indian banking industry today is in the midst of an IT revolution. A combination of regulatory and competitive forces has led to increasing importance of total banking automation in the Indian banking industry. Hence, there is a paradigm shift in banking in India as they started to realize the need to be 'Customer focused' which is imperative for the survival and growth. Many aspects of information technology, that is, ATMs, tele-banking, mobile banking, internet banking along with consumer durable loans, home loans, personal loan, business loan, insurance, demat services, etc. have started taking place, especially after the entry of private and foreign banks which had advantage of the latest technology. That is why banking has become more competitive in today's world market. [3] In India though the money market is still characterized by the existence of both the organized and the unorganized segments, institutions in the organized money market have grown significantly and are playing an increasingly important role. Amongst the institutions in the organized sector of the money market, commercial banks and commercial co-operative banks have been in existence for the past several decades. The Regional Rural Banks (RRBs) came into existence since the middle of seventies. Thus with the phenomenal geographical expansion of the commercial banks and the setting up of the RRBs during the recent past, the organized sector of money market has penetrated into the rural areas as well. Besides the aforesaid institutions which mainly served sources of short term credit to industry, trade, commerce and agriculture, a variety of specialized financial institutions have been set up in the country to accommodate the specific needs of industry, agriculture and foreign trade.

On the basis of Reserve Bank of India Act, 1934, banks are of two types:

1.Scheduled Commercial Banks: According to RBI Act 1934, "a scheduled bank is that bank which has been included in the second schedule of the Reserve Bank of India."

To be eligible for this concession a bank must satisfy the following three conditions:

- It must have a paid up capital and reserves of an aggregate value of at least Rs.5lakhs.
- It must satisfy the RBI that its affairs are not conducted in a manner detrimental to the interests of its depositors.
- It must be a corporation and not a partnership or a single owner firm.

RBI gives these banks number of facilities like credit, rediscount undies, etc. These banks have to deposit fixed proportion of their demand and time deposits with RBI.

2. Non-Scheduled Commercial Banks: Non-scheduled commercial banks are the banks having total capital less than Rs.5 lakhs. These banks are not included in the second schedule of the RBI Act, 1934, as RBI has no specific control upon these banks. But they have to send details of their business to RBI every month. These banks are falling gradually in numbers, at present only 3 such banks are working in India.

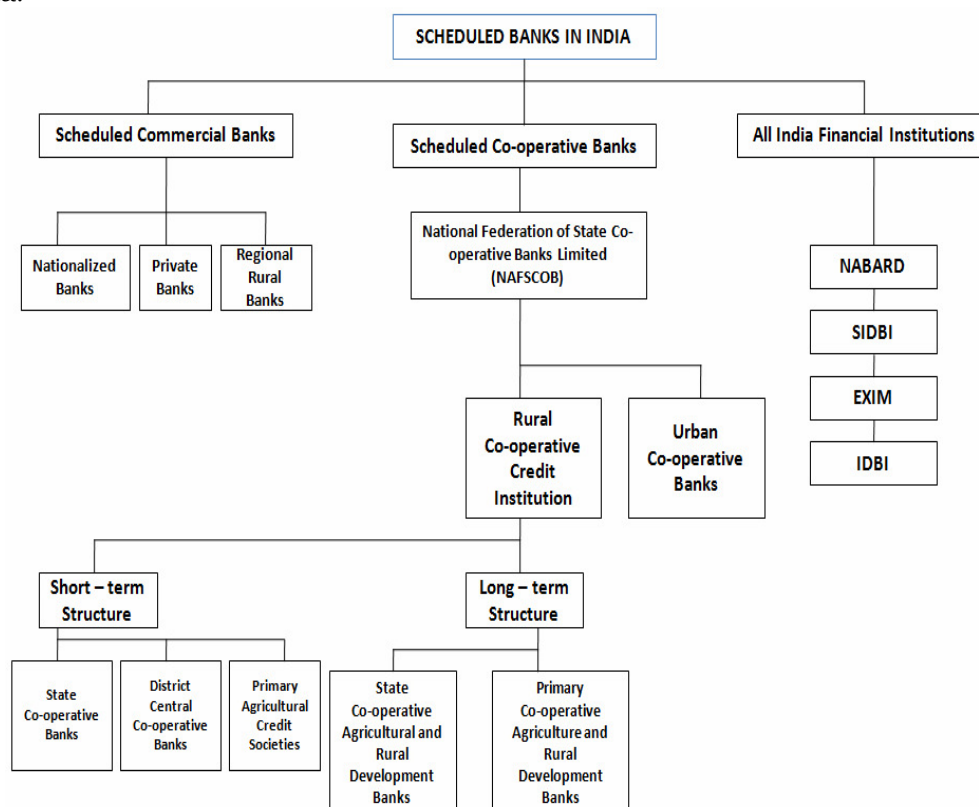


Figure 1.1: Indian Banking Structure (as on March2011)

Source: TNAU Agri-Tech portal

3.1 Commercial Banks

Among the banking institutions in the organized sector, the commercial banks are the oldest institutions having a wide network of branches, commanding utmost public confidence and having a big share in the total banking operations. The commercial banks operating in India fall under a number of sub-categories on the basis of ownership and management control.

3.1.1 Public Sector Banks

Public sector in Indian banking reached its present position in three stages. At the first stage, the then existing Imperial Bank of India was converted into the State Bank of India in 1955 followed by the establishment of its seven subsidiary banks. Secondly, the nationalization of 14 main commercial banks on July 19, 1969 was completed and thirdly, 6 more commercial banks were nationalized on April 15,

1980. Bank of India was later on merged with PNB and Global Trust Bank with that of OBC Bank. Now, IDBI Ltd. is included in public sector banks in 2005 hence this sector constitute 27banks in all.

3.1.2 Private Sector Banks

Private Sector Banks are those Banks which are owned by the private players. The private sector played a strategic role in the development of joint sector bank's reforms in India. In 1951, there were in all 556 private sector banks, of which 474 were nonscheduled and 92 were scheduled. Since then, the number of public sector banks is increasing while those of private sector banks are decreasing.

Private sector banks include Indian and foreign banks:

4 INDIAN PRIVATE SECTOR BANKS

There are two categories of Indian private sector banks as old and new private sector banks.

Old private sector banks are 15 at present but from performance point of view they are not sound as showing downfall in their profitability year after year. In accordance with the financial sector reforms adopted in 1991, new private sector banks have been allowed to set up. According to Narasimham Committee, New private sector banks should be allowed to be established in India, for financially feasible and customer friendly products. New private sector banks are those entered in Indian banking industry after liberalization policy of 1991 and now they are seven in number.

5 FOREIGN BANKS

These banks are those incorporated in a foreign country and set up their branches in India. Their principal function is to make credit available for the exports and imports of the country and dealing in foreign exchange, having their head office in their home country. In India, 32 foreign banks have been established and providing healthy competition to our banks with the use of most up-to-date technology. Hence, the liberalization as well as globalization has distorted the ways of banking business and the Indian banks are facing fierce competition to stay in foreign markets. They are facing number of challenges to get better performance on one hand and on the other hand, with efficiency and effectiveness they are serving customers in new ways.

6 E-BANKING

Bank branches alone are no longer enough to offer services to meet the need of today's high demanding customers. Electronic or online banking is the latest delivery channel to be presented by the retail banks and there is large customer acceptance rate which means delivery of banking services to customers using electronic technology either at their office or home. The e-banking offers huge opportunities in every sphere of business as the competitive advantage, member/client retention, increased revenues and reduced costs. Understanding clients, organizational elasticity, availability of resources, system security, reputable brand name, having multiple integrated channels-channel specific marketing, support from top management and good client services are the vital factors for the success of e-banking. In E-banking system, banks are increasing their customer base with the help of multiple e-delivery channels like ATMs, Credit/Debit/Smart Cards, Internet banking, Mobile banking, Tele banking, EFTs etc. E-banking is offered by many banking institutions due to pressures from global competitions hence, in case of delay in offering transactions based services on the internet; they might lose their market share. To be successful, banks have to offer e-banking facility instead of being pushed into it by others. The customers can do their banking not only when they want to do but also from the convenience, comfort, confidentiality and security of their homes by using internet or other networks, television, telephone/modems. [4]

6.1 The Internet - A Distribution Channel

Distribution channels are physical capacities to build up customer contacts in a systematic way in order to inform, counsel and sell products and services. The Internet is a so called electronic distribution channel, with self-service terminals and telecommunication equipment. Today, media distribution channels are an important way of distributing information and managing usual transactions. Together, personal and media distribution channels are called internal distribution channels. On the other side there are external distribution channels like salesman or franchising partners. The following figure visualizes this classification. [5]

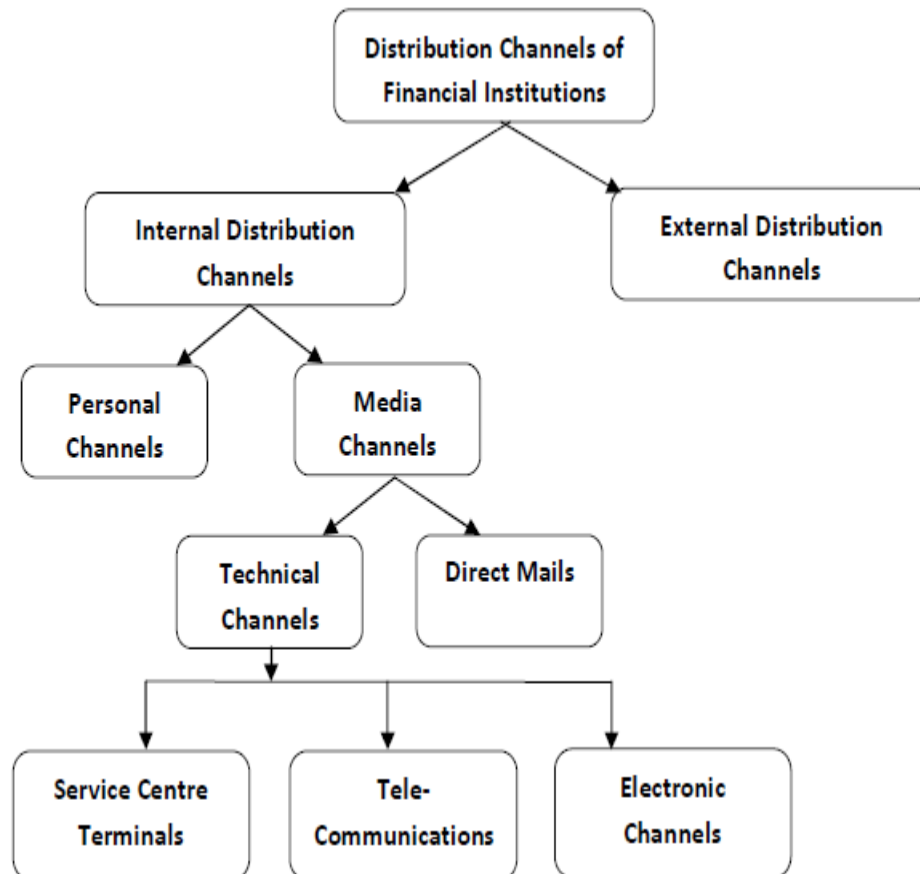


Figure 1.2: Distribution Channels of Financial Institutions

6.2 Areas of Use of the Internet in Financial Institutions

Generally, we may distinguish four classes of Internet used by a bank:

- Information presentation
- Communication (example, email to request for more information)
- Interaction with user (example, execution of programs with individual customer data)
- Transaction banking (example, electronic fund transfer)

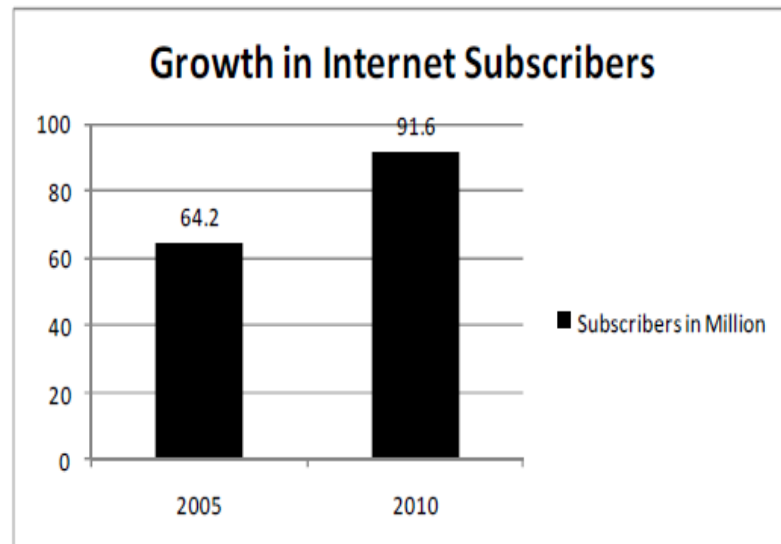


Figure 1.3: Growth in Internet Subscribers in India

Source: NASSCOM, 2011

7 PRODUCTS AND SERVICES OF E-BANKS

E-Banks offer a variety of products and services to attract maximum customers. This will help in building a good market share, creating customer loyalty, with features that are user friendly, more useful and cost effective. E-Banking is attracting customer's by developing their area of 'convenience'.

7.1 Features Of Internet Banking:

- **Online applications**

Consumers interested in doing banking through electronic mode, can get the same facility online only, by registering on the bank's website.

- **Bank Account Access**

E-Banking customers also have the ability to view their accounts online.

- **Transfer of Funds**

Customers can also transfer funds from one bank account to another through internet banking registration.

- **Bill Payment**

Online bill payment is one of the most helpful features of internet banking; it helps in making payment of bills electronically in a second time. The biller is first added by the customer in his/her e-banking account and post which, monthly or accordingly, bill can be paid by just one click of mouse.

- **Benefits at Participating Online Merchants**

The banks partner with online merchants, like matrimony sites, travel agencies, etc. to offer discounts to the customers when a purchase is made with the card.

- **24*7 Customer Service**

Internet banking facility can be availed any time by the user and anywhere, as per customer's convenience and comfort.

- **Access to Old Transactions**

Internet interface is designed in such a manner that history of bank account state mentor e-transactions can be viewed. Some banks provide the data for last 30-45 days only, while others offer a history of six months to 5 years also.

- **Loan Status and Credit Card Account Information**

Many banks are also providing the feature to check the loan status and to see the credit card information as well. Banks ultimate objective is to let customer access his/her all the possible accounts, under one id only, for their delight. This will further also help the banks in increasing their customer base. These features and many others like ordering a cheque book, making a demand draft(DD), stop

payment instructions, etc. help customers in saving their time and simplify their lives. [10]

8 E-BANKING SUPPORT SERVICES

There are a variety of e-banking products and services, offered by both public and private sector banks, along with the risks they cause to the institutions. The most common e-banking support services are web-linking, account aggregation, electronic authentication, website hosting, payments for e-commerce and wireless banking activities, same has been discussed below:

8.1 Web-linking

All the banks have their sites maintained with World Wide Web (WWW). Some websites are completely informational, while others are transactional, features of a Website are:

- Communicative Websites Offers account-related information and updates to static data (such as addresses).
- Informational Website Informational websites gives customers access to general information about the bank, its products and services.
- Transactional Website The ability to conduct transactions through the bank's website by initiating banking transactions or buying products and services. Banking transactions can be a retail account balance inquiry and would also include large business to business funds transfer. [11]

8.2 Managing Service Providers

A bank may choose to sub-contract with a service provider to create, arrange and manage their websites, including web-links. When a bank sub-contracts web-linking arrangements to a service provider, the institution must ensure that the service providers absolutely able to manage the risk exposure. [12]

8.3 Account Aggregation

Account aggregation is a service that collects information from many websites, presents that information to the customer in a consolidated format. The information aggregated could be public as well as personal. This is for customer convenience, as it helps in avoiding multiple logins and managing their various account portfolios. [13]

8.4 Electronic Authentication

Verification of customer's identity and authorizing him/her to avail e-banking facilities are integral parts of e-banking. Banks have adopted alternative authentication methods, including:

- Passwords and personal identification numbers (PINs),
- Digital certificates using a public key infrastructure (PKI),
- Microchip-based devices such as smart cards or other types of tokens,
- Database comparisons (e.g., fraud-screening applications), and
- Biometric identifiers.

The authentication methods listed above vary in the level of security and privacy they provide. As such, the choice of which technique(s) to use should be proportionate with the risks in the products and services. [13]

8.5 Wireless E-banking

Wireless banking is a delivery channel that can extend the reach for internet banking products and services. Wireless banking happens when customers access a financial institution's network(s) by using mobile phones, pagers or personal digital assistants (PDA) through telecommunication companies' wireless networks. [13]

9 E-BANKING STRATEGY

Financial institution management must choose the level of e-banking services based on customer needs and the institution's risk assessment. Institutions need to reach

this decision and the factors considered are customer demand, competition, expertise, implementation expense, maintenance costs and capital support. An institution may choose not to provide e-banking services or to limit e-banking services to an informational website only. Banks or financial institutions must do periodic review to ensure that everything is appropriate for the institution's overall business strategy. Institution's growth depends on the growth in market share, relationship with the customers, cost reduction or new revenue generation. If the bank or a financial institution thinks that a transactional website is appropriate, the next decision is the range the electronic products and services. A bank or a financial institution to have a good market share and to grow must ensure that the e-banking facility to be offered to the customers and for which it is essential to do cost-benefit analysis, risk assessment, monitoring activities, establish clear accountability for the development of policies, regular internal and external audit and managing outsourcing relationships. [19]

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A CHARACTERISTIC ANALYSIS ON TRANSITIONING TO PHYSICS-OF-FAILURE FOR RELIABILITY DRIVER USING BIPOLAR DEVICE

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Abstract- Power hardware has logically acquired a significant status in power age, circulation, and utilization. With over 70% of power handled through power hardware, ongoing examination tries to work on the dependability of force electronic frameworks to follow more rigid limitations on cost, security, and accessibility in different applications. This paper gives an outline of the significant parts of dependability in power gadgets and to address what's in store patterns in this multidisciplinary research bearing. The continuous change in outlook in dependability research is introduced first. Then, at that point, the three significant parts of force hardware unwavering quality are examined, individually, which cover material science of-disappointment investigation of basic power electronic parts, cutting edge plan for dependability cycle and heartiness approval, and clever control and condition checking to accomplish further developed unwavering quality under activity. At long last, the difficulties and open doors for accomplishing more solid power electronic frameworks in the future are examined.

Keyword: Capacitors, plan for unwavering quality (DFR), protected entryway bipolar semiconductor (IGBT) modules, material science offailure (PoF), power hardware, strength approval.

1. INTRODUCTION

Power hardware empowers effective change and adaptable control of electric energy by exploiting the inventive arrangements in dynamic and detached parts, circuit geographies, control techniques, sensors, advanced signal processors, and framework reconciliations. While targets concerning effectiveness of force electronic frameworks are reachable, the rising dependability necessities make new difficulties because of the accompanying variables:

1. Mission profiles basic applications (e.g., aviation, military, more electrical airplanes, rail route footholds, car, server farm, and clinical gadgets);
2. Arising applications under unforgiving climate and long activity hours [e.g., inland and seaward wind tur-bines (WTs), photovoltaic (PV) frameworks, cools, and siphon systems];
3. More severe expense limitations, dependability prerequisites, and wellbeing compliances, e.g., interest for parts per million (ppm) level disappointment rates in ongoing items;
4. Constant requirement for higher power thickness in power converters and more significant level ntegration of force electronic frameworks, which might summon new disappointment systems and warm issues;
5. Vulnerability of dependability execution for new materials and bundling innovations (e.g., SiC and GaN gadgets);
6. Expanding intricacy of electronic frameworks regarding capacities, number of parts, and control calculations;
7. Asset requirements (e.g., time and cost) for unwavering quality testing and heartiness approval because of time-to-advertise pressure and monetary strain

To meet the future application patterns and client assumptions for ppm level disappointment rate each year, it is fundamental to have better comprehension of disappointment instruments of force electronic parts and to investigate creative Research and Development ways to deal with construct dependability in power electronic circuits and frameworks.

According to this point of view, valuable open doors exist for power hardware to grow its job in managing effective and dependable power handling in various types of utilizations. Almost forty years prior, the extent of force hardware was characterized by William E. Newell as three of the significant disciplines of electrical

designing displayed in Fig. 1(a). In like manner, the future dependability research in power gadgets includes multidisciplinary information as characterized here, displayed in Fig. 1(b). It covers the accompanying three significant perspectives: 1) logical examination to comprehend the idea of why and how power electronic items fall flat; 2) plan for unwavering quality (DFR) and vigor approval cycle to work in dependability and adequate heartiness in power electronic items during every improvement interaction; and 3) keen control and condition checking to guarantee solid field activity under unambiguous mission profiles. Strength approval is an interaction that is broadly acknowledged and executed in the auto area, which is to exhibit that an item fills its planned roles with adequate edge under a characterized mission profile inside its predetermined lifetime. Mission profile is a representation of all of the relevant operation and environmental conditions throughout the full life cycle through production process, test, shipping, and service to

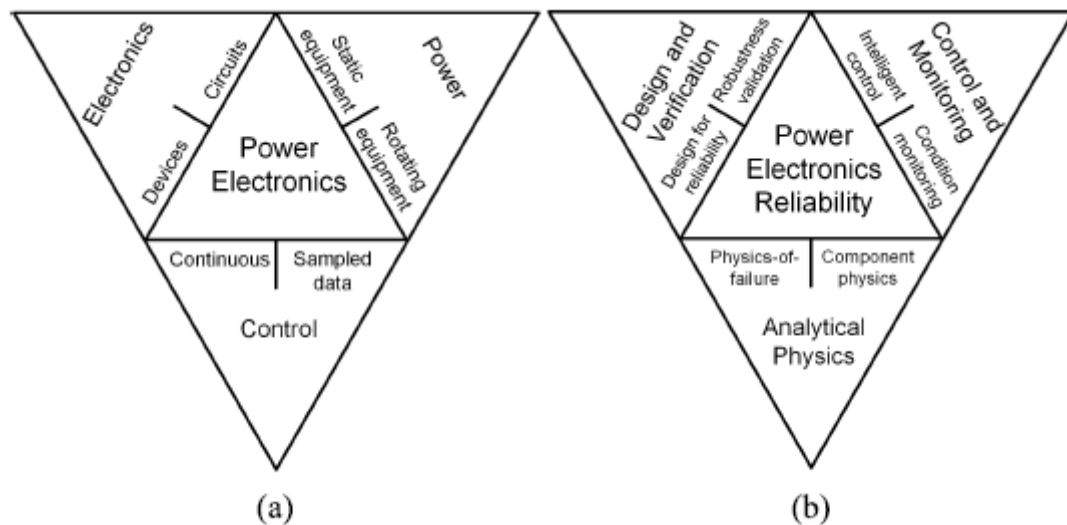


Fig. 1 Defined scope in (a) power electronics by William E. Newell in the 1970s and (b) power electronic reliability research needs seen from today.

end of life. The robustness validation process involves the activities of verification, legal validation, and producer risk margin validation.

This paper gives an overview of power electronics reliability from the three respective aspects defined in Fig. 1(b) and addresses the future trends in this multidisciplinary research direction. Section II lists the ongoing paradigm shift in reliability research in power electronics. Section III presents the physics-of-failure (PoF) analysis of reliability-critical components to provide a basis for system level design. Section IV discusses the state-of-the-art DFR and robustness validation process to build-in reliability through design. Section V presents the control and monitoring (including faulttolerant strategies) methods to improve reliability of power electronic systems under field operation. Finally, the future challenges and opportunities in reliability of power electronics are discussed.

2 ONGOING PARADIGM SHIFT IN RELIABILITY RESEARCH IN POWER ELECTRONICS

Dependability is characterized as the capacity of a thing to fill the expected role under expressed conditions for a specific timeframe, which is frequently estimated by likelihood of endurance and disappointment rate. It is applicable to the sturdiness (i.e., lifetime) and accessibility of the thing. The pith of dependability designing is to forestall the formation of disappointments. The lacks in the plan stage meaningfully affect all delivered things and the expense to address them is logically expanded as the advancement continues.

A. Reliability in Typical Power Electronic Applications

The presentation prerequisites of force electronic items are progressively requesting concerning cost, effectiveness, unwavering quality, natural maintainable materials, size, and power thickness. Of which, the dependability execution has impacts on the security, administration quality, lifetime, accessibility, and life cycle cost of the particular applications.

B. Ongoing Paradigm Shift in Reliability Research

The dependability designing has arisen as a distinguished discipline since the 1950s with the requests to address the unwavering quality issues in electronic items for military applications. From that point forward, much trailblazer work has been given to different unwavering quality themes. One of the standards is the quantitative dependability expectation in light of exact information and different handbooks delivered by military and industry. One more stream of the discipline centers around recognizing and displaying of the actual reasons for part disappointments, which was the underlying idea of the PoF introduced in 1962. Be that as it may, until the 1980s, the handbook based steady disappointment rate models (e.g., Military-Handbook-217 series) have been predominantly applied for portraying the helpful existence of electronic parts. Since the 1990s, with the expanded intricacy of electronic frameworks and particularly the use of coordinated circuits (ICs), an ever increasing number of confirmations were proposing that consistent disappointment rate models are insufficient. The Military-Handbook-217F is consequently authoritatively dropped in 1995. The PoF approach has begun to acquire its increasingly more significant job in dependability designing.

As of late, the drives to refresh the Military-Handbook-217F have gone to a crossover approach, which is proposed for the arranged adaptation of Military-Handbook-217H. During the phase of program's securing provider determination exercises, refreshed experimental models will be utilized for looking at changed arrangements. During the genuine framework plan and advancement stage, logical based dependability demonstrating along with probabilistic strategies will be applied. Escalated PoF research has been consistently led since 1990s in microelectronics and the cutting edge results are introduced. With the change from unadulterated observational based techniques to additional logical based approaches, the change in outlook in dependability research is happening from the accompanying viewpoints.

From Components to Failure Mechanisms: The PoF approach is a strategy in light of underlying driver disappointment component investigation and the effect of materials, imperfections, and weights on item unwavering quality. It changes the examination of framework from a container of parts to a crate of disappointment systems. The conventional handbook-based dependability forecast gives disappointment rate models to different parts. The PoF approach dissects and models every disappointment component incited by ecological and utilization stresses. For a given part, there could be numerous disappointment systems, which ought to be recognized independently. Furthermore, disappointment instruments are not restricted to the part level. As talked about in the standard ANSI/VITA 51.2, there are different disappointment systems in part level (i.e., single semiconductor level), bundle level, and printed circuit board (PCB) level. From this imminent, it is challengeable to apply the PoF to a perplexing arrangement of which predetermined number of models and their related boundaries are accessible. Hence, it is vital to distinguish and to zero in on the basic disappointment components in unambiguous applications.

From Constant Failure Rate to MCF Curve: The conventional reliability metrics constant failure rate (defined as λ) and the corresponding mean-time-between-failures (MTBF) (defined as $1/\lambda$) are found to be inappropriate to most practical cases as discussed. Therefore, it discouraged the indiscriminate use of these metrics.

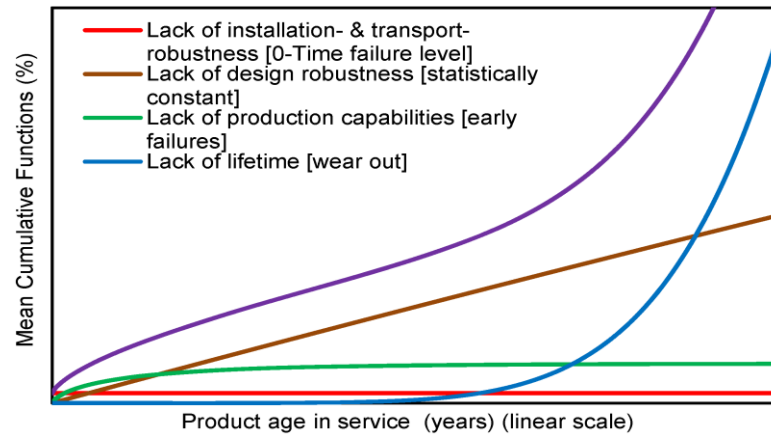


Fig. 2 Example of MCF or $M(t)$ curve for explaining and measuring reliability.

3 DFR AND ROBUSTNESS VALIDATION OF POWER ELECTRONICS

The second part of force gadgets unwavering quality is to incorporate in dependability and adequate vigor into framework plan through the DFR interaction. Enterprises have progressed the improvement of unwavering quality designing from conventional testing for dependability to the DFR. The DFR is the interaction directed during the plan period of a part or framework that guarantees them to have the option to accomplish required degree of unwavering quality. It intends to comprehend and repair the unwavering quality issues front in the plan interaction.

In an organized way to deal with the DFR was suggested, which incorporate an intuitive movement of key plan exercises utilizing fitting investigation instruments. Because of the distinction in picked dependability instruments and indicated prerequisites of items, the DFR cycle changes with industry areas, nonetheless, the conventional structure as a rule covers the course of distinguish, plan, investigate, confirm, approve, and control. In DFR process is introduced for aviation frameworks beginning from the idea, arranging and necessity, advancement, test and assessment, discharge, and assess the field activity execution.

Measurements is a vital premise to manage the impacts of vulnerability and changeability on unwavering quality, which is likewise valid for the PoF-based DFR process. Both exact models and physical-based models are exposed to different sorts of vulnerability in material properties, stress conditions, fabricate interaction, and precision of the accessible models. For instance, if the changes of material-subordinate boundaries k , m and T_0 , and functional pressure subordinate boundary T are considered, the anticipated lifetime of the IGBT modules will be conveyed with time instead of the single fixed values as displayed in Table VII. The two-parameter Weibull conveyance is broadly applied to introduce the combined disappointment appropriation work because of its adaptability to show various patterns of the disappointment level with time. The probabilistic-based PoF models have been produced for plastic bundle consumption. Moreover, Monte Carlo reenactment is another significant measurements device to deal with vulnerabilities to examine the heartiness edge, certainty level. Nonetheless, as the variety is in many cases an element of time and working condition, insights itself isn't adequate to decipher the dependability information without judgment of the suspicions and nonstatistical factors (e.g., alteration of plans, new parts, etc).

4 CONCLUSION

Dependability is a significant presentation file of force electronic frameworks. The status and future patterns of the DFR in power hardware are introduced in this paper. A change in perspective in unwavering quality exploration on power gadgets has left straightforward handbook in view of steady disappointment rate for the PoF approach and DFR process. In like manner, three significant parts of force hardware

unwavering quality are examined: 1) the PoF investigation of dependability basic parts (e.g., IGBT modules and dc-interface capacitors) and two related concentrate on cases; 2) the cutting edge DFR cycle and vigor approval for power electronic frameworks; and 3) the prognostics and wellbeing the executives, dynamic warm control, and shortcoming lenient methodologies for solid field activity.

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INTERNET OF THINGS IN SMART CITIES: APPLICATIONS, CHALLENGES, AND FUTURE PROSPECTS

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Abstract - The Internet of Things (IoT) has become a transformative technology for modern cities, facilitating a shift toward smart cities by integrating interconnected devices to enhance urban living. This paper explores the applications, challenges, and future prospects of IoT within the smart city framework. It delves into various IoT applications that improve efficiency in urban management, including traffic monitoring, waste management, and healthcare. Additionally, the paper discusses significant challenges such as data security, infrastructure costs, and device interoperability. Lastly, it presents potential future directions, highlighting advancements like 5G, artificial intelligence (AI), and edge computing that promise to overcome current limitations and unlock new possibilities for IoT in smart cities.

1. INTRODUCTION

The rise of IoT has opened new opportunities for urban areas to evolve into smart cities by using data-driven, real-time solutions to address the challenges of modern urbanization. Smart cities leverage IoT technology to enhance infrastructure, improve public services, and make cities more livable, sustainable, and efficient. Through sensors, connectivity, and data analytics, IoT creates an ecosystem where various city functions are interconnected, allowing urban managers to make informed decisions and optimize resources.

2. APPLICATIONS OF IOT IN SMART CITIES

2.1 Smart Traffic and Transportation

One of the primary applications of IoT in smart cities is intelligent traffic management. IoT sensors embedded in traffic lights, roadways, and vehicles collect and analyze real-time data on vehicle flow, congestion, and accidents. By adjusting traffic signals dynamically based on real-time data, smart traffic systems can reduce congestion and improve traffic flow, reducing emissions and enhancing urban mobility.

2.2 Waste Management

IoT-enabled waste management solutions use sensors installed in garbage bins to monitor waste levels. The collected data helps optimize collection routes, reducing fuel consumption and labor costs. Such systems improve urban cleanliness and waste collection efficiency, and promote environmentally friendly practices in waste management.

2.3 Energy Management

In the energy sector, IoT plays a critical role in managing and monitoring energy consumption. Smart grids use IoT-enabled sensors to measure energy use, identify outages, and automatically reroute power as needed. Additionally, smart meters provide real-time data to utility companies, helping balance supply and demand and enabling consumers to monitor their usage patterns, contributing to energy savings.

2.4 Healthcare and Emergency Services

IoT in healthcare improves access to medical services by enabling remote patient monitoring and efficient emergency response systems. Smart health devices collect and transmit patient data to healthcare providers, enabling timely diagnosis and treatment. IoT sensors can also be used to monitor environmental factors like air quality, alerting citizens and medical services in real time about hazardous conditions.

2.5 Water Management and Pollution Control

Smart water management systems leverage IoT to monitor water levels, leaks, and usage. These systems help conserve water resources by detecting leaks early and ensuring efficient distribution. IoT sensors also track air quality and pollution levels, aiding cities in maintaining healthier environments and addressing environmental challenges.

3. CHALLENGES OF IMPLEMENTING IOT IN SMART CITIES

3.1 Data Privacy and Security

As IoT devices collect vast amounts of data, ensuring the privacy and security of this information is a critical challenge. IoT networks in smart cities are vulnerable to cyberattacks, which could compromise personal data and disrupt essential services. Ensuring secure communication and data storage is therefore essential.

3.2 Interoperability and Standardization

IoT ecosystems consist of diverse devices from different manufacturers, making interoperability a key challenge. A lack of standardization across devices hinders seamless communication and integration. Establishing common protocols and standards is crucial for the cohesive functioning of IoT systems within smart cities.

3.3 Infrastructure Costs

Building a robust IoT infrastructure for a smart city requires significant investment. The cost of deploying IoT devices, establishing connectivity, and maintaining these systems can be prohibitive, particularly for developing nations. This financial constraint often limits the scalability of IoT applications in smart cities.

3.4 Data Management and Storage

With IoT generating massive amounts of data daily, managing, storing, and analyzing this data is a complex task. Cloud storage solutions are commonly used, but they come with high costs and security concerns. Efficient data management systems that can handle big data are necessary for effective IoT implementations in smart cities.

4. FUTURE PROSPECTS OF IOT IN SMART CITIES

4.1 5G and Enhanced Connectivity

The advent of 5G promises high-speed, low-latency connectivity, which is essential for real-time IoT applications. With faster data transfer rates, 5G will enable more reliable and responsive IoT networks, supporting the seamless functioning of smart city applications like autonomous vehicles and real-time monitoring.

4.2 Edge Computing and Decentralized Processing

Edge computing, which processes data closer to its source rather than relying on centralized cloud servers, is expected to alleviate data latency issues and reduce data transmission costs. This decentralized approach enhances the speed and efficiency of data processing, making it ideal for time-sensitive smart city applications.

4.3 Artificial Intelligence and Machine Learning Integration

AI and ML algorithms can significantly enhance IoT applications in smart cities by enabling predictive analytics and automation. For example, AI-driven traffic management systems can forecast congestion patterns and adjust signal timings accordingly. The integration of AI also enables cities to analyze vast amounts of data efficiently, facilitating proactive urban management.

4.4 Sustainable and Green IoT Solutions

Future IoT applications are expected to focus on sustainability, with green IoT solutions aimed at reducing environmental impact. For instance, solar-powered IoT devices and energy-efficient data centers can reduce carbon footprints. Smart cities

will increasingly adopt IoT systems that prioritize environmental conservation and resource efficiency.

5. CONCLUSION

IoT technology is reshaping urban landscapes by enabling the development of smart cities that address pressing issues such as congestion, pollution, and resource management. While challenges like data security, interoperability, and high costs persist, advancements in connectivity, AI, and sustainable solutions hold the potential to overcome these barriers. As technology continues to evolve, IoT will play a pivotal role in creating smarter, more resilient, and sustainable urban environments. The ongoing integration of IoT in smart cities signifies a transformative shift toward a future where data-driven insights empower cities to better serve their residents, offering new levels of efficiency, convenience, and environmental sustainability.

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Editor

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DEALING WITH COVID-19 IN DENTAL PROFESSION: CHALLENGES AND SOLUTION

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Abstract - To state that the new corona virus SARS-CoV-2 has widely and intensely impacted our lives is a distortion. Since it first showed up on our scanning system in December 2019, the new corona virus has wreaked havoc on virtually all businesses and industries over the planet. The brunt is fairly felt in developing, developed, industrialized, rural, rich, and poor countries and communities; heedless of how well-prepared those countries and communities perceive they were 20 months ago. To this day we are alleviate literature to prepare for, respond to, and adapt to the widely and intensely impact of this virus. This chapter presents contrasting view point on the impact of the novel corona virus to dentistry, through the lenses of a private practice-based general dentist, a nursing home-based public health dentist, and a school of dentistry clinical director. The objective of the chapter is to contribute our experiences and challenges, as well as highlight our capacity to acknowledge to a confrontation with resilience, determination, creativity, inventively, and most importantly, humility and kindness.

1. INTRODUCTION

As we endeavour to cope with the comprehensive brunt COVID-19 has had on all of our lives, we are all trying to grasp the same terminal, arresting a global pandemic. However, though that intention is shared, the path to get there may be altogether varied build upon on the exclusive situation or environment. There is no question that the COVID-19 pandemic presents exclusive opportunities to take troublesome modernization to levels never imagined. In this chapter, the present different viewpoint based on the understanding in various dental health care settings, following the journey and the responses they manage to accommodate to a new reality. We know of the basic concern of personal protective equipment (PPE) and social distancing, however the clash often reached into areas that we formerly had taken for acknowledged. Ones that was not so obvious. Their decisions were unique to the environment they presided over. In some instances, they were highly personal and enlightening and in others - they were to disturb the culture and the teaching model of an integrated department at a large College of Dentistry. Reopening for dental care took on an absolute disparate connotation for patients in a solo practice, group care facility and the pre-doctoral dental clinic.

2. A PRIVATE PRACTICE VIEWPOINT

I am sure that were as sure as recollection is 20/20. A change to how all dentistry was being delivered was conspicuous. I'm a dental student from 1990s and the destructive progression of AIDS was conspicuous throughout the country and the world. At that time, the inescapable use of PPE that we take for granted today resemble to be more of a suggestion rather than a requirement. I remember being

guide by an oral surgeon who requested on not wearing gloves so he could better perceive what was happening during a procedure. Almost overnight, a criterion shift took place that hampered not only dentists but every healthcare provider. The use of PPE became the norm as we endeavour to protect ourselves and our patients against infection. Needle sticks took on an increased level of analysis that resounds to this every day.

Dentistry is emerge and ever-changing art and profession. As instructor we have seen that all over our administration. Adhesives, composites, digital radiographs and digital impressions are accepted today but they were a development of research and innovation leveraged by a ambition to improve results. These shifts in processes, materials, and workflows arise over years or may take decades. It is rare to see prompt and universal change such as what we lived with the AIDS epidemic, Forty years later. We are at the intersection of another criteria shift The SARS-CoV-2 virus which causes COVID-19 has affected all of us, and created a need to once again re-evaluate how we care for our patients. That feedback is universal in principle but can be exclusive depending on the provider and the locals. Solo practitioners, group practices, community clinics and dental schools are all gripping toward the same target along slightly differing paths. Necessarily, we have an ever-increasing agreement to the health of our patients and all those around us.

I am a solo practitioner and as well as faculty at rural dental college, Loni of dentistry for the past 30 years. For almost all of that time I have had the good affluence to be in the same location and neighbourhood. The health of my practice is informally tied to the cohesion of my patient base. In other words, I am starting to see the grandchildren of my long time patients. This familiar relationship with a patient base is not an exclusive phenomenon for many solo practitioners. Patients who come year after year notice. The changes, even the small ones many more.

Patients than I would have thought have asked about the physical changes they saw in the reception and treatment areas as a result of the new healthcare agreement required to operate safely in the COVID-19 era. With all the authority to information patients now have available to them. They are often well abreast about what precautions can be taken to assure their health and safety. They can see the obvious changes but it is what we do, or how we plan behind the scenes, that then make the biggest change. It is here where I feel that the jolt of COVID 19 may actually turn out to be a positive driving force for the forthcoming of dentistry.

The palpable effects are well documented however; it will be the ethereal positive results that will resound for years to come, just like they did those 40 years ago. Yes, having to deal with a forced stoppage was economically paralyzing, but for most of us it was not insurmountable. Constraint for reinstate created new challenges for infrastructure, air filtration, scheduling, social distancing and PPE Hunting for the disburse mask became courage event. However, as conditions are eased and the risk of infection falls with the advent of a vaccine, these will not be the lasting legacy of COVID-19.

We have traditionally always been very effective in our response to prevent cross contamination. What has changed for the better, seemingly overnight, is the quality of our patient interactions and the analysis we give to our patients overall health. We questioned how we were going us connect our office precaution to our patients. An email or letter would easily administer the information, but its capability was suspect. We elected to individually reach out to each family, if the patients that came into the office valued the changes we were making, and then surely speaking with them would be favourable. This proved to be one of the keys to successfully reopening. Our consultation not only encourages our patients, they often re-established rapport and a connection that might have waned over time.

Those interactions assemble value in their return as each call was specific to that patient's particular involvement. It gave us a chance to know what was paramount in their mind so we were able to address it instantly. With so many of our patients working from home, their availability and flexibility to line up appointments was a plus. They often were close by at home rather than drive from work. When they did come in, they found that more time was entirely devoted to them. Waiting in a reception area became a thing of the past as we became very attentive of our time commitment to each patient.

I had originally created my office with what was a common theme 25 years ago more open and this year, we were in the process of contract mg with several new nursing homes we were expanding. We identified a new doctor and hygienist to join our team. All dental providers were well educated to understand the severity of the global impact of COVID-19. Several of them resigned because they either had a compromised immunity or had a family member with a com promised immunity. All payments from the nursing homes were suspended: however. JKEY contracts remained on hold and intact. Due to the resulting lack of income, the company was forced to lay off all remaining employees. The office manager was paid minimally to take calls from facilities that needed consultations.

Beginning in August, the States in India began to allow consultants to re-enter the facilities or to address cracked dentures and consultations in person. A few facilities were decimated. Losing 50% of their patient population to COVID-19. Some patients had been without their dentures for so long, that they had to be put on a soft diet and had grown comfortable eating without them. At present, approximately 20 months since the beginning of the pandemic, nursing homes are slowly re-opening. Few facilities have been designated as COVID 19 facilities. These facilities care for all the COVID-19 patients in their county in order to mitigate the advance of the virus throughout the whole population.

The administrative staffs have been rehired and we are now in the process of interviewing new clinical jobholders. During the pandemic pause, we were able to analyse vendors of the needed PPE In preparation to return to the facilities, we entrenched new COVID 19 business and clinical protocols As the facilities begin to re-open, the general consensus is that all individuals arrive are required to have had a negative COVID-19 test within days prior to their visit. This has been challenging. The turn-around time for test results is usually listed as 2-3 days for the PCR test. However, in reality, the results may take between 2 and 15 days, depending on the volume of tests to be completed by the lab. While the position is not ideal there are fewer cases of COVID-19 in all nursing homes than a few months ago. The States of India continues to isolate infected patients in designated homes, in order to keep the larger population of nursing home residents safe. As we move back towards returning to servicing all our nursing homes, we have to continue flexible with our employees and facilities as well as they, with us. We are invariably looking for new locations with the hope of getting our test results in a certain and timely manner. Most importantly, we have to remember that we are "practicing oral health professionals, which means that we have to keep derive as the situation evolving in order to administer the best treatment for our patients.

3. A DENTAL SCHOOL VIEWPOINT

As a result of COVID-19, both the education of dental students and the clinical practice of dentistry have reversed in ways that may not return to the "old normal." Dental students are learning this new norm and will carry this leading into private/group practice when they graduate. Just as things drastically changed after the 1980s AIDS/HIV crisis, these new changes will be fast and definitive. In 1991, the Third Edition of the JADA supplement, Facts About Aids for the Dental Team, stated,

"The American Dental Association and the centers for Disease Control have published infection control endorsement for the dental office and dental laboratory. Attachment to these recommendations will further diminish the possibility of transmission of HIV in dental settings following this pattern; the changes we made and will extend to make to control the spread of COVID-19 will be wide spread. A significant task facing a practicing dentist is how to keep abreast of changes in dentistry, and how must acknowledge how to transition from hands-on enduring education classes to the virtual or modified virtual session. Schools of dentistry across the globe had to adjust to new educational methodologies. The didactic education can occur remotely, via a number of different video conferencing podiums, but the educational experience should personalize. The students can be in small group seminars or large format classes in both, during the video lecture they may get a polling question conducted at the entire group. The results are advertised sit the shared screen granting the lecturer to customize their presentation and alter the discussion to make sure that the students accept the concepts presented. The shared screen experience itself is appreciation. Using screen mirroring and 3D software, the lecturer can draw and annotate virtual models so that multiple choices and alterations for treatment can be considered.

Similarity, many clinical understanding and examinations are now done virtually Communication skills formerly captured in person sing Standardized Patient, are now taught via room. The patients are at home but still consider the role of the patient that are playing that day, e.g.: -The angry patient, the abused patient, etc. The major difference is that feedback to the dental student or dentist if this was a CE program, is now limited to a written report with a follow up phone call or in person zoom, if needed.

The use of PPE and other administrative and engineering handles has changed with COVID-19 Back in 1993, one author reported that, "Perhaps patient grasp the reasons for PPE but still do not like their use. Again, there are affinities in the education and private practice settings. The accomplished dentist and the novice dental student both need frequent reminders about the proper. Protocols to done and duff PPE. This is in addition to consideration the requirements as conferred by organized dentistry, the various state forming boards, and the centers for Disease Control (CDC).

The challenging conferred by controlling aerosols in a dental office has led to the invested of HEPA filtered air exchange units. As per the CDC guidelines, "Consider the use of a convenient high-efficiency particulate air: (HEPA) air filtration unit while the patient is undergoing, and instantly following, an aerosol generating procedure. Select a HEPA air filtration unit based on its Clean Air Delivery Rate (CADR). The CADR is a settled performance standard defined by the corporative of Home Appliance Manufacturers and reports the system's cubic feet per minute (CFM) rating under as used conditions. The higher the CADR, the quicker the air cleaner will work to remove aerosols from the air. Working in partnership with air filtration the use of extra oral suction tits. This portable dent is placed close to the hand-piece and manages she spread of the aerosol.

The COVID 19 pandemic has impacted. Dental school in a number of different ways, from human resources and staffing to building ownership restrictions Dental school's curriculum had to be completely reshuffled in the spring of 2020, and those radical changes continue to this day. We share here our viewpoint an hone our clinical programs in the DDS program were impacted by the pandemic outlining for a Return in Clinical Operations (RCO) in a University based setting presents ongoing challenges that share some plebeian with the challenges of restarting privately or corporately owned dental practices but present with its own exclusive set of challenges as well.

Establishing the ongoing safety and health of our community including, students, patients, acuity and staff was all over the process the primary consideration in planning our RCO. That principle was carefully unified into planning and modifying our other two primary *raison d'être*, patient care and student education. In order to create properly for the functioning of our Pre Doctoral Comprehensive Care Clinics, a team was created during our period of entirely remote learning that was led by the Senior Director of Comprehensive Care Clinics and integrated representatives from all groups answerable for the proper functioning of the clinical operation. The team was composed of members of the Department of cariology and Comprehensive Care including in Chair and Vice Chair, to Group Practice Directors, an Academic Coordinator, a Clinic Manager, and the Senior Director of Clinic Operations.

The challenges faced in the reopening of our Care Centers in a Dental School setting included:

- 1) State and University mandated limitations on building and room occupancies
- 2) Reclassification of dental procedures by risk of infection by SARS-CoV-2, and the alteration of clinical protocols to minimize the risk of spreading the novel virus
- 3) Physical plant evaluations regarding airflow and quality
- 4) Faculty shortages
- 5) Choosing appropriate PPE

Our pre COVID-19 clinical set up had students treating patients in one of our fourteen group practices. With some students training in internal and external rotations, eight 30 chairs clinics were available to approximately 100 students. When we were able to restart patient care for the BDS program in early November 2020, State and University occupancy regulations limited our clinic occupancy to ten patients at a time (10 chairs) and twenty students. In order to maximize hands on student. Learning and efficiency in patient care, the following modifications were made -

- The twenty Students treated patients in pairs to maximize the patient care experience and student education.
- Rather than one half days and five full day, students were assigned to clinic three fall days one week and three half days the next in alternate fashion. This minimized contact in the building, elevator usage, and student turnover
- Throughout the day, bunch was alternate so patient care could continue throughout the day

Historically, the risk levels of dental treatment have been classified either by medical or dental risk to the patient or difficulty of the action for the practitioner. The COVID-19 era impact with it a unique need to stratify dental therapies by risk of spreading the virus. Since COVID-19 is an airborne disease and aerosol creation has been known to be complicit in facilitating its spread, the capacity to control generation of aerosol within our clinical areas became paramount. A risk lamination of dental procedures developed by the University of Alabama Birmingham was fitted that defined dental procedures from high aerosol to low aerosol generating procedures (AGP) and was based on the capability to mitigate the spread of aerosol or eliminate it altogether. Engineering studies were achieving that indicated our air filtration systems were of Medical Operating Room quality and that air exchange was almost immediate. With that in mind, each pre-doctoral clinical care center was segmented into high risk, medium risk, low risk, and simulation areas. Patients were seated at six feet minimum distances. Since there is no social. Distancing between providers of patient care, all clinical personnel, faculty and students are protected

with used N95 respirators face shields, eye wear, hair tie gowns, shoe coverings and bonnets Administrative staff is equipped with grade 3 surgical masks and face shields All students, faculty, staff, and administration are compulsory to be tested for SARS-CoV2 weekly (saliva test). High AGP patients are tested and overhead high speed expulsion systems are employed when treating these patients to minimize aerosols carrying in the clinic. All operative dentistry procedures are achieved in isolation (dental dam) to the point where if a tooth could not be isolated and air water spray was compulsory, the tooth may have been considered non restorable in this era.

Treatment protocols and criteria along with dental materials were revisited and modified in some situations. Silver di-amine fluoride was popularized into the Comprehensive Care Clinics for the first time to treat teeth with comprehensive decay that could not be isolated or in cases where. More traditional treatment carried the risk of a conclusive extraction involving the use of aerosols. Selective caries excavation was reinforced so as to avoid a similar resultant issue. The use of hand excavation of caries and restoration of teeth with resin modified glass ionomer has been animated in deep carious lesions to reduce the use of aerosol producing instrumentation. In order to reduce the traffic of students and patients immigrated to specific radiographic imaging center in the clinics, a handheld X-Ray system was introduced. To reduce the incidence of patient gagging (aerosol production) our transition to digital imaging was significantly accelerated. We have increased our capability of imaging and manufacturing indirect restorations in house by fivefold and will soon add additional technology. That will naturally increase the number of scanners and afford us with the ability of securely storing and transmitting images to commercial laboratories for increased manufacturing capability.

The University Office of Equal Opportunity offered faculty of particular age groups and of significant medical hazard the option of searching an accommodation to teach remotely. The significant number of faculty in those categories, joined with the number of students unassigned to clinical activities due to building occupancy restraints presented with the opportunity to settle a program of "remote preparation" where by students could work with remote faculty to settle frameworks for treatment plans and appear in clinic completely prepared to treat their patients with excellence. This program's decided is to ensure that the student's time in clinic is dedicated to maximizing direct patient care unencumbered by record keeping and operation preparations. The pandemic has impacted every facet of human life around the globe. The RCO for the BDS program at RDC Dentistry is no exception. The leadership of the Department of orthodontics and dentofacial orthopaedics understand that the key to our success moving forward will lie in our capability to be aware of the emergent data, our capability to recognize its impact, our flexibility, and our deep desire to increase patient care for the community we serve and excellence in education for our students.

4. CONCLUSIONS

The brunt of COVID-19 is universally felt yet the feedback to the pandemic varies with the setting and goals of the organization or association. The common station-creating an environment where each one can live and work safely-can be appear at through many paths depending on the position or the environment. The quality of patient communication and the analysis given to a patient's comprehensive health has been paramount to the solo practitioner during the COVID-19 pandemic. In nursing homes, the key to giving dental care is to remain malleable with employees and facilities. Rebound to clinic actions in a university setting presents challenges that are collateral to the private sector and at the same time abnormally unique. Patients, student jobholder faculty and staff have to be considered Education models

needed to adapt Simulation, remote, virtual and hands on guidance have to mesh logical and yet still cultivate a personalized experience. All of these feedback and approach may not be obvious to our patients, but conclusively, they have been a positive driving effort in dentistry.

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INTERDISCIPLINARY APPROACH BETWEEN DIGITAL ENGINEERING TECHNIQUES AND DENTISTRY: A BOON

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Abstract - Digital techniques including cone beam computed tomography (CBCT), 3-dimension (3D) reconstruction, digital design for implant placement, CAD CAM for veneers and bridges, 3D printing are widely used in medical research, as well as clinical application, which promotes the cross and integration of fields on medicine dentistry and engineering. The requirements of interdisciplinary talents on the two fields are increased rapidly in recent years. All of these digital techniques as well machines need great engineering minds to invent thus making it easier convenient and a better place for saving lives.

Keywords: Engineering, dentistry, multidisciplinary, CBCT, CAD CAM.

1. INTRODUCTION

Diagnostic imaging in dentistry has seen enormous development in the last two decades. In spite of the compelling research interest in Cone Beam Computed Tomography (CBCT)¹, Magnetic Resonance Imaging (MRI), having no ionizing radiation exposure, has also shown significant potential to clarify relevant clinical questions L. K. Niraj, B. Patthi, A. Singla et al., "MRI in dentistry- A future towards radiation free imaging – systematic review," Journal of Clinical and Diagnostic Research, vol. 10, no. 10, pp. ZE14–ZE19, 2016.)². Still, intraoral radiographs are the most common imaging method used in dental practice. To shift from analog to digital imaging was the earliest revolution in modern dentomaxillofacial radiology, bringing many advantages to the clinical work flow³. However, there is still a need for further development of the digital receptors.

In past years minute diagnosis was not possible, there were either random judgements or else extreme expertise or trial and error was the way diagnosis and treatment for the smallest of the disease. Which would lead to wrong treatment planning, deaths or various other side effects? But as the software and hardware world advanced rapidly from bulky computers to flat screen laptops, so did software and other various robotic machines. Thus leading to building of radiographic machines CBCT, CAD CAM, MRI, CT scan, digital microscopes. All of these engineered machines have helped in detecting the minute of the disease leading to a perfect diagnosis and treating it without trial and error.

Different machines offer various specific features to help the doctors and dentists in finalising a correct diagnosis. This chapter will explain few digital diagnostic machines as well as 3d printing machines which would explain the interdisciplinary approach between dentistry as well as engineering.

2. CONE BEAM COMPUTED TOMOGRAPHY

The introduction of cone beam computed tomography (CBCT) devices, changed the way oral and maxillofacial radiology is practiced. CBCT was embraced into the dental settings very rapidly due to its compact size, low cost, low ionizing radiation exposure when compared to medical computed tomography. Alike medical CT, 3 dimensional evaluation of the maxillofacial region with minimal distortion is offered by the CBCT.

Basic principle: Conventional CT equipment using a fan shaped X ray beam captures a series of axial plane slices or from a continuous spiral motion over the axial plane. A CBCT machine, on the other hand, uses a cone-shaped beam and a reciprocating solid state flat panel detector, which rotates once around the patient, 180-360 degrees, covering the defined anatomical volume (complete dental/maxillofacial volume or limited regional area of interest) rather than slice-by-slice imaging found in conventional CT. This single scan (rotation) captures planned data (180-1024 2D images, similar to lateral cephalometric images, each one's marginally offset), unlike stacked axial slices found in CT, further reducing the absorbed x-ray dose from 6 to 15 times in comparison to CT. Depending upon manufacturers, the scanning time of CBCT equipment varies from nearly 5 to 40 seconds. The X-ray parameters of CBCT is comparable to that of panoramic radiography with a usual operating range of 1-15 mA at 90-120 kVp, while that of CT is considerably higher at 120- 150 mA and 220 kVp. The captured 2D images are instantaneously conveyed to the computer, which reconstructs them, using modified Feldkamp algorithm, into the anatomical volume for viewing at 1:1 ratio in axial, coronal, and sagittal planes (orthogonal planes)⁴. The data is in the Digital Imaging and Communications in Medicine (DICOM) format, which enables ease of telecommunication and usage with other third party imaging software.

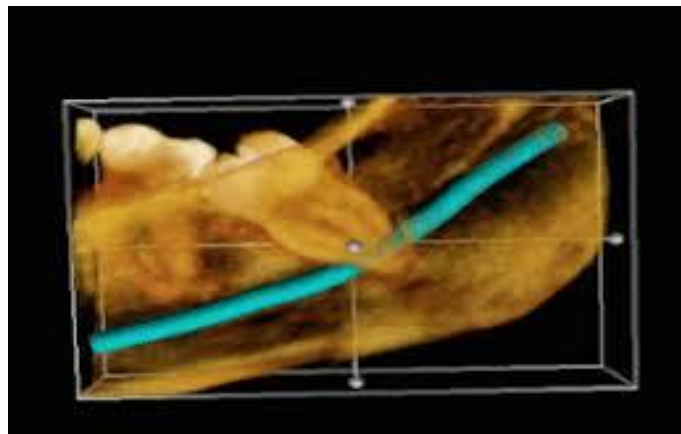
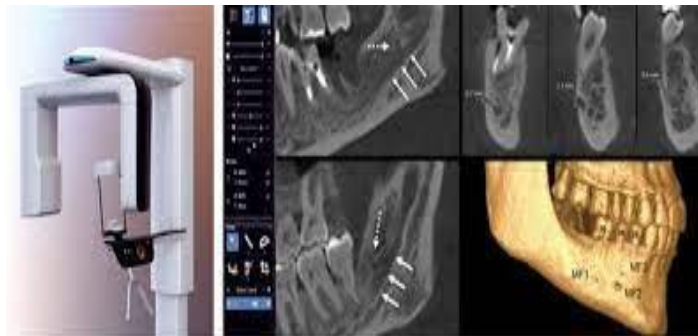
Most of the CBCT equipment comes with user-friendly viewing software containing basic 3D imaging tools. Third party software is accessible at a wide range of price, which provides extensive tools to analyze and do treatment plans. Besides these, third party software are used to prepare surgical guides, virtual study prototypes, and laser generated resin models, easing the process of diagnosis, treatment plan and delivery of the treatment^{5,6}. The utmost hands-on benefit of CBCT in dental imaging is the facilitation to interact with the data and create images imitating those generally employed in clinical settings (for example panoramic, cephalometric, or bilateral multiplanar projections of the temporomandibular joint). These reconstructed views, consecutively interpreted, judged, and measured for diagnostic and treatment-planning purposes.

CBCT in dentistry is used for:

- Tracking the nerve through its foramina,
- Implant placement plan
- For disimpactions of teeth
- In oral and maxillofacial surgeries for any cysts tumours
- Visualization of abnormal teeth
- Evaluation of the jaws and face
- Cleft palate assessment
- Diagnosis of dental caries (cavities)

- Diagnosis of dental trauma.
- To check for number of pulp canals in a tooth in endodontic during RCT treatment, etc

CBCT technology is increasingly accessible in dental practice. It hugely expands diagnostic and treatment possibilities for patients. However, CBCT should only be used after careful consideration, where conventional two-dimensional imaging techniques are not sufficient or where access to the technological processes such as guided surgery will improve patient management. When selecting the best CBCT examination for an individual, it is important to minimise X-ray dose while striving for an image that enables appropriate diagnosis and management. This requires an understanding of the concepts behind CBCT and related technologies, making appropriate training essential for every member of the dental team.⁹



3. INTRA ORAL SCANNERS

An intraoral scanner is a device that is used to capture a direct optical impression. The scanner projects a light source onto the area to be scanned. The images are captured by imaging sensors and are processed by scanning software, which then produces a 3D surface model. With the introduction of the first intraoral scanner, CEREC (Chair side Economical Restoration of Esthetic Ceramics) by Dentsply Sirona in 1985, dentistry was offered an exciting alternative to conventional means of impression-taking. Since then, digital technology has developed, resulting in faster, more accurate and smaller scanners than ever before. Intra Oral Scanners

Recent advances in technology have given dentistry a new direction in diagnosis and treatment planning. Digital models are a possibility and promising alternative to conventional alginate impressions. Three-dimensional scanning offers various advantages and overcomes the drawback of existing methods. Some factors on which intraoral scanning depends include the purchase and support of the technology, training, the chair time and lab time required, and patient acceptance.

Most recent studies accept intraoral scanning as a routine method of recording impressions specific to fields of orthodontics and prosthodontics for its acceptance and tolerance even by the younger patients. In 2014, a series of studies was conducted by Patzelt et al. to verify the accuracy and efficiency of three to four IOSs. They concluded that most of these scanners had comparable accuracy and the digital workflow was more time-efficient.

In 2018, Abduo et al.¹¹ also conducted a study to verify the accuracy of intraoral scanners specific to prosthodontic setup. He concluded that in comparison to conventional impressions, the IOS systems can be reliably used for diagnostic purposes and short-span scanning. The studies indicated variable outcome of the different IOS systems. The accuracy of IOS systems appears to be promising and comparable to conventional methods, they might still be vulnerable to inaccuracies which can be overcome by reducing the span of scanning, and ensuring the scanned surfaces exhibit minimal irregularities.

A systematic review in 2021 by Christopoulou et al.¹² investigated the evidence on patient-reported experiences and preferences following impression taking with intraoral scanners. All studies demonstrated some benefit in favour of intraoral scanning compared with conventional techniques. More positive feelings were generally observed with the intraoral scanners regarding smell, taste, sound, vibration, nausea, and queasiness. Overall, comfort assessment mostly favoured digital methods. No differences were found concerning the level of anxiety between the conventional or digital methods. He concluded that intraoral scanners were a promising new asset in the orthodontic office from the perspective of individuals' experiences and preferences.

Orthodontists also have concerns about stacking multiple model casts because of problems related to either storage space or keeping the fragile gypsum intact. The digitalization of impressions incorporated into orthodontic work not only allays these concerns but also expands the horizon of treatment modalities such as clear aligners, customized appliances, and, of course, retainers.^{13,14}

4. BEHIND THE TECHNIQUE

Here is a brief description of dental scanning technologies:

1. Triangulation

Optical triangulation measures distances to objects without physically touching them. It is useful in acquiring data within a few microns from delicate, wet or soft materials, as are found in the oral cavity. Laser technology is used to calculate distances from the scanner wand sensor to the object using Pythagorean geometric principles.

2. Active Wave front Sampling

This system utilizes a 3D-in-motion technique. It captures the 3D data in a video sequence and models the data in real time. Because it does not rely on a laser and triangulation techniques, it is thus faster and eliminates the downsides of distortion and optical illusion. It can create an onscreen virtual model almost instantaneously.

3. Parallel Confocal Imaging

Using a system of “point and stitch” reconstruction, laser light bounced off the target surface is reflected back to the sensor. The resulting data is used to construct thousands of tomographic slices that are assembled into a picture of the target object. **Accordion Fringe Interferometry:** This system utilizes two beams of laser light that create three projected patterns — called fringe patterns — that strike the target surface and take on new fringe patterns. The distortion in the original pattern is detected by a high-definition video camera, which forms the 3D image.¹⁸

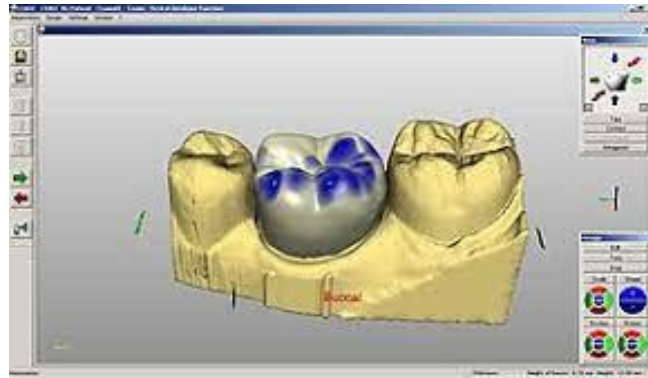


5. CAD CAM

5.1 Computer Aided Diagnosis Computer Aided Manufacturing

Computer-aided design (CAD) and computer-aided manufacturing (CAM) technology systems use computers to collect information, design, and manufacture a wide range of products. With CAD/CAM, parts and components can be designed and machined with precision using a computer with integrated software linked to a milling device. This technology was introduced to dental community in the early 1980s. The earliest attempt to apply CAD/CAM technology to dentistry began in the 1970s with Bruce Altschuler, Francois Duret, Werner Mormann, and Marco Brandestini¹⁹. CAD/CAM dentistry describes the software that makes it possible for dental professionals to perform complex restorations faster, more efficiently, and sometimes more accurately. Both dental practices and laboratories use CAD/CAM technology to construct restorations like crowns, inlays, onlays, veneers, bridges, dentures, and implant-supported restorations from high-strength ceramic. Here's what to expect from a restoration procedure using CAD/CAM. Computer-aided design (CAD) and computer-aided manufacturing (CAM) have become an increasingly popular part of dentistry over the past 25 years. The technology, which is used in both the dental laboratory and the dental office.

All CAD/CAM systems have three functional components: data capture or scanning to capture and record data about the oral environment (tooth preparation, adjacent teeth and occluding tooth geometry); CAD to design the restoration to fit the preparation and to perform according to conventional dental requirements. Thus making it easy to use, as well as delivering the best results for superb treatment.



6. CONCLUSION

The intricate detailing and superb engineering done by the skilled and knowledgeable engineers and inventors have made life so easy. Indirectly serving the human race and uplifting the expectations of science and medicine.

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प्रकृति का प्रसाद केंचुए की खाद

प्रो. डॉ. पवन कुमार जैन

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हरित क्रांति जब शुरू हुई तो कोई सोच नहीं सकता था, कि फसलों को बचाने व उत्पादन बढ़ाने के लिए उपयोग किए जा रहे रसायन भूमि के लिए विष बन जाएंगे अर्थात् जिससे भूमि की उर्वरा, शक्ति पानी धारण करने की क्षमता, उत्पादन क्षमता, सूक्ष्म जीवधारियों की क्रियाशीलता एवं उत्पादकों की क्वालिटी समाप्त हो गई है।

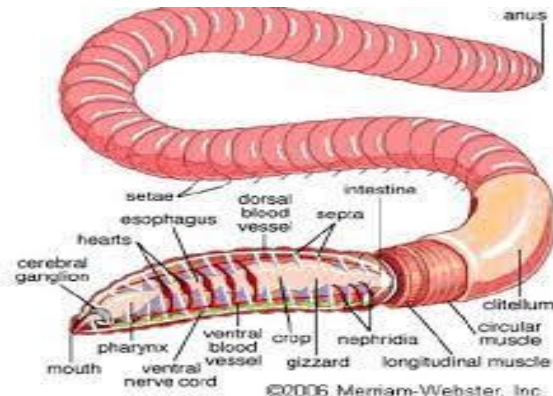
तब ऐसी स्थिति से निपटने के लिए मानव समाज के पास केवल एक विकल्प शेष रहता है जो है जैविक खेती। इस जैविक खेती का एक अंग है वर्मीकम्पोस्टिंग। वर्मीकम्पोस्टिंग केंचुओं के द्वारा खाए गये, कचरा, या गोबर को मल के रूप विसर्जित करने को वर्मीकम्पोस्टिंग कहते हैं इसके मल को वर्मीकम्पोस्ट कहते हैं।

1 केंचुए का जीवन परिचय

केंचुए को अंग्रेजी में अर्थवर्म (Earthworm) कहते हैं जिसका अर्थ है भूमि का कीड़ा। केंचुओं की दो प्रकार की प्रजातियां पाई जाती हैं।

1. माइक्रोडिली – ये छोटे आकार की होती हैं इनकी संख्या 280 है।
2. मेगाडिली – ये बड़े आकार की प्रजाति होती हैं इनकी संख्या 3200 है।

वैज्ञानिकी दृष्टिकोण के केंचुआ अकशेरुकीय प्राणी है जिसे जंतुशास्त्र में एनीलिडा संघ में रखा गया है। इसका शरीर लंबा बेलनाकार, खंडयुक्त जिन पर सीटी होती है इसी से इसका चलना फिरना होता है। केंचुआ द्विलिंगी होता है किन्तु स्वनिषेचन न होकर पर निषेचन होता है इसकी श्वसन त्वचा के द्वारा होता है इसलिए त्वचा को नम होना आवश्यक होता है।

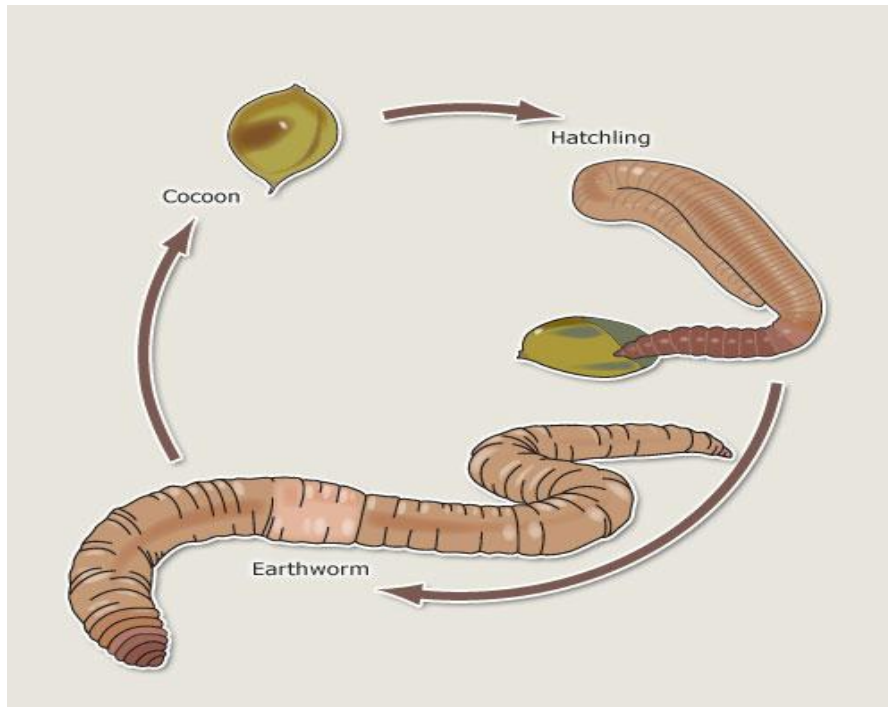


खाने की आदत जमीन पर प्रचलन और विष्टा देने के आधार पर केंचुओं को निम्न प्रकार वर्गीकृत किया गया है।

1. **एपीजिक** — केंचुए की यह प्रजाति भूमि की सतह पर पायी जाती है। ये गहरे रंग के छोटे जीवन चक्र वाले तथा अधिक कोकून (अण्डे) उत्पन्न करते हैं इनके कुछ नाम निम्न हैं। एसीनिया फोयटिडा, पेरी आनिक्स, एक्सकेक्वेटस तथा यूट्रीलिस यूजिकी आदि
2. **इंडोजिक** — ये केंचुए केवल विशेष समय में ही दिखाई देते हैं जैसे वर्षा ऋतु में और बाकी समय विश्राम करते हैं। ये जमीन में अधिक गहराई में रहते हैं।
3. **अनेसिक** — इस प्रजाति के केंचुए का शरीर लम्बा एवं जमीन में सुरंग बनाकर रहते हैं इनकी प्रजाति निम्न हैं, फेरिटिमा, इलागेटा, फेरिटिमा पोस्थुमा इत्यादि।

2 जीवन चक्र

केंचुओं में नर और मादा दोनों जनन अंग एक साथ होते हैं। ये प्रजनन के बाद अंडे न देकर अंडकोश देते जिन्हें कोकून कहते हैं। कोकून शरीर के बाहर आने के बाद दो-तीन सप्ताह में उसमें से 2 से लेकर 7 बच्चे निकलते हैं। ये बच्चे 6-7 सप्ताह के बाद प्रजनन का कार्य शुरू कर देते हैं। उनके शरीर पर मुँह की तरफ से थोड़ा पीछे फूली हुई एक पट्टी तैयार होती है जिसे क्लाइटेलम कहते हैं। यह प्रजनन के लिए तैयार होने की निशानी है।



प्रजाति एटिनिया फोयटिडा करीब-करीब संपूर्ण विश्व में समान रूप से पाई जाती है इस प्रजाति की विशेषता यह है कि निम्न प्रकार के वातावरण एवं प्रतिकूल परिस्थितियों में बहुत सरलता से ढल जाता है, इसका रंग लाल हल्का भूरापन लिए हुए तथा हल्के बैंगनी रंग के होते हैं।

ये 10^0 C- 35^0 C सेंटीग्रेड तापमान व 20-60% नमी होने की दशा में आसानी से जीवित रह सकता है इसका वजन 1000-1500 किली ग्राम तक होता है इसका जीवन चक्र 150-180 दिन का होता है।

ये जन्म के 40 से 45 दिन बाद प्रजनन करने लगता है और एक संसर्ग के बाद प्रत्येक 2-3 दिन में अंडा देता है। यह कार्य 4-6 सप्ताह तक चलता है एक अंडे में 3-5 बच्चे निकलते हैं परन्तु रहने का प्रतिशत बहुत कम होता है।

इसके शरीर में 85% पानी होता है शरीर की त्वचा द्वारा पानी का आदान-प्रदान होता है शरीर से लगी हुई श्लेष्मा तापमान से रक्ष करती है। किन्तु अधिक तापमान में इनकी मृत्यु हो जाती है।

ये रात्रिचर प्राणी है। इसलिए इसे अंधेरा अधिक पसंद है ये रोशनी से डरता है ये प्रतिदिन 1.5 ग्राम से 7 ग्राम तक भोजन ग्रहण करता है। इसके शरीर से निकलने वाली कास्टिंग में जिरेलिन, ऑक्सिन और साइटोकाइनिन नाम पौधों के हार्मोन होते हैं तथा म्यूकस रोगाणुओं को नष्ट करने में सहायक होता है।

3 वर्मीकम्पोस्टिंग के लिए कच्चा पदार्थ

जैव अपघटित कार्बनिक पदार्थों का उपयोग वर्मीकम्पोस्टिंग के लिए किया जाता है जैसे :-

1. **जानवरों का गोबर** — गाय को गोबर, भेड़ का गोबर, घोड़े का गोबर, बकरी का गोबर, मुर्गी का बीट आदि का उपयोग इस कार्य में किया जाता है। अन्य जानवरों के गोबर की तुलना में गाय का गोबर अधिक माना जाता है क्योंकि अनेक प्राथमिक जांचों से पता चला है कि यह अनेक रोग जनकों से बचाव करता है। वर्मीकम्पोस्टिंग के लिए घोड़े के गोबर का उपयोग बहुत सावधानी पूर्वक करना चाहिए। क्योंकि टिटैनस वायरस घोड़े के गोबर में सामान्यतः पाया जाता है। जो कि मनुष्य के लिए बहुत हानिकारक साबित हो सकता है।
2. **कृषि अपशिष्ट** — कृषि अपशिष्ट को अनाजों की उपज प्राप्त करने व भूसे से अनाज को अलग करने के उपरांत, प्राप्त किये जा सकते हैं जिसमें तने, पत्तियों, भूसी (केवल धान की भूसी छोड़कर)

सब्जियों के छिलकों, सड़ी गली पत्तियों, प्रसंस्कृत शेष भोज्य पदार्थ, गन्ने के रस निकलने के बाद शेष पदार्थ आदि।

3. **वनीय अपशिष्ट** — इसमें पादम उत्पाद आते हैं, जिसमें लकड़ी के टुकड़े, छिलका, बुरादा और सड़ी-गली पत्तियों उपयोग की जाती है।
4. **शहरी अपशिष्ट** — शहरी अपशिष्ट को आवासीय लोगों में कॉलों के बाहर जला दिया जाता है परन्तु यदि इसका उपयोग खाद बनाने में किया जाए तो शहर को साफ व प्रदूषण मुक्त रखने के साथ-साथ उपयोगी पदार्थ खाद के रूप में प्राप्त होगा।
5. **पुराने बेकार अखबार व सूती कपड़े** — ये सभी कार्बनिक अपघटित पदार्थ हैं यदि इनका अन्य उपयोगी पदार्थ के रूप में पुनः चक्रीयकरण नहीं किया जा सकता तो इनका उपयोग वर्मीकम्पोस्टिंग में चक्रीयकरण में किया जाना चाहिए।
6. **शहरी कूड़ा** — इसकी एक निश्चित मात्रा जो कार्बनिक होती है, संग्रहित की जा सकती है जिसका उपयोग पुनः चक्रीयकरण कम्पोस्टिंग में किया जा सकता है। अधिकांश घरों के रसोई के अपशिष्ट को थोड़ी सी मेहनत के बाद वर्मीकम्पोस्ट के लिए उपयोग किया जा सकता है।
7. **बायोगैस स्लरी** — बायोगैस प्राप्त करने के बाद यदि स्लरी का उपयोग कृषि में नहीं किया जाए तो इसका सबसे अच्छा उपयोग वर्मीकम्पोस्टिंग के लिए किया जा सकता है।
8. **औद्योगिक अपशिष्ट** — औद्योगिक अपशिष्टों में जैव खाद प्रसंस्करण इकाई व शराब, दवाईयों से निकले अपशिष्ट पदार्थों का थोड़ी सी मेहनत के बाद वर्मीकम्पोस्ट बनाने में उपयोग किया जा सकता है।

4 वर्मी कम्पोस्ट

सम्पूर्ण विश्व व हमारे देश में वर्मीकम्पोस्ट बनाने की प्रक्रिया 10-12 वर्ष पहले ही शुरू हुई है इसी कारण इस विधि से आज तक ज्यादा जानकारी देने वाला साहित्य उपलब्ध नहीं है। आज कल केंचुए के कुछ प्रजातियों के अध्ययन के बाद उनको कृत्रिम रूप से पालकर खाद बनाई जाने लगी है। केंचुओं द्वारा भोजन तत्वों का पोषण करने के बाद करीब 60-70 प्रतिशत अपशिष्ट पदार्थ मल रूप में निकलता है जिसे कास्टिंग कहते हैं। इस खाद को वर्मीकास्टिंग/वर्मीकम्पोस्ट कहते हैं।

5 वर्मी कम्पोस्ट का उत्पाद

वर्मीकल्चर तकनीक की सबसे अच्छी विशेषता यह है कि इसकी किसी भी स्तर पर उत्पाद इकाई आसानी से स्थापित की जा सकती है। किसी भी उत्पादन क्षमता की इकाई स्थापित करने में वर्मीकल्चर की मूलभूत प्रक्रिया में कोई विशेष अंतर नहीं आता, परन्तु उत्पादन क्षमता के अनुसार कार्य में आने वाले तरीकों, औजारों एवं विधियों में अंतर आ जाता है। इसलिए विस्तृत रूप से यह कहा जा सकता है कि वर्मीकम्पोस्ट उत्पादन दो पैमाने पर किया जा सकता है।

1. लघु स्तर
2. बड़े पैमाने पर

6 लघु स्तर पर वर्मी कम्पोस्ट का उत्पादन

लघु स्तर 10–12 किलोग्राम प्रतिमाह वर्मी कम्पोस्ट का उत्पादन कोई भी व्यक्ति थोड़ी सी जगह में कर सकता है। कच्ची/पक्की किसी प्रकार की जगह, प्लास्टिक/लकड़ी के पुराने डिब्बे, ट्रे, सीमेंट की टंकी, मिट्टी की नांद/बड़े गमले, प्लास्टिक के टब आदि में वर्मीकम्पोस्ट बनायी जा सकती है। उपर्युक्त बर्तन के साथ-साथ बजरी, सुखा या गीला कचरा, केंचुए, पानी डालने के लिए छोटे आकार का झारा, ढाकने के लिए जूट का टुकड़ा और कास्टिंग पदार्थ को हिलाने के लिए पंजे की आवश्यकता होती है।

लघु स्तर पर वर्मीकम्पोस्ट बनाने के लिए पात्र के नीचे की ओर बजरी बिछा कर उस पर सूखा कचरा डाला जाता है। इसके ऊपर केंचुओं सहित अपघटित किया हुआ कार्बनिक पदार्थ डाला जाता है फिर उसे गीले कचरे से ढंक देना चाहिये। सबसे ऊपर की ओर जूट का कपड़ा गीला करके ढक देना चाहिए जिस पर समय-समय पर पानी डालते रहना चाहिए। जिससे नमी बनी रहे। 20 किलो खाद बनाने के लिए 500–1000 संख्या के केंचुओं की आवश्यकता है। पात्र में खाद दो तरीके से बनायी जा सकती है।



1. पात्र में धीरे-धीरे कचरा मिलाते जाना चाहिए।
2. एक बार में पूरा भर कर छोड़ देना चाहिए और जब खाद तैयार हो जाए तो उसे अलग कर नए सिरे में पुनः खाद बनानी चाहिए। इसे बेच विधि कहते हैं।

वर्मीकम्पोस्ट की पूरी विधि के मध्य बर्तन के कचरे में 30–40 प्रतिशत नमी होनी चाहिए। नमी की जांच करने के दो तरीके हैं—

1. कचरे को हाथ में लेकर मुट्ठी में दवाएं तो हाथ गीला हो जाए लेकिन पानी न गिरे।
2. केंचुए के ढेर को उलट-पुलट करने से यदि केंचुए की त्वचा गीला और चमकदार दिखाई देती है तो साथ ही शरीर पर कचरे कास्टिंग के कण चिपकते नहीं हैं तो यह भी नमी का सही माप है।

वर्मीकम्पोस्ट बनने की प्रक्रिया में केंचुए की संख्या और पात्र में डाले गए कचरे की मात्रा पर निर्भर करता है। बैच विधि में 40–50 दिन के समय में केंचुओं की संख्या में वृद्धि होती है। केंचुए का औसतवजन एक ग्राम का होता है और सभी प्रकार के उचित वातावरण में ये 3–7 ग्राम का भोजन खाता है।

कम्पोस्ट बनाने के बाद केंचुओं को अलग कर देना चाहिए। इसके लिए साफ स्थान पर पक्के फर्श पर अखबार बिछाकर पूरे बर्तन को उलट देना चाहिए। प्रारंभ में केंचुए ऊपर दिखाई देते हैं फिर कुछ देर बाद अंदर चले जाते हैं। क्योंकि ये रोशनी से डरते हैं तो शीघ्र ही अंधेरे में चले जाते हैं। इसी जगह से खाद से केंचुए आसानी से अलग हो जाते हैं। पलटी हुई खाद की ढेरी की 2 इंच मोटी ऊपरी परत हाथ से हटाने पर फिर से केंचुए दिखाई देने लगते हैं। थोड़ी देर रुककर जब केंचुए अंदर चले जाए तो फिर पर्त अलग कर लें। इसी तरह कई पर्तों में खाद धीरे-धीरे अलग होती जाएगी और धीरे-धीरे नीचे की ओर सिर्फ केंचुए और कचरा रह जाएगा जिसे शीघ्र नया बैड बनाकर उसमें छोड़ दिया जाना चाहिए।

7 वृहद पैमाने पर वर्मीकम्पोस्ट उत्पादन

इसके लिए निम्न विधि अपनाई जाती है।

सरफेस बेड विधि (सतही विधि):— इस विधि में कच्चा माल, साधन और मजदूर की आवश्यकता होती है। सबसे पहले फर्श पर 1/2 इंच मोटाई तक की बजरी रेत डालनी चाहिए जिससे बेड में उचित नमी बनाए रखने में मदद मिलती है। साथ ही साथ केंचुए और अंडे भी नीचे नहीं जाते हैं। रेत अपनी क्षमता के अनुरूप पानी सोख लेती है और

अधिक पानी को बह जाने देती है। नमी की कमी होने पर रेत द्वारा सोखा गया पानी ऊपर बेड पर आ जाता है। रेत के ऊपर 3 इंच तक मोटा कचरा, सब्जियों के छिलके, फसल अवशेष आदि डाले जाने चाहिए। इसके ऊपर वर्मीकम्पोस्ट के लिए पहले से तैयार किया गया कच्चा माल डालना चाहिए। इस कचरे में मिट्टी नहीं होनी चाहिए।

वर्मीकम्पोस्ट के बेड को उत्पादन के लिए हाथ की ऊँचाई और दो हाथ की चौड़ाई वाली बेड बनानी चाहिए। इसकी लम्बाई कितनी भी रखी जा सकती है। परन्तु ऊँचाई और चौड़ाई निश्चित होती है इस बेड में बजरी और मोटे कचरे के ऊपर कच्चा अवशिष्ट पदार्थ एक हाथ की ऊँचाई तक डालना चाहिए। जिससे बेड की चौड़ाई निर्धारित हो जाती है अर्धगोलाकार बेड बनाने से यह लाभ होता है कि केंचुए को कास्टिंग गिराने के लिए सबसे अधिक सतह मिलती है केंचुए कचरा बेड के ऊपर धरातल से करीब दो-तीन अंगुली नीचे तक खाते हैं परन्तु कास्टिंग हमेशा धरातल के ऊपर गिराते हैं बहुत अधिक संख्या में केंचुए होने पर सभी केंचुओं के लिए धरातल पर इस काम को करने में आसानी होती है इस प्रकार बेड में वायु का आवागमन बहुत अधिक होता है जो कि केंचुओं के लगातार गतिशील और स्वस्थ रहने के लिए बहुत जरूरी है।

अर्धगोलाकार बेड में पानी की कमी होने पर भी अंदर की ओर 1 1/2 फुट चौड़ाई और एक फुट ऊँचाई में बहुत अच्छी नमी बनी रहती है यह देखा गया है, कि 10-15 दिन तक बेड में पानी नहीं देने से भी केंचुओं के जीवित रहने के लिए आवश्यक नमी बनी रहती है चूंकि इस स्तर पर केंचुए केवल जिंदा रहते हैं लेकिन कास्टिंग करने की प्रक्रिया रुक जाती है इसलिए बेड बनाने के बाद उस पर अच्छी तरह से पानी का छिड़काव किया जाता है।

बेड में केंचुए डालने से पहले अनेक स्थानों पर हाथ डालकर राह देख लेना चाहिए किसी स्थान पर बहुत अधिक गर्मी/बदबू तो नहीं आ रही है जब बेड में सभी तरफ एक समान नमी, तापमान और किसी प्रकार की बदबू नहीं आ रही है तो उस बेड के बीचों बीच एक नाली बनाकर उसमें केंचुए अण्डे और थोड़ी सी मात्रा में पहले से बनी खाद भी डालते हैं इसके बाद पूरे बेड को टाटपट्टी या धान के पुआल से ढक दिया जाता है।

वर्मीकम्पोस्ट की प्रत्येक क्रिया के बाद नमी को देखकर आवश्यकतानुसार बेड में पानी का छिड़काव करते हैं बेड में उचित परिस्थितियां मिलने पर केंचुए अपने आप में चारों ओर एक समान फैल जाते हैं अधिकांश केंचुए सतह से नीचे लगभग दो इंच गहराई में रहते हैं। इस प्रकार 10 फीट लम्बाई के बनाये गये बेड में औसतन 400-500 किलो कचरा आ जाता है केंचुए के कचरा खाने के औसतन दर के

आधार पर इतने कचरे के लिए 5000 केंचुओं की आवश्यकता होती है। उचित, नमी तामपान और वायु का आवागमन होने पर बेड बनाने के लगभग 30–35 दिनों के अंदर ऊपर की सतह में करीब 3–5 इंच मोटी पर्त पूरी तरह से तैयार वर्मीकम्पोस्ट एकत्र हो जाती है। टाटपट्टी को हटाकर तैयार कास्टिंग को एक तरफ उतार दिया जाता है तैयार खाद को जिससे यह काम आसान हो जाता है। 2–4 इंच की 2–3 पर्तों में बनी हुई खाद को एक तरफ उतारने के बाद कच्ची खाद व केंचुए के मिश्रण में पंजे से कुरैरी लगाकर उसको फिर से ढक दिया जाता है इसके बाद पुनः नमी को देखकर पानी का छिड़काव करते रहते हैं। पहली पर्त की खाद को बनने में ज्यादा समय लगता है लेकिन उसके बाद की 4–6 इंच मोटी पर्त 5–7 दिनों तक तैयार हो जाती है पूरी खाद को शुरू में जिस तरफ उतारा गया था उसी ओर उतारना चाहिए। इस प्रकार 40–50 दिनों में 80 प्रतिशत से अधिक खाद उतर ली जाती है और अंत में थोड़ी से खाद व सभी केंचुए सहित एक छोटी से ढेर के रूप में रह जाते हैं।

अब नीचे डाले गए कचरे को एक तरफ करके पुनः फर्श पर 4 अंगुली मोटर नया कचरा डालकर पहले बताए अनुसार कच्चा माल डालकर नया बेड बनाया जा सकता है इसमें जो पहली बार कचरा नीचे डाला जाता था उसका उपयोग ऊपर ढाकने के लिए किया जाता है बड़े पैमाने पर तैयार की गयी वर्मीकम्पोस्ट को छानना जरूरी होता है इसके लिए लकड़ी के फ्रेम में जाली लगे हुए छननों का इस्तेमाल किया जाता है। इस वर्मीकम्पोस्ट खाद को छानने के बाद जितनी जल्दी हो सके उतनी जल्दी सील बंद कर दिया जाता है। जिससे कि उसमें इस बात का विशेष ध्यान दिया जाता है कि बोरी में कुछ स्थान खाली छोड़ दिया जाता है जिससे उसमें हवा रह सके। इसके बाद सील की गयी बोरियों को ऐसे स्थान पर रखा जाता है, जो ठण्डा व छायादार हो।

8 वर्मीकम्पोस्ट उत्पादन हेतु आवश्यक औजार व उपकरण

वर्मी कम्पोस्ट के लिए आवश्यक औजार व उपकरण चुनाव इस बात पर निर्भर करता है कि उत्पादन किस स्तर पर हो रहा है बहुत छोटे स्तर पर काम करने के लिए कम साधनों का भी उपयोग किया जा सकता है। परन्तु बड़े पैमाने पर उत्पादन करने के लिए औजार और उपकरणों का होना अतिआवश्यक है। बड़े पैमाने पर उत्पादन में प्रयोग किया जाने वाले औजारों का वर्णन इस प्रकार है।

(1) पानी का स्रोत पाईप लाइन और टंकियां

वर्मीकम्पोस्ट उत्पादन में केचुएं व कचरे के लिए ठंड में कम पानी की आवश्यकता होती है परन्तु यह मात्रा गर्मी के बढ़ जाती है इसी प्रकार इकाई की स्थापना तभी करनी चाहिए जब उसके पास ही आवश्यकतानुसार पानी उपलब्ध हो।

पानी का स्रोत बहुत दूर होने पर बाल्टियों से पानी लाने की बजाय पाईप लाइन का उपयोग किया जाता है यदि पानी मिलने में परेशानी हो तो उत्पादन वाले स्थान पर ही पानी जमा करने के लिए भूमि पर एक टंकी बना लेनी चाहिए। पानी देने के लिए फब्बारेनुमा बहाव सबसे अधिक अच्छा है साथ ही साथ बाल्टी मग के स्थान पर झारे का प्रयोग किया जाना चाहिए। स्थायी रूप से बनायी गयी इकाई में छत की ओर से लटकाए हुए छोटे स्प्रिंकलर का या फब्बारे का उपयोग किया जा सकता है केवल नल खोल देने या मोटर चला देने से आवश्यक पानी दिया जा सकता है इससे समय और श्रम दोनों की बचत होती है।

(2) टोकरी, प्लास्टिक ट्रे, परात

बड़े पैमाने पर वर्मीकम्पोस्ट इकाई में ट्रक, ट्राली से कच्चा माल उतारने के लिए, प्राथमिक अपघटन करने के लिए मिश्रण बनाने में भरने के लिए, बेड़ खाली करने के लिए, संग्रहण पैकिंग आदि के लिए इनकी आवश्यकता पड़ती है। सामग्री के अनुरूप नाप व आकार की टोकरी परात और ट्रे की आवश्यकता होती है इनकी संख्या वर्मीकम्पोस्ट उत्पादन के आधार पर तय होती है।

(3) फावड़े, पंजे व दंताली

ये तीनों औजार वर्मीकम्पोस्ट उत्पादन इकाई की प्रक्रियाओं को पूरा करने के लिए, आवश्यकता है। फावड़े का उपयोग कच्चे माल को भरने में किया जाता है लोहे या लकड़ी के पंजे का उपयोग वर्मीकम्पोस्टिंग बेड में कुरैरी लगाने के लिए किया जाता है, दंताली का उपयोग कच्चे माल को फैलाने व बेड़ पर बनी हुई खाद को उतारने के लिए किया जाता है।

(4) दस्ताने

कच्चे माल, कचरे को मिलाते समय हाथों में रबर के दस्तानों का उपयोग करना चाहिए।

9 वर्मीकम्पोस्ट की गुणवत्ता

वर्मीकम्पोस्ट किसी भी प्रकार के कच्चे माल से तैयार की जाए तो बनी हुई, वर्मीकम्पोस्ट के भौतिक गुणों में कोई विशेष अंतर नहीं दिखाई देता यह इस बात का प्रतीक है कि प्राकृतिक रूप से केंचुए के शरीर में की जाने वाली प्रक्रिया सदा एक समान रहती है।

हमेशा वर्मीकम्पोस्ट छोटे –छोटे दानेदार पदार्थ के रूप में होती है इसके हर दाने का नाप व आकार एक समान होता है। वर्मीकम्पोस्ट को उपयोग करने तक उसमें लगातार 30 प्रतिशत नमी बनाए रखना चाहिए इस नमी पर खाद का तापमान लगातार 15–25 से रखा जा सकता है। इस तापमान पर उसमें उपस्थित अधिकांश सूक्ष्म जीवाणु क्रियाशील बने रहते हैं।

9.1 भौतिक गुण

1. यह दानेदार काले भूरे रंग का होता है। यह गंधहीन व हानिकारक जीवाणु रहित होता है।
2. वर्मीकम्पोस्ट के दानों पर म्यूकम जैसा पदार्थ का आवरण होने से यह मिट्टी में हवा का आवागमन और जल संधारण क्षमता बढ़ाती है।
3. खाद में नमी की 30 प्रतिशत मात्रा होने पर इसमें सूक्ष्म जीवाणुओं की क्रियाशीलता बढ़ जाती है। जिससे पौधों को आवश्यक पोषण प्राप्त करने में आसानी होती है।
4. वर्मीकम्पोस्ट में विद्युत आवेशित कण होते हैं। जो पौधों को मिट्टी से पोषक तत्व प्राप्त करने में सहायता करते हैं।

9.2 रासायनिक गुण

वर्मीकम्पोस्ट की रासायनिक जांच से परिणामों से यह निष्कर्ष निकाला जा सकता है कि सभी प्रकार की फसलों के लिए आवश्यक रसायन इसमें पाए जाते हैं इन रासायनों को पोषक तत्व भी कहा जाता है। पोषक तत्व हैं नाइट्रोजन, फास्फोरस, पोटैश, मैंगनीज, जिंक व कॉपर। वर्मीकम्पोस्ट की एक सबसे बड़ी विशेषता यह है कि इसमें अतिसूक्ष्म तत्व जिसमें बोरान, मोलिव्डेनम आदि हैं पौधों के लिए पर्याप्त मात्रा में पाए जाते हैं।

विभिन्न परीक्षणों से वर्मीकम्पोस्ट के रासायनिक विश्लेषण से निम्न जानकारीयां सामने आई हैं।

1. पी.एच.	7.0 – 7.5%
2. N ₂	1.75 – 2.5%
3. C : N	12 – 15.1%

4. पोटेशियम	1.25 – 2.0%
5. फास्फोरस	1.5 – 2.25%
6. कैल्शियम, मैगनीशियम, सल्फर	3.5 गुणा
7. लोहा, कॉपर, जिंक, मैगनीज	200–700 पी.पी.एम.
8. कोबाल्ट, मोलिव्डेनम, पोटैस	पर्याप्त मात्रा में धुलित अवस्था में।

9.3 आर्थिक पहलू

केंचुए की वर्मी बायोटेक्नोलॉजी बहुत ही लोकप्रिय है क्योंकि यह बहुत सरल विधि के साथ-साथ लागत वाली भी है। इस तकनीक में किसी भी प्रकार के महंगे मूलभूत संरचना की आवश्यकता नहीं होती है केवल कुछ वस्तुओं की आवश्यकता होती है जैसे बिछाने के रेत, खजूर, नारियल, ताड़, छेवला आदि के पत्तों की आंशिक रूप से अपघटित कार्बनिक पदार्थ और केंचुओं को हानिकारक जीवाणुओं जैसे चींटियों, चूहों, सांपों आदि से बचने के लिए उपर्युक्त पदार्थ का होना चाहिए। ऊपर बतायी वस्तुओं की आवश्यकता सरफेस विधि द्वारा कम्पोस्ट बनाने में होती है। इसके अतिरिक्त बेड के ऊपर स्थानीय रूप से उपलब्ध वस्तुओं से छाया बना दी जाती है जिससे केंचुए के बेड को सीधी धूप से बचाया जा सकता है इसको देखने से ज्ञात होता है कि सरफेस विधि द्वारा कम्पोस्ट बनाने में लागत तो बहुत ही कम या न्यूनतम आती है क्योंकि किसी भी स्थान पर आसानी से ये चीजों उपलब्ध हो जाती है।

9.4 वर्मीकम्पोस्ट के लाभ :-

1. आसान प्रबंधन
2. वर्मीकम्पोस्टिंग अवशिष्ट एक ही स्थान पर उपलब्ध होने से उसका अधिकतम उपयोग होगा और औद्योगिक स्तर पर आर्थिक लाभ होगा।
3. वृहद स्तर पर घरेलू, और ग्रीमण औद्योगिक, अपशिष्ट को पुनः चक्रण किया जा सकता है यह प्रदूषण को भी कम करता है।

10 कम्पोस्टिंग पदार्थों का प्राथमिक उपचार

प्रारंभ में कम्पोस्टेबल, नॉन कम्पोस्टेबल, बायोडिग्रेडबल और नॉन बायोडिग्रेडबल पदार्थों का पृथक्करण किया जाता सकता है जैसे प्लास्टिक पत्थर, कांच धातु आदि। बहुत अधिक संक्रमणित अपशिष्ट (घरेलू अपशिष्ट भी जैसे अधिक मसाले) रसायनों को अपशिष्टों से अलग कर देना चाहिए। साफ व स्वच्छ पदार्थ का चुनाव करना चाहिए। अपशिष्ट पदार्थों का ढेर बना दिया जाता है बड़े-बड़े टुकड़ों में बांट दिया जाता है अलग किये गये पदार्थों का अलग ढेर बना दिया जाता है

और इसे ऐसी ही स्थिति में धूप में रहने में बांट दिया जाता है अलग किये गये पदार्थों का अलग ढेर बना दिया जाता है और इसे ऐसी ही स्थिति में धूप में रहने दिया जाता है जिससे अन्य दूसरे अनचाहे सूक्ष्म जीव नष्ट हो जाते हैं और दुर्गन्ध भी दूर हो जाती है।

11 वर्मीकम्पोस्ट उत्पादन में सावधानियां

केंचुआ एक बहुत ही संवेदनशील जीव है इसलिये केंचुए द्वारा कम्पोस्ट बनाने की प्रक्रिया में निम्न सावधानियों को ध्यान में रखकर उत्तम गुणवत्ता वाली खाद अधिक मात्रा में प्राप्त की जा सकती है :—

1. **तापमान** — केंचुए की संवर्धन प्रक्रिया का तापमान 20–30 से तक होना चाहिए जिससे केंचुए की वृद्धि और प्रजनन अच्छी तरह से हो सके।
2. **स्थान** — केंचुओं द्वारा कम्पोस्ट बनाने के लिए बेड का आकार निश्चित होता है और उसमें निश्चित संख्या में ही केंचुए डाले जाते हैं।
3. **नमी** — कम्पोस्ट बनाते समय नमी 30 प्रतिशत से अधिक होनी चाहिए। जिससे कार्बनिक पदार्थ नर्म हो सके और केंचुए तेजी से भोजन ग्रहण कर सकें। इस बात का भी ध्यान रखना चाहिए। कि बेड जलनिमग्न अवस्था में न हो, नहीं तो केंचुए मर जाएंगे।
4. **प्रकाश** — केंचुए प्रकाश के प्रति बहुत संवेदनशील होते हैं ये अंधकार प्रिय होते हैं और प्रकाश से दूर भागते हैं सीधे सूर्य के प्रकाश के कारण नमी बहुत तेजी से कम होती है जिसके कारण केंचुए कचरे की निचली सतह में छिप जाते हैं।
5. **पी.एच. माध्यम** — केंचुओं को उदासीन माध्यम (पी.एच. — 7) प्रिय होता है अम्लीय माध्यम नुकसानदायक होता है।
6. **सी : एन अनुपात** — वर्मीकम्पोस्ट बेड में कार्बन नाइट्रोजन का अनुपात 15:1 से 30:1 के बीच होना चाहिए। मिट्टी में कार्बनिक की निश्चित मात्रा कम होने पर केंचुए के मृत होने की स्थिति आ जाती है जब अनुपात 30:1 से अधिक होने पर अपघटन की दर घट जाती है। कार्बन नाइट्रोजन अनुपात फीड मिक्सचर में 15:1 से कम होने पर नाइट्रोजन अमीनोफिकेशन के कारण नष्ट होने लगता है।
7. **परभक्षी** — वर्मीकम्पोस्ट बेड में केंचुओं की सुरक्षा चींटियों, मेढ़क, सांप, चूहों आदि से बचाना आवश्यक है। चींटियों से बचाव के लिए करंज की खली उपयोग की जा सकती है।
8. **आंशिक अपघटन** — केंचुओं को दिया जाने वाला आहार आंशिक रूप से अपघटित होना चाहिए। क्योंकि जाता कूड़ा कचरा,

कार्बनिक पदार्थ के ढेर से बहुत अधिक ऊष्मा निकलती है जिससे केंचुए मर जाते हैं इसी लिए बेड तैयार करने से पहले कचरे में गोबर की निश्चित मात्रा मिलाकर छोड़ देते हैं और बाद में कचरा बेड में करते हैं।

12 वर्मीकम्पोस्ट सतही विधि लघुत्तम इकाई वर्णन

इकाई नाम	:-	केंचुआ पालन सतही विधि
केंचुआ बेड	:-	10 X 3 X 1.5 फीट
इकाई क्षेत्र	:-	12 X 3.5 फीट (सतह)
स्थान	:-	छायादार, बगीचे, शेड लगाकर किसी भी स्थान पर
केंचुआ संख्या	:-	4,200 से 5,000 नग प्रति इकाई
कचड़ा	:-	जैवीय अपघटन योग्य (500 किलोग्राम) प्रति 60 दिन
वर्मीकम्पोस्ट	:-	300 किलो प्रति 60 दिन
कनवर्जन अनुपात	:-	60 से 65 प्रतिशत (फील्ड स्तर पर)
केंचुआ गुणन	:-	20 प्रतिशत प्रतिमाह (फील्ड स्तर)
इकाई क्षमता	:-	अपना रोजमर्रा का कार्य करते हुए एक कृषक परिवार सरलतापूर्वक पांच उपरोक्त इकाई का संचालन कर सकता है।

आर्थिक विश्लेषण :-

वर्मीकम्पोस्ट के उत्पादन से कृषक दो प्रकार से लाभान्वित हो सकते हैं।

1. प्रत्यक्ष लाभ
2. अप्रत्यक्ष लाभ

प्रत्यक्ष लाभ :-

250 किलो कचरा + 250 किलो गोबर + 5 किलो केंचुआ
 300 किलो खाद + 8 किलो केंचुआ 300 किलो खाद न्यूनतम मूल्य 3 रुपये किलो की दर से रुपये 900/- 3 किलो केंचुआ 500/- कि.ग्रा. की दर से रुपये 1500/- कुल रुपये 2400/-
 इस प्रकार दो माह में रुपये 3000/- के केंचुए से 2400/- रुपये का लाभ कमाया जा सकता है। तथा तीन हजार पूंजी के केंचुए कृषक के पास उपलब्ध रहेंगे।

इस प्रकार वर्ष भर में कुल लाभ रुपये $2400 \times 6 = \text{रु. } 14400/-$
 प्रतिवर्ष इस प्रकार एक कृषक लगभग रुपये 15000/- रुपये की

अतिरिक्त आय प्रतिवर्ष प्राप्त कर सकता है। तथा उसके पास रुपये 3000/- की पूंजी के केंचुए उपलब्ध रहेंगे।

अप्रत्यक्ष लाभ

कृषक अगर वर्मीकम्पोस्ट का प्रयोग अपनी खेती में करे तो उसे निम्न अतिरिक्त लाभ हो सकते हैं।

1. रु 600-700 की रासायनिक खाद की बचत 1 एकड़/फसल इस प्रकार रुपये 1200-1400/- की बचत प्रतिवर्ष (रासायनिक खाद के खर्चों/एकड़)
2. सिंचाई के खर्चों तथा पानी की बचत लगभग 20-25 प्रतिशत तक की।
3. तीन वर्ष पश्चात जुताई में ईंधन/मेहतन में कम खर्च।

13 अन्य उपयोगी साहित्य

1. बी.एस. हन्सरा, जी. पेरुमल एवं के.चन्द्रकन्दन (2001), मोर्डनाइजिंग इन्डियन एग्रीकल्चर इन 21 सेन्चुरी, कोन्सेप्ट पब्लिसिंह कं. नई दिल्ली।
2. एम. घोष. जी.एल. चट्टोपाध्याय के.बराल एवं पी.एम. मुन्शी, पोसीबिलिटीज ऑफ, वर्मीकम्पोस्ट इन एग्रीकल्चर फॉर रीकोनसाईलींग ससटेनेबिलिटी विथ प्रोडक्टिविटी, इंस्टीट्यूट ऑफ एग्रीकल्चर, विश्व भारती, शांति निकेतन, पश्चिम बंगाल।
3. अस्पी फाउन्डेशन, जैविक खेती की दिशा में एक नया कदम, रामकृष्ण मिशन आश्रम, राँची (झारखण्ड)

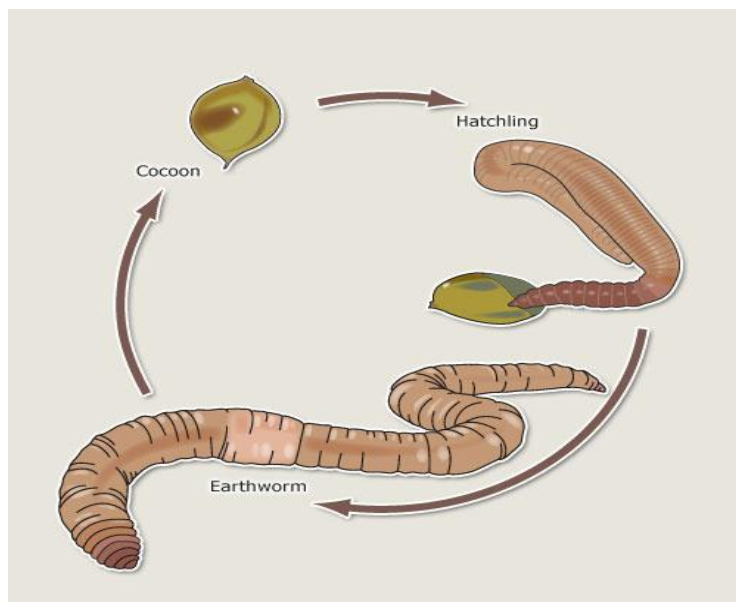
14 वर्मीकम्पोस्ट की मात्रा का निर्धारण

भूमि का प्रकार	प्रथम वर्ष	वर्मीकम्पोस्ट की मात्रा
1. उत्तम उर्वरा भूमि	2000 किलो/एकड़	500-600 किलो/एकड़
2. मध्यम उर्वरा भूमि	3000 किलो/एकड़	500-600 किलो/एकड़
3. खराब कम उर्वरा भूमि	5000 किलो/एकड़	2000 किलो/एकड़
प्रथम, दूसरे, तीसरे वर्ष में 500 किलो/एकड़ आगे तीनों वाले वाले वर्षों में।		

15 वर्मीकम्पोस्ट तथा अन्य कार्बनिक खादों की तुलना

खाद	N (%)	P (%)	K (%)
वर्मीकम्पोस्ट	0.66	0.99	0.40
सड़े - गले कार्बनिक पदार्थ	0.50	0.20	0.50

गोबर खाद	0.40	0.20	0.10
सुआर मल खाद	0.55	0.50	0.40



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A STUDY OF CONSUMER BEHAVIOR RELATED TO ADOPTION OF MOBILE WALLET SYSTEMS IN INDIA BASED ON MOBILE TECHNOLOGY ACCEPTANCE MODEL

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Abstract- As far the mobile wallet industry is concerned; the development has resulted in prevalent adoption of the mobile wallets for numerous purposes. The central focus of the research study is to discover the level of approval and adoption of mobile wallets by people throughout the corona virus crisis. On 24 March 2020, the Indian Government declared a lockdown for more than 20 days. Due to the lockdown, the movements of the whole population of India were under stringent constraints to stop the spread of the deadly novel corona virus disease in India. A recent study that was made by FIS revealed that 68% of Indian consumers are using online or mobile banking to perform their monetary transactions. The study likewise found that 48% of the respondents were anticipated to utilize contactless payments instead of hard cash or cards as an outcome of the pandemic. It represents that there was a massive shift in consumer behaviour as far as their daily shopping routines are concerned. The study revealed that senior and young generation Y consumers were more adaptive to modifications in the way they were making payments as compared to other age. The study adopts the existing mobile technology acceptance model based on the Self-efficacy Theory, Protection Motivation Theory and critical mass theory to discuss the total objective or behaviour of the people to adopt mobile wallet systems in India, especially after 24 March 2020. Primary data was collected by using a self-administered questionnaire that was utilized to gather information from individuals who had begun utilizing mobile wallets for the first time after the first lockdown was imposed in India. Aspects such as ease of use, self-efficacy, perceived pleasure and perceived critical mass were discovered to have a significant positive association with the behavioural objective that resulted in the adoption of mobile wallets by people who were not utilizing mobile wallets previously. The research study makes an effort to learn the specific elements that had an optimal influence on the adoption of mobile payment systems after the pandemic set in. The study tries to extend the existing technology acceptance model in light of the pandemic situation. In general, the model reveals 58% of the variance in (BI) behavioural intention to adopt mobile wallet applications as an outcome of the Covid 19 pandemic.

Keywords: Mobile Wallets, Mobile Wallet Adoption, Mobile Technology Acceptance Model

1 INTRODUCTION

In the past few decades, technology has been developing rapidly-especially, with regards to Mobile-based applications that have simplified e-commerce.¹ Cellular Smartphones are becoming more potent in terms of both- processing power and bandwidth.² This has enabled developers to make highly optimized applications that run on both android and iOS platforms. These applications have a more elaborate graphical user interface and have made life easier for millions across the globe. Mobile wallets are services that are installed in the form of an application that is connected to the bank account of the user and can be used to make instant payments for individual purchases from vendors who accept payments from the mobile wallet systems. Mobile wallets are like physical wallets and can store credit card numbers, the owner's identity, contact information, electronic cash, billing details, shipping

information etc. of the user.³ The mobile wallets have become extremely popular and will soon be accepted as a prevailing payment method of the future.⁴ Traditionally, cash was used as a common medium of exchange in all kinds of retail stores by specific individuals who did not have the required level of trust in mobile wallet systems. Due to the pandemic, the overall payments landscape witnessed a considerable change and consumers moved voraciously towards making payments using mobile wallets. The FIS report that was published in September 2020 showed that the total digital wallet deals in India increased from 124.3 crores in February 2020 to 253.2 crores in May 2020. In the year 2016, the Indian Government announced demonetization and efforts were taken by the Government to move towards a cashless society.⁵ the overall value of the digital payments market in India was at rupees 1638.49 trillion in the financial year 2019. Reports from KPMG suggest that it will rise to more than ₹ 4300 trillion.⁶ Technological innovations have equally supported the mobile payments industry. India saw many unique state-of-the-art innovations as far as the digital payment industry is concerned. The demonetization had a deep impact on the ecosystem of the Indian payments, and there were continuous efforts made by the Government to digitize the payments in the country.

The Ministry of Electronics and Information Technology announced the Digital India program. It made it unavoidable for businesses having a turnover of over ₹ 50 crores to make payments through the electronic medium.⁷ Due to the Covid 19 pandemic, the travel, hospitality and retail sectors were poorly hit due to which the digital payment sector saw a decline of approximately 35% in the total value of transactions.⁸ According to the recent data provided by the National Payments Corporation of India, the sharp decline was observed due to the lockdown is as there were several restrictions on travel and the hospitality sector in general. In India, several mobile wallet payment systems range from PayTM to Google pay. Owing to the pandemic, people seem to be scared exchanging currency notes as the currency notes can be contaminated and result in spreading of the infection.

In contrast, the exchange of currency notes or coins takes place.⁹ Therefore, it can be said that mobile payments have become the new normal and reports suggest that people who adopted mobile payment systems during the pandemic will continue to use mobile payment systems even after the pandemic ends. The current study has been conducted to find out the specific factors that had a maximum impact on the adoption of mobile payment systems after the pandemic set in. The study attempts to extend the existing technology acceptance model in light of the pandemic situation.

2 OBJECTIVES OF THE STUDY

1. To study the concept Mobile Wallet System in India.
2. To study the Mobile Technology Acceptance Models.
3. To study the association between aspects such as ease of use, self-efficacy, perceived pleasure, perceived critical mass and the behavioural objective that resulted in the adoption of mobile wallets by people.
4. To study different concepts related to adoption of mobile wallet adoption behavior such as Mobile Usefulness, Perceived Protection, Mobile Ease of Use, Perceived Critical Mass, Mobile Self Efficacy, Technological Self Efficacy, Behavioral Intention to Use etc.
5. To study the specific elements that had an optimal influence on the adoption of mobile payment systems after the pandemic set in.

3 LITERATURE REVIEW

3.1. The original Technology Acceptance Model developed by Davis and MTAM (Mobile technology Acceptance Model)

Davis developed the initial technology acceptance model to look into the antecedents, which affected the intent of individuals to accept a novel innovation. The design established by Davis is among the most widely utilized designs to take a look at the intent to adopt an innovation.¹⁰ Numerous revisions of the initial technology acceptance model were made that covered the gaps and recognized the limitations of the initial technology acceptance model. MTAM is one such design which was established by Ooi & Tan.¹¹ The MTAM model or the mobile technology acceptance model deals with the fundamental limitations of the initial technology acceptance model-which is its original definition. The technology acceptance model, which was developed by Davis, specified all the variables from the point of view of an organization. Nevertheless, innovation adoption is not just about a specific company, workplace or organization. The technology acceptance model and its principles can extend beyond organizational restrictions where there are several variables which can impact the choices of people regarding whether they must embrace a specific technology or not. Several scholars have made valid references to variables that are interdisciplinary when we talk about mobile innovation. Human beings react differently to various innovations, and their behaviour is positively vibrant. For example, the perceived ease of use for a mobile user would undoubtedly be different from those who use a notebook computer as a laptop have a larger screen size and much better battery life. The MTAM was developed to address such problems, and it incorporated numerous modifications that appeared to have increased the total validity of the design. The MTAM utilizes Mobile Ease of Use (MEOU) and variables like Mobile Usefulness (MU) which makes the model more specifically appropriate to the adoption of mobile-based applications. The original MTAM was not powerful enough to accommodate the intricacies associated with the usage of mobile innovation applications as it had a minimal number of variables. Overall, it can be concluded that the original MTAM was ineffective enough as it lacked the variables that must be otherwise considered while studying the element of mobile innovation approval.

To overcome this drawback, Phan and Daim recommended that more variables need to be added to clarify the adoption of an innovation, in particular, related to mobile services.¹² It would be fair if both technological and non-technological aspects that affect the adoption decision are examined in a research study model. Other researchers have backed this method for future mobile innovation adoption research studies. The study by Ooi and Tan was the first to propose the MTAM as an extended design. They studied the adoption of smartphone credit card technology using MU and MEOU with other extra constructs that relate to the context of a smart device credit card. During the pandemic scenario, the 'practicality' and 'ease of use' of mobile technology are similarly crucial for individuals dealing with a persistent condition of Corona-phobia in embracing mobile technology. Provided the importance of 'Mobile usefulness' and Mobile ease of use' throughout the pandemic, the current study proposes to extend these fundamental constructs of the tightfisted mobile technology acceptance model with other drivers of adoption that a non-technological.

3.2. Self Efficacy theory

As cited in Schunk, the Self-Efficacy Theory developed by Bandura postulates that individuals who feel a shared sense of self-efficacy in carrying out a job might consequently prevent it, but those who think that they are capable would readily perform.¹³ Also, the Self-Efficacy Theory proposes that the self-perception of

individuals act as the very best predictors of their behaviours in particular situations. Since its beginning, the role of self-efficacy has been explored in various research domains, including technology adoption and acceptance. In the current research study, self-efficacy is defined as a "person's individual belief about his or her capability to initiate, persist in, and achieve success in behaviour". If people have a proper understanding of their self-efficacy in using a novel technology, they are more likely to adopt and accept it. Self-efficacy is not just essential for potential technology adopters but also matters especially when during the pandemic, contamination can occur by exchanging currency notes. As the Self-Efficacy Theory is dealing with personal belief, it might match the MTAM that mainly deals with technological factors.

3.3. Critical Mass Theory

The Critical Mass Theory proposed by Oliver et al. attempts to anticipate the efficiency of group action in pursuit of public welfare. In the context of technology adoption, the critical mass theory could be applied to understand the impact of other individuals on people's technology use within the organization.¹⁴ Predominantly, the number of individuals adopting a technology might cause the useful insights of probable adopters as the 'Critical Mass Theory' proclaims that the adoption of people depends upon their membership in neighborhoods (e.g., organizations). As observed by Lee et al., a critical mass of users suggests the state of sufficient group approval, which has a profound impact on subsequent adoption and use of technology. With this, Shen et al. thought that individuals' PCM of a piece of technology would then affect their adoption behaviours.¹⁵ Throughout the pandemic circumstance, social networking and messaging platforms like WhatsApp saw a 40 percent boost in use, according to a study done by Kantar, a data and consulting company.¹⁶ Though individuals never met face to face as often due to the virus scare, they were still a part of their social group. Therefore, the critical mass theory is very much relevant and need to be thought about as one of the critical variables that affect the behavioural intention to utilize a provided technology.

3.4. Protection Motivation Theory

The protection motivation theory reveals how individuals deal with and make decisions in times of harmful or stressful occasions in life.¹⁷ These decisions are a method of safeguarding oneself from viewed threats. The theory tries to predict and explain what encourages people to alter their habits. During the lockdowns that were announced in India, people may have felt it safe to perform transactions using the mobile wallets. They might have enjoyed the deep sense of satisfaction as there was no longer a need to go back to their houses, with loose change and wash/ sanitize currency notes with soap before storing them. Generally, the flow has been perceived as a desired intrinsic reward when performing an activity and, therefore, serves as an influential construct in technology use.

4 DEVELOPMENT OF THE HYPOTHESIS FOR THE STUDY

The current study covers the following variables to develop the hypothesis.

- a. Mobile Usefulness (MU): MU refers to the degree of perceived performance enhancement in utilizing a mobile technology or service.¹²
- b. Perceived Protection (PP): Refers to the perception that using the technology would protect the individual by avoiding physical contact with the currency notes or any other contaminated object, which would spread the infection.
- c. C. Mobile Ease of Use (MEOU): Refers to the perceived degree of easiness in learning and utilizing a mobile technology or service.¹²

- d. Perceived Critical Mass (PCM): A component of Social Influence that plays an influential role in driving an individual's behaviour.¹⁸
- e. Mobile Self Efficacy (MSE): defined as one's perceived ability to make payments using m-wallet.¹⁹
- f. Technological Self Efficacy (TSE): defined as one's perceived ability to use other mobile-related technology such as the ability to upload and download documents, installing and uninstalling applications, send emails, and troubleshoot fundamental issues that may arise while making the use of mobile wallets.²⁰
- g. Behavioral Intention to Use (BIU): is defined as the degree to which a person has formulated prearranged plans to perform or not perform some specified future behaviour.²¹

4.1 Statements of Hypothesis

- H1: MEOU is positively related to BI
- H2: MSE is positively related to BI
- H3: MSE is positively related to MEOU
- H4: MSE is positively related to MU
- H5: MU is positively related to BI
- H6: PCM is positively related to BI
- H7: PCM is positively related to PP
- H8: PP is positively related to BI
- H9: TSE is positively related to BI
- H10: TSE is positively related to MEOU
- H11: TSE is positively related to MU

5 RESEARCH METHODOLOGY

a. The target population of this study is m-wallet users (Regular Residents) from Pune (Maharashtra, India) who used the Mobile wallet technology for the very first time after 24.3.2020. Maharashtra in general and Pune in particulars sees a mix of different religions like Hindus, Christians, and Muslims that live together in unity. The literacy rate of Pune is 89.56% (Male – 92.31% and Female 86.67%) according to the 2011 census data.

b. Sampling method: Purposive sampling technique was utilized as the sample of this study needs a level of filtering. People who had used the mobile wallets for the very first time during the pandemic were chosen purposively.

c. Sample Size: Though the researcher distributed the questionnaires to 524 respondents, a total of 400 responses were eligible for data analysis. This translates to a response rate of around 78%. A self-administered questionnaire with adapted measurement items from past studies was used as the survey instrument. A Likert scale with seven points ranging from “(1) Strongly Disagree” to “(7) strongly Agree” was utilized to measure the perceptions of respondents relating to the items of measurement. Table 5.1 showcases the measurement items and sources.

6 DATA ANALYSIS

6.1. The profile of the respondents:

Variables	Attributes	Total			
		Count	%	%	Count
Gender	Male	204	51.00%		
	Female	196	49.00%	100.00%	400
Age	Less than or = 20 yrs	3	0.75%		
	21-30 yrs	4	1.00%		
	31-40 yrs	11	2.75%		

	41-50 yrs	60	15.00%		
	51 years and above	322	80.50%	100.00%	400
Education level	SSC/HSC	31	7.75%		
	Diploma/Advanced diploma	107	26.75%		
	Bachelors degree/Professional qualification	229	57.25%		
	Masters/PhD	33	8.25%	100.00%	400
Marital status	Single	8	2.00%		
	Married	392	98.00%	100.00%	400
Occupation	Housewife/Homemaker	13	3.25%		
	Working Professional	58	14.50%		
	Self-employed	203	50.75%		
	Private employed	69	17.25%		
	Student	57	14.25%	100.00%	400
Annual Income	>= 1 lakhs	42	10.50%		
	1-2 lakhs	49	12.25%		
	2 to 3 lakhs	110	27.50%		
	3 to 4 lakhs	123	30.75%		
	4 to 5 lakhs	46	11.50%		
	5 to 6 lakhs	22	5.50%		
	Above 6 lakhs	8	2.00%	100.00%	400
Frequency of using m-wallet since lockdown	Very Rarely	49	12.25%		
	Once in a full moon	54	13.50%		
	Not so frequently	42	10.50%		
	Sometimes	94	23.50%		
	Often	101	25.25%		
	Always	24	6.00%		
	Every Day	36	9.00%	100.00%	400

The sample contained an almost equal number of male and female respondents. Purposive sampling method was used to identify individuals who used mobile wallets for the very first time after the lockdown was announced. Age -wise, the table shows that the maximum numbers of respondents belong to the age group of 51 years and above. It seems that people from older generations can be reluctant to use modern technology as methods of payment. 57.3% of the sample contained people who had either a bachelor's degree or a professional qualification. 98% of the respondents were married around 2% of the respondents were single. The table shows that the state of Maharashtra is a very famous tourist destination; most of the respondents in the sample (51%) were self-employed. 31% of the respondents had an income between 3 to 4 lakhs. 25% of the respondents often use mobile wallets since the lockdown was announced.

6.2. Constructs and Measurement Items

1. Mobile Usefulness

- MU1: I find that using mobile wallets has several advantages
- MU2: Effectiveness in my routine would increase as a result of using mobile wallets.
- MU3: Time is saved because of the use of mobile wallets.
- MU4: The productivity is enhanced with mobile wallets as far as payments are concerned.

- MU5: I can pay faster using mobile wallets as compared to traditional cash payment methods.

2. Mobile Ease of Use

- ME0U1: I think that using a mobile wallet is not difficult at all.
- ME0U2: I think that it is not difficult to learn how to use mobile wallets.
- ME0U3: I can efficiently find what I want while using mobile wallets.
- ME0U4: I think that it is not difficult to become an expert in mobile wallet usage.

3. Perceived Critical Mass

- PCM1: Most of my associates frequently use mobile wallet for paying.
- PCM2: Most of the people I interact with use mobile wallet for making payments.
- PCM3: Many people within my social groups routinely utilize mobile wallet for making payments at all retail stores.
- PCM4: Most individuals in my group use mobile wallet.
- PCM5: Most of my friends and acquaintances frequently make the use of a mobile wallet for paying.

4. Perceived Protection:

- PP1: I find it is safe to use mobile wallets.
- PP2: I feel that using mobile wallets helps me avoid direct contact with contaminated objects.
- PP3: I feel that if I use currency notes, I will get infected with the coronavirus.
- PP4: I feel that using mobile wallets helps in maintaining the principle of social distancing.

5. Mobile Self-Efficacy

- MSE1: I think it would be easier to use mobile wallets if I had first learned how to use it.
- MSE2: Even if there was no one around to explain me how to use the mobile wallets, I would still be able to use it effectively.
- MSE3: Even if I had never been exposed to the use of mobile wallets before, I'm confident that I would be able to use mobile wallets easily.
- MSE4: If I could refer someone to help me to solve my difficulties during the usage of mobile wallets, I would be able to use mobile wallets.
- MSE5: If I'd seen someone else using mobile wallets and experience it before I tried using mobile wallets myself, only then I would be able to use mobile wallets.
- MSE6: If someone had assisted me in getting started, I would be able to use mobile wallets easily.

6. Technology Self- Efficacy

- TSE1: I'm confident that I can understand the words or terms that are related to the use of mobile wallets.
- TSE2: I feel confident that I can access online forums or online discussion groups regarding the use of mobile wallets.
- TSE3: I'm confident that I can learn the advanced usage and features of mobile wallets.

- TSE4: I am confident that I can figure out what is to be done when a particular feature of the mobile wallet application does not work.

7. Behavioural Intention

- BI1: I am confident that I will continue to use mobile wallets in the near future.
- BI2: whenever I get an opportunity, I will prefer using mobile wallets rather than using hard cash.
- BI3: I'm willing to continue the use of different mobile wallets in the future.
- BI4: assuming that I have access to the users of mobile wallets, I intend to use it whenever the opportunity serves.
- BI5: I will think about using mobile wallet always.

6.3. Common method bias

A Self-report approach was used to compile the questionnaire. Due to this approach, the problem arising from the common method bias could threaten the overall value of the results of the study. Therefore, a common method of factor analysis was used to find out the magnitude of the common methods of bias and the adverse impact it may have on the data. It was found that the substantive factor loading is what is significant, whereas the method of factor loading is one non-significant with negative values. Therefore, it can be said that common method bias is not a significant concern and does not challenge the overall validity of the study.

6.4. Assessing the outer measurement model

The Dijkstra- Henseler's rho (RhoA) and composite reliability measures were used to evaluate the overall reliability. Based on table number 5.5, it can be seen that all the values of Dijkstra- Henseler's rho (RhoA) and composite reliability exceeded the minimum required value of 0.7. Therefore, it can be said that all the measurement items for the constructs that have been used in the study are reliable. The table also represents convergent validity as all the average variance extracted values for all constructs are above 0.5. The loading value of all measurement items is at least 0.7. As far as discriminant validity is concerned, the HTMT (Hetero-Trait-Mono-Trait) inference was used. The results in table 5.6 show that the value of one is not included in any of the confidence intervals which means that all the constructs of indeed different from each other with regards to the empirical standards.

6.5. Loadings, Composite Reliability, Dijkstra Henseler's rho and Average Variance Extracted.

Constructs	Items	Loadings	Composite Reliability	rho_A	Average Variance Extracted
BI	BI1	0.889	0.935	0.932	0.769
	BI2	0.878			
	BI3	0.858			
	BI4	0.86			
	BI5	0.863			
MU	MU1	0.834	0.913	0.902	0.702
	MU2	0.794			
	MU3	0.873			
	MU4	0.831			
	MU5	0.814			
MEOU	MEOU1	0.833	0.935	0.885	0.726
	MEOU2	0.86			
	MEOU3	0.877			
	MEOU4	0.807			
PCM	PCM1	0.883	0.95	0.955	0.824

	PCM2	0.914			
	PCM3	0.921			
	PCM4	0.898			
	PCM5	0.885			
PP	PE1	0.913	0.935	0.946	0.846
	PE2	0.918			
	PE3	0.924			
	PE4	0.894			
MSE	MSE1	0.847	0.935	0.927	0.716
	MSE2	0.82			
	MSE3	0.834			
	MSE4	0.865			
	MSE5	0.823			
	MSE6	0.855			
TSE	TSE1	0.857	0.935	0.903	0.732
	TSE2	0.834			
	TSE3	0.896			
	TSE4	0.863			

Notes: BI=Behavioural Intention; MU = Mobile Usefulness; MEOU = Mobile Ease of Use; PCM=Perceived Critical Mass; PP=Perceived Protection; MSE = Mobile Self-Efficacy; TSE = Technology Self-Efficacy.

Table 6.1. Hetero-Trait-Mono-Trait (HTMT inference).

Paths	Original Sample (O)	Sample Mean (M)	Bias	2.50%	97.50%
MEOU - > BI	0.212	0.218	0.006	0.122	0.403
MSE - > BI	0.174	0.184	0.01	0.059	0.346
MSE - > MEOU	0.322	0.327	0.005	0.171	0.463
MSE - > MU	0.395	0.398	0.003	0.214	0.576
MU - > BI	0.264	0.287	0.023	0.164	0.434
PCM - > BI	0.049	0.051	0.002	-0.013	0.121
PCM - > PP	0.344	0.347	0.003	0.252	0.449
PP - > BI	0.464	0.466	0.002	0.192	0.367
TSE - > BI	-0.129	-0.127	0.002	-0.286	0.026
TSE - > MEOU	0.338	0.44	0.102	0.302	0.589
TSE - > MU	0.364	0.361	-0.003	0.21	0.561

6.6. Inspecting the inner structural model:

There is an absence of multi-co linearity as the Variance inflation factors of all values have a range from 1.000 to 4.131, which are below the minimum acceptable limit of five. Fig. 5.1 and Table 5.1 show that nine out of the eleven hypotheses were supported. Except for the sixth and the ninth hypothesis, all other hypotheses were when supported. MEOU ($\beta = 0.212$, $p < 0.001$), MU ($\beta = 0.264$, $p < 0.001$), MSE ($\beta = 0.174$, $p < 0.001$), and PP ($\beta = 0.464$, $p < 0.001$) are significantly related with the BI to adopt mobile wallet technology. Contrariwise, two constructs, namely TSE ($\beta = -0.129$, $p > 0.05$), and PCM ($\beta = 0.049$, $p > 0.05$) failed to explain an individual's behavioural intention to adopt the mobile wallet technology.

Fig. 6.1: Structural model

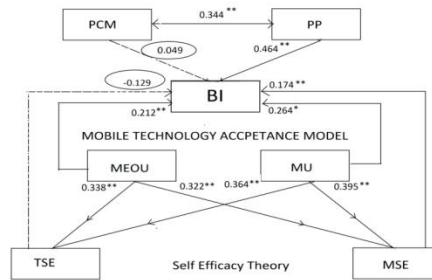


Table 6.2. Testing of Hypothesis

Hypotheses	Paths	Path Coefficients	T Statistics	P Values	Remarks
H1	MEOU -> BI	0.212	3.246***	0	Supported
H2	MSE -> BI	0.174	2.588**	0.005	Supported
H3	MSE -> MEOU	0.322	4.367***	0	Supported
H4	MSE -> MU	0.395	4.456***	0	Supported
H5	MU -> BI	0.264	4.134***	0	Supported
H6	PCM -> BI	0.049	1.410 NS	0.129	Unsupported
H7	PCM -> PP	0.344	7.265***	0	Supported
H8	PP -> BI	0.464	6.452***	0	Supported
H9	TSE -> BI	-0.129	1.589 NS	0.086	Unsupported
H10	TSE -> MEOU	0.338	6.157***	0	Supported
H11	TSE -> MU	0.364	4.654***	0	Supported

Notes

a. BI=Behavioural Intention; MU = Mobile Usefulness; MEOU = Mobile Ease of Use; PCM=Perceived Critical Mass; PP=Perceived Protection; MSE = Mobile Self-Efficacy; TSE = Technology Self-Efficacy.

b. ***p < 0.001, **p < 0.01, NSp > 0.05.

7 DISCUSSION AND IMPLICATIONS

According to the hypothesis, MU (Mobile usefulness) and MEOU (Mobile ease of use) have positive and significant relationships with the behavioural intention to use. Therefore, the first and the fifth hypothesis is supported. It can also be seen that H8 is supported. These results show that during the coronavirus pandemic, people are adopting m-wallet due to the easiness in learning and the advantages of using it as it gives them a sense of being protected against exposure to the virus. Conversely, the outcomes reveal that sixth hypothesis is not supported as there is no significant statistical relationship of 'perceived critical mass' with the behavioural intention to use. In this study, notwithstanding the current grade of PCM is not robust enough to inspire adoption, it is adequate to encourage the perceived protection it shows the attitude of the mobile wallet users to follow the masses to feel protected from the virus. Hence, H8 is supported. Additionally, PP was found to have a significant relationship with behavioural intention. Therefore, the fifth hypothesis is supported. This suggests that extrinsic motivation leads to the adoption of the Mobile Wallet technology. People spread awareness among community members through various channels of communication and social networking platforms. Several messages on social media platforms propagate the use of mobile wallets to avoid touching different surfaces and exchanging currency notes that may result in an increase in the risk of infection by the novel coronavirus. Additionally, 'Mobile self-efficacy' was found to have a statistically significant association with behavioural intention; thus, we can see that H2 is supported. Generally, the usage of mobile wallets in making payments needs a particular person to have the required level of confidence in doing

so. Therefore, during the pandemic, those with a higher level of MSE would naturally have a higher intention to use mobile wallets. Quite the reverse, TSE does not have a substantial effect on the behavioural intention. Therefore, it can be seen that the ninth hypothesis has not been supported. The insignificant path could be as Mobile wallets are useful, and for making payments, one doesn't need to be a super geek who knows the complex functions and features of mobile wallets. The primary function of making payments does not require other complex technological skills (such as installing programs, setting up DNS proxies, clearing application cache memory etc.). That is why both 'Mobile Self-efficacy' and 'Technology Self-efficacy' have meaningful relationships with 'mobile ease of use' and 'Mobile usefulness'. Since mobile wallet users with high levels of technology self-efficacy and mobile self-efficacy are self-reliant, it would be easy for them to find out the various advantages of using the mobile wallet, especially during the corona virus pandemic. Hence, H3, H4, H10, and H11 are supported.

The model that has been proposed in the study has extended the tightfisted MTAM with adoption drivers that are non-technical and based on three different theories. The three theories that have been used in the current study are the Self-Efficacy Theory, the Critical Mass Theory and the Protection Motivation Theory. Several researchers advocated the extended mobile technology acceptance model by including several other variables to illustrate the adoption of new technologies-especially technologies that are related to mobile-based applications. Besides, the outcomes showed that the extended model has good explanatory power as 58% of the variance in BI could be explained. Thus, it endorses the robustness of this model to understand better users' acceptance of mobile wallet technology is during the pandemic situation.

8 LIMITATIONS AND FUTURE DIRECTIONS

Like any other study, this study has several limitations that need to be aware of. Firstly, as this study was conducted in the state of Maharashtra, that has the country's highest per capita income. The findings might not truly reflect the mobile wallet adoption in other states. As such, caution should be practiced in generalizing the findings and researchers should consider conducting out a cross-national study that could enhance the generalization of results. Some other factors that can have an influence such as Perceived Enjoyment have not been considered for the current study. Future studies can eliminate the insignificant variables and further extend the model to include additional variables that may be technological or non-technological in nature finally, as this study uses a cross-sectional background that considers the data at a single point of time. While conducting future studies, the longitudinal approach could be used that would account for the time differences. Further, it will also be interesting to observe whether the people who have adopted the Mobile wallet technology during the pandemic, continue to use it with the same or increased frequency even after the effect of the pandemic ends.

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REMODELING FASHION MARKET DURING PANDEMIC WITH THE RIGHT MINDSET

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Abstract - The shutdown of physical retail and decline in consumer has altered the fashion business landscape. Alteration has expedited decline of struggling companies but sustained stronger empires. The industry witnessed lion's share of value creation by the leaders in fashion industry. The present research aims to study the fashion industry during pandemic crisis. The paper discusses opportunities created by fashion brands instead hard hit by pandemic. Based on the stress mindset theory by Crum et al. (2017), this paper studies the entrepreneur mindset discovering opportunities from the challenges. This paper is a conceptual study. The data collected and analysed is absolutely based on secondary sources. According to the stress mindset theory by Crum et al (2013) either stress-is-enhancing or stress-is-debilitating. An opportunistic approach towards a stressful event enhances productivity, and a negatively gauged similar stressful event is debilitating. This theory of stress and mindset combination is the best fit for the present study. The entrepreneurs were not only affected physically and financially during pandemic but also emotionally drained. Technological advancements encroaching individual lives expedited in the recent pandemic have demanded more emotional strength than physical. The economic drought was turned to downpour with creative and innovative ideas in the fashion industry. Mindset is the way to deal with life challenges to survive. The present research suggests the need to analyze the stressful event in the light of solutions instead of focusing on challenges.

Keywords: Fashion; Fashion Market; Fashion Industry; Pandemic; Stress Mindset Theory.

1 INTRODUCTION

The fashion industry alone contributes around US\$3000 bn around the world. That is an estimate of 2% of the world's gross domestic product (GDP) (Botti, 2019). Communities extensively accept the concept of fashion with different classes and groups. Fashion is directly and highly influenced by its environment, primarily by marketing factors (Bhardwaj and Fairhurst, 2010). Recent research by Mahmoud et al., 2021 elucidated the three different generations based on digital exposure. Gen X are individuals born between the years 1965– 1981. They are regarded as digital immigrants while Gen Y is individuals born between 1982–1999, and finally, Gen Z as individuals born between the years 2000–2012. These two generations are digital natives.

The fashion gurus study the consumer psyche to trigger the correct fashion sense. These fashion gurus decide the class and group fashion sense employing creativity and innovation. Due to the global pandemic, there was a shutdown of physical retail and a decline in the consumer that has altered the fashion business landscape. Alteration has expedited the fall of struggling companies but sustained stronger empires. The pandemic hit the fashion industry, recapitulated trends, and kept the show running. The industry witnessed the lion's share of value creation by the leaders in the fashion industry. A shift from physical stores to online shopping has been observed to a vast extent. McKinsey report forecasted a growth decline of 27% in the fashion industry during the year 2020.

Further, it has predicted the insolvency of 56% of the global fashion companies in a forthcoming couple of years (Amed et al., 2020). The fashion industry's economic sustainability was shattered by shutting down most European and American retail business houses (M & Kannappan, 2020). In a statement, the fashion industry is often synonymously understood as the clothing business, but this fails to specify the essential contrast between fashion and clothing. Fashion includes almost everything from clothing, footwear, handbags, sleepwear, and accessories. Pandemic has immensely influenced lifestyle patterns and altered routines. The preferences changed with the change in work and sleep patterns. Indoor living made comfort a priority reducing the aesthetic value of the fashion. The psychological theories appertaining to styling and designing processes also to purchase and sale approach required rethinking (Attardo, 2021). Thus pandemic times were more of mental well being rather than physical beauty enhancement. The need for mental well being was the need for both the seller and buyer. Both were equally hit and in dire need of a support system. It was a win-win situation for the business that grasped the buyer condition. Meeting the buyer's requirement and creating a willingness to pay is the mantra of any economic game. Fashion houses that continued to offer monotonous products were no more in the game. A positive mindset was the core game-changer during the pandemic crisis.

1.1 Objectives

The present research aims to study the fashion industry during pandemic crisis. The paper discusses opportunities created by fashion brands instead hard hit by pandemic. Based on the stress mindset theory by Crum et al. (2017), this paper studies the fashion business mindset discovering opportunities from the challenges

1.2 Methodology

This paper is a conceptual study. The data collected and analysed is absolutely based on secondary sources.

2 FASHION INDUSTRY

Digital retailing brought in the challenges of size and fit, but choice, preference, value and fashion consciousness remained the purchase stimulators (Kaushik et al., 2020). The difference in the generation, options, and fashion consciousness exists, but the core customer values like expectation and satisfaction towards service remain the same (Adeola et al., 2021). Conventional thinking is brands are for products, but the truth is brands involve emotional and social association of customers either for the brand or product or both, apart from differentiation of product or service branding, emotional loyalty of customers. Fashion that fulfilled the need felt the emotional triggers and continued to think could only conquer the market. The fashion or the business organisation that sparked genuine emotion builds an everlasting rapport with the customer. Rapport building is a harmless process of high respect (Bishnoi & Singh, 2021). Hyper-consumerism and lower price purchase are fundamental traits of an average consumer used by fashion brands (Hansen & Schaltegger, 2013).

On the contrary, regardless of age and education, fashion innovators, opinion leaders, and fashion opinion seekers influence consumer buying patterns and preferences (Johnson, 2008). However, fashion individuality is an exception to the former (Park, 1998). Customers with fashion individuality prefer personal choice over social norms. They are uninfluenced by the market movements and fashion transformations in society. This study underscores the business perspective switchover in the fashion industry to survive during the Pandemic. Fashion retailing during pandemics displayed new changes. The dynamism demonstrated an adaptive system impacting the complete growth and development process of strategic logistic

management. It has reoriented progress while rendering quality services during the crisis (Sarma et al., 2021). The advent of digital retailing in the fashion industry provided additional opportunities for entrepreneurs to cater to different generational cohorts earlier, as explained by Mahmoud et al. (2021), i.e. Gen X, Y, and Z (Pentecost and Andrews, 2010). The user-friendly digital retailing that existed before Pandemic received a massive boost after the Pandemic (Watanabe et al. 2020). The women buyers, specifically between 25 and 34 years old, were willing to fashion regardless of the Pandemic. The age category is a potential buying prospect that marketers can study further to develop appropriate marketing strategies (Suraweera & Jayathilake, 2021).

2.1 Pandemic crisis

The global pandemic surfaced avant-garde lifestyles. Everyday life turned indoors due to social distancing and lockdown. However, technological advancements like video conferencing, cloud phone calls, various online meeting platforms, social media platforms and many more kept socialising onboard, ensuing colossal internet traffic and screen time (Kim, 2020). A few such lifestyles are bullet-pointed as follows;

- Online meetings
- Status update
- Short videos on social media
- Vlogs

Likewise, many formal and informal events were conducted due to the social distancing norms of the pandemic. There is a cautious opening for physical gatherings limited to quantity as people feel comfortable via online meetings. The cocoon of online life is convenient to switch on and off. The panic of pandemic gradually subsided with preparedness and a changed repertoire (Kirk & Rifkin, 2020; Sheth, 2020). The new normal of pandemic provided a new way of life with work from home, socialising restrictions and limited larger gatherings. The new lifestyle has emerged with choices and preferences of health concerns, hygiene concerns, athleisure wear over glamorous wear (Brydges et al., 2021). The COVID-19 outbreak disrupted most of the industrial sectors, including the fashion industry. Pandemic affected the wholesale and retail fashion business in most countries (R., 2021). Affecting industry encloses shutting down of retail business plus manufacturing, marketing, operations and logistics (Rodríguez-López et al., 2021). The fashion industry identified the gap of the current fashion requirement but at a different level. Minimalist casuals that are camera-friendly are in vogue. However, “revenge spending” is also forecasted when situations normalise (Mollard, 2020).

The global pandemic impacted the fashion industry by retrenchment, reduced work hours, and low productivity. Pandemic had a more significant impact on women workforce than men. The resultant pandemic led to working women with childcare issues and caregiving at home (Diss, 2020). The apparent fact of the fashion industry is significant consumption is by women fashion. Once earning and now jobless, women could no longer contribute to the fashion industry. Players in the fashion industry have also undergone a highly stressful period during the global pandemic. The pandemic distress will continue for the fashion industry with high consumer expectations (Emerald Expert Briefings, 2020). The hygiene concerns, transparent production and operations, timely logistics and environmental sustainability are few challenges ahead. During the pandemic, not all fashion houses have succumbed to bankruptcy, but few did survive. They survived yet attaining high productivity and huge profits.

3 THEORETICAL FRAMEWORK

3.1 The Stress Mindset Theory

Stress's origin and meaning have been exciting, from Latin to Old French to modern English. Hans Selye in 1936 defined the term stress as "the non-specific response of the body to any demand for change", as published by The American Institute of Stress (2017), established on the request of Hans Selye to be in the service on all stress-related subjects. The pioneering works of Lazarus and Folkman (1984) highlighted the importance of cognitive appraisal in determining the stress response. There is growing evidence that mindset affects outcomes in intelligence domains (Dweck, 2008) and ageing (Levy & Myers, 2004) and shapes the stress response. Individuals with a stress-is-enhancing mindset exhibit more adaptive physiological responses and more approach-oriented behavioural responses in the face of stress when compared to individuals with a "stress-is-debilitating mindset". Mindsets can be changed quite readily by simply orienting people to different information. There is always a scope to create new neuropathways that look for opportunities in threats and strengths in weakness. A changed mindset can be brought in by watching educational videos, observing influential speakers or stories, listening to inspiring stories or witnessing success via failure. The concept that stress mindset is not situation-specific and can influence the stress response regardless of challenge and threat evaluations has been argued conceptually and through structural equation modelling. Understanding how stress mindset operates in challenging and threatening contexts provides critical insights into *if* and *how* individuals can improve their responses to stress without changing the demands of a situation (which may be difficult or impossible) or improving their immediate resources (which can be infeasible or taxing).

As an emerging theory on stress management, the stress mindset theory by Crum et al. (2017) is the best fit for understanding the novel economic stagnation due to the global pandemic. The reason is that the theory was initially studied on employees working in a multinational corporation. The view assessed the mindset approach of the employees towards stress. However, the same can be applied to people in business struggling with high stress levels. The fashion industry, on usual, plays neat tricks to avoid customer reprimand. It is a mindset game of alluring customers with sustainable products to conceal the unsustainable business activities (Pui-Yan Ho & Choi, 2012). Consumer buying behaviours and attitudes play a crucial role in a business unit's communication and marketing strategies (Ha-Brookshire & Norum, 2011). Every move of a consumer is closely monitored and studied. Latest technologies, including AI and chatbots, have put the customer in the spotlight. Every click done on the web is captured for consumer behaviour analysis. Companies steer ignorant customers via technologies. Business marketer code customer minds in such a fashion that customer feels believes and enjoys as hypnotized by business marketing tools and techniques. Fashion is covetously spoonfed as happiness and well-being (Universidad de Cádiz et al., 2019).

As mediators of economic growth and development, business activities bridge the gaps in the overall socio-economic growth of rural and urban populations. A paradigm shift can be found in the mindset of the business community from calculated risk-taking to being innovative and sustainable growth. Entrepreneurs protect the business idea through risk-bearing and constant learning; in the process, stress is inevitable. Stress mindset is conceptualized as the extent to which an individual holds the mindset that stress has enhancing consequences for various stress-related outcomes or holds the mindset that stress has debilitating consequences for outcomes such as performance and productivity, health & well-being, and learning & growth (Crum et al., 2017). An entrepreneur often acts as a galvanizing element in an economy. Entrepreneurs protect the business idea

through risk-bearing and constant learning; in the process, stress is inevitable (Inamdar 2018). An entrepreneur's right stress mindset builds confidence and exploits the right opportunities and the correct ethical values.

4 FINDINGS

Online sales remarkably increased due to non-essential retail closure, including the fashion industry during the lockdown norms of the pandemic crisis. The effect of the pandemic on the fashion industry, both on physical and online platforms, is discussed from the strategic business perspective. High-end technology in the fashion industry assisted to a massive extent in approaching customers during the lockdown and social distancing (Minh & Ngan, 2021). Early innovators also turned to the late majority in the adoption cycle of marketing with no choice left. This quick shift is the outcome of the persistent efforts of the industry to create and meet the needs of customers. A few such innovative products that are made need for the customers irrespective of no job are, smarf (a combination of scarf and mask), mask chain (available in pearls, metal, handcrafted, etc.), toilet seat sanitizer, fancy sanitizer holders for handbags, face shields, gloves, and the list goes on. As mentioned above, an interesting feature of the list is that all are available for purchase easily online. The stress mindset theory by Crum et al. (2017) has revealed that a positive evaluation of a stressful event would result in positive outcomes. This theory of stress and mindset combination is the best fit for the present study. According to the stress mindset theory by Crum et al. 2013), either stress-is-enhancing or stress-is-debilitating. An opportunistic approach towards a stressful event enhances productivity, and a negatively gauged similar stressful event is debilitating. The fashion industry was affected physically and financially during the pandemic and drained at the emotional level. Technological advancements encroaching individual lives expedited in the recent pandemic have demanded more emotional strength than physical. Social media usage on routine is one of the significant reasons that the purchase graph was going up despite the pandemic crisis and economic fluctuations. Women buyers are the prospective buyers having broad scope for marketing departments (Suraweera & Jayathilake, 2021). The swift change from a physical market to an absolute online platform is wise to reach socially distant customers. Humble customer service is the added topping to keep the business going. The future of the fashion industry will be different from before regarding buyer behaviour. The pandemic crisis has increased demand for local and sustainable brands, which will continue even after the pandemic. However, a change in consumption patterns was observed but would not diminish or be blocked, especially for clothing. Research has observed new trends in consumer buying behaviour. Consumers might tend to follow the online purchase habit (P.v.m & M.p.v.d, 2021). Customers are habituated by online purchases simultaneously spoilt by a wide range and easy returns. The social media platform content of the business is an indicator of credibility. The information offered represents the business. Thus the mindset should be that of connecting the customer. Availability is another significant aspect; hence, being available to answer queries is of considerable importance. Scrolling down tendency and forgetfulness of posts is a common feature of social media users. Getting noticed and being in the conversation is the remedy for the same.

5 SUGGESTIONS

The fashion market faced a huge setback but raised like a Pheonix. The fashion market faced a huge setback but raised like a phoenix. The global lockdown has emerged a vicious cycle of no job, no earning leading to no purchase. However, entrepreneurs reiterated the process with the right mindset. The entrepreneurs

focused on the opportunities rather than the challenges. New doors were created in fashion, boosting the sales with a willingness to pay by the customers. The creative and innovative ideas of the fashion industry turned economic drought into a profit downpour. Mindset is the way to deal with life challenges to survive. Opportunities, threats, distress, eustress, risks, ego and motivation unceasingly ringed the business market. Only those who continue with perseverance towards the set goals sustain in the market. The right mindset and personality make any business stand above all. Easy accessibility to the internet and the latest technology are a few reasons for the changed stress mindset. The same generation old theory of stress termed as consistently negative can be altered via intervention to produce corresponding changes in self-reported health and work performance.

The present research suggests the need to analyze the stressful event in the light of solutions instead of focusing on challenges. An amalgam of optimistic mindset and changing industry trends could generate productive yields. The fashion industry is complementing the needs of customers, flexibly offering what is needed. Although the pandemic has initiated new investments in innovation, creativity, production and logistics, which is worth expanding to outlast instead of blowing with the wind (Sarma et al., 2021). The technology-enabled customers to select from a broad variety, varied pricelist, multiple options, secure payment options, no-contact delivery and easy returns. Reduced commute with increased variety found a high rate of consumption (Watanabe et al. 2020). In future times fashion industry must make accord advertisement strategies with new normal norms. Particular focus on social distancing, frequent hand wash and other sanitization routines (P.v.m & M.p.v.d, 2021). As the trend continues, social media will dominate customer choices and preferences. Social media based promotion would be an effective strategic move for the fashion industry. Superior customer relations can be build up using official social media pages to boost the fashion industry. The social network for information on fashion. campaigns as an efficient strategy. Maintaining a business image on social media is a challenging task. The operation on social media is scalable. The mindset decides the scalability primarily as the business reaches different minds with both dumb and great wit. A mindset shift towards catering for customers and prioritising their needs will assist social media posting action. The action should reflect the genuineness of customers while interacting. Eventually, the social media of the business will become more natural and legitimate. The social media platform is a complimentary spread of business information. It is the information that helps the customer connect to the business either on a loyal or emotional basis.

5.1 Future Research

This study is a panoramic view of the fashion industry during the pandemic. A literature review could only give a brief look at the scenario. However, empirical research could provide more insights into real-time situations. Future examination, either product or operations wise, can catch the crux of techniques used as game-changer during the pandemic.

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SUSTAINABILITY OF RURAL DEVELOPMENT PROJECTS: BEST PRACTICES AND LESSONS LEARNED BY IFAD IN INDIA

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Abstract - The present project represents the culmination of a multiphase research process. The first step involved a comprehensive desk review of ongoing efforts to promote the sustainability of IFAD programmers in the Asia and the Pacific region. The review was based on an analysis of the sustainability issues encountered by a range of international development and lending institutions operating in the region and elsewhere, and of relevant internal documents, including IFAD policy and strategy initiatives, project design guidelines, supervision reports and monitoring and evaluation (M & E) findings.

The primary purpose of this trip was to develop a methodological note outlining: the rationale for selecting the country programmers to be visited, agreements reached on the scope of the field-based research on sustainability of IFAD programmers, an explanation of the methods used to obtain information on sustainability, and the time frame for data collection and reporting of findings. Drawing explicitly on the desk review and methodological note, case studies of ongoing PI programmers in the region were carried out in February-May 2008.

Keywords: Rural Development, Sustainability, IFAD, Employment, Health Mission IFAD: International Fund for Agricultural Development.

1 INTRODUCTION

This project begins with a broad description of concepts and definitions related to sustainability. This introduction draws on the current definition of sustainability adopted by IFAD to guide design and evaluation of its field activities. It then considers the various perspectives on sustainability of IFAD project participants and institutional stakeholders that were encountered during the case studies. It concludes by presenting aspects of sustainability that may not have been fully incorporated into the design and implementation of current projects, but that will likely improve the sustainability of IFAD programmers in the future.

2 DEFINITION OF SUSTAINABILITY

IFAD's Office of Evaluation adds to this definition by considering resource flows. It acknowledges that assessment of sustainability entails determining "whether the results of the project will be sustained in the medium or even longer term without continued external assistance". It further expands on the concept of programme sustainability by distinguishing among several factors that either contribute to or detract from the long-term impact of IFAD interventions (*IFAD 2006a*):

- i. **Political Sustainability** – government commitment, an enabling policy environment, stakeholder interests, strong lobby groups and political influence/pressure;
- ii. **Social Sustainability** – social support and acceptability, community commitment, social cohesion;
- iii. **Ownership** – whether or not communities, local government and households accept and own the outcomes of the project in ways that are sustainable;
- iv. **Institutional Sustainability** – institutional support, policy implementation, staffing, recurrent budgets;
- v. **Economic and Financial Sustainability** – resilience to economic shocks, financial viability, reduced household vulnerability and increased capacity to cope with risk/shocks;

- vi. **Technical Sustainability** – technical soundness, appropriate solutions, technical training for operations and maintenance, access to and cost of spare parts and repairs;
- vii. **Environmental Sustainability** – projects' positive/negative contributions to soil and water preservation and management, resilience to external environmental shocks.

3 MULTIPLE DIMENSIONS OF SUSTAINABILITY IN FIELD OPERATIONS

In order to ensure project sustainability, IFAD must consider four essential dimensions (*TANGO International 2008a*):

1. **Institutional sustainability** – functional institutions will be self-sustaining after the project ends.
2. **Household and community resilience** – resilient households and communities take intentional action to enhance the personal and collective capacity of their members and institutions to respond to and influence the course of change.
3. **Environmental sustainability** – an environmentally sustainable system must maintain a stable resource base, avoid overexploitation of renewable resources and preserve biodiversity.
4. **Structural change** – the structural dimensions of poverty are addressed through the empowerment of poor and marginalized rural households.

It is not unrealistic to expect the first two dimensions of sustainability to be achieved in one or two project cycles (5-10 years). These could be people's or private-sector organizations or governmental institutions. Critical steps in promoting institutional sustainability include:

- Promoting institutional ownership of project activities;
- Supporting capable existing institutions rather than establishing new ones;
- Securing successful transfer of decision-making to low administrative levels in line with decentralization policy;
- Building sufficient follow-through capacity within key institutions (e.g. within governmental and community-based organizations); and
- Building capacity to adapt to change (*Elhaut 2007*).

The second dimension of sustainability involves **building household and community resilience**. This dimension has not received much attention in IFAD projects. In addition to promoting interventions that increase household income and assets, it is important to create a situation in which households and communities are able to handle dynamic and unexpected changes without collapsing (*Cascio 2007*).

The third dimension of sustainability involves the **establishment of environmentally sustainable production systems**. Again, most IFAD projects have not given sufficient attention to this dimension. Given the dependence of most rural communities on a limited natural resource base, environmental sustainability is critical to the maintenance of household income and asset streams. Furthermore, as the case studies show, environmental sustainability is not likely to be achieved without well functioning institutions involved in collective action.

The fourth dimension of sustainability, which is often the hardest to achieve, involves **addressing the structural dimensions of poverty that perpetuate social inequality**. In order to overcome the structural dimensions of poverty, development organizations must provide focused capacity- and confidence building measures that empower vulnerable individuals and groups and encourage more-active participation in planning and decision-making processes by the traditionally unheard (*IFAD 2007j*). 1

4 PROGRAMME PROCESSES SUPPORTING SUSTAINABILITY DESIGN

Two distinct programming models broadly characterize most IFAD projects designed by the Asia and the Pacific Division (PI). The first is a market-led programme model that implements infrastructure, microcredit and agribusiness projects, with the primary purpose of increasing access to markets. In the community-led model, the formation of self-help groups (SHGs) is emphasized as a means of promoting sustainability through community empowerment. The desk review and interviews with CPMs suggest that this approach is more appropriate in areas that are isolated from commercial centers, lack access to agricultural and other markets, and are characterized by distinct ethnic majorities, weak institutions and strong community cohesiveness. While the current draft guidelines for project design (IFAD 2007a) do not offer guidance on the incorporation of specific design elements or exit strategies in support oblong-term sustainability, the division has outlined potential improvements in design and operational processes in an effort to promote programme sustainability (*Elhaut 2007*). The following list of priorities reflects its current thinking as it seeks to address the issue:

- ✓ **Results-based country strategies**
From the outset, country strategies should support project design oriented towards the achievement of realistic results. Results-based strategies must drawn adequate risk assessment and appropriate risk management strategies.
- ✓ **Improvement of the underlying analysis**
Project design must use accurate contextual, institutional and opportunity analyses to provide clear guidance on project design at the level at which sustainability is being sought.

4.1 Implementation of Projects within Specific Sectors

The review of sustainability of IFAD programmes in Asia and the Pacific has revealed range of issues related to project implementation. Some of these are common across all projects, but most are implementation issues encountered within specific technical sectors.

- Microfinance
- Agricultural production and marketing
- Infrastructure
- Natural resource management
- Social mobilization

4.2 Indicators of Multiple Dimensions of Sustainability

The following list presents potential indicators of institutional sustainability that could be adapted to IFAD-supported projects. Each is consistent with the four critical dimensions of the 'sustainability lens' that forms the basis for the case studies, the IFAD sustainability framework and the forthcoming sustainability guidelines.

A) Indicators of Institutional Sustainability

The following indicators provide information on the sustainability of what has been core strength of IFAD's strategy throughout the Asia and the Pacific region – the formation of community institutions:

- Project designs incorporating institutional analysis and risk analysis;
- Collaboration with existing national and sub national institutions;
- Creation of linkages between 'micro community' activities and 'meson/market sector' facilities and services;
- Phased project design that allows flexibility and internalizes performance incentives;
- Investment in institutional capacity development;

- Improved access to inputs and markets in support of technical and economic/financial sustainability;
- Growth of the common fund through member participation in savings and credit activities; and
- Capacity to manage savings, credit disbursement and credit repayment programmers.

B) Indicators of Household and Community Resilience

Attainment of household and community resilience can be viewed as the ultimate measure of the sustainability of programme impacts. However, the desk review and case studies noted that livelihood resilience is not being captured by project M&E systems or review missions. Evidence from Ethiopia suggests that resilient households and communities share common characteristics across a variety of livelihood systems, socioeconomic contexts and climates. These indicators can be adapted to the context of IFAD-supported projects to develop indicators and indices to measure changes in resilience.

- a) Household Resilience
- b) Community Resilience

C) Indicators of Systematic Environmental Change

IFAD projects currently do not include indicators to measure environmental changes resulting from project interventions. The following list captures aspects of environmental change that could be adapted to IFAD projects:

- Cultivated systems, including measures of soil fertility and moisture, integrated pest-management practices, genetic diversity and crop yields;
- Managed forests, including measures of the quality of forests (genetic stock, tree circumference, resistance to pests and disease, and so on) and the nature of forestry practices;
- Fisheries, including measures of the size, health and age structure of population stocks, as well as the management practices applied;
- Water quantity, including measures of the availability of surface freshwater as well as groundwater;
- Water quality, including measures of eutrophication, turbidity, dissolved oxygen and other critical indicators; and
- Sensitive ecosystems, including measures of coastal, mountain and dryland ecosystem health.

D) Indicators of Empowerment

Changes in underlying societal power structures and empowerment of the community are important indicators of sustainability. However, structural changes are typically the most difficult to achieve as well as the most difficult to measure. Several indicators to measure empowerment are in use by various organizations. They include measures such as community control and management of resources, as well as increased participation by poor people in the institutions that make decisions and administer the resources that affect their lives (Binswanger 2003). The Community Capabilities Index (Hariri and Heather 2007) is another measure of empowerment that may be well suited to the prevailing context of IFAD's development projects. The index uses the following indicators:

- Ability to take initiative;
- Ability to manage village funds;
- Ability to organize;
- Ability to manage communal lands; and
- Level of achievements.

4.3 Establishing Standard Indicators of Sustainability

It is essential that a modest number of key sustainability indicators be incorporated into existing monitoring systems. IFAD is already using the Results and Impact Management System (RIMS) – a comprehensive system for measuring and reporting on IFAD-supported country programmers. RIMS could be adjusted to accommodate key sustainability indicators. In addition, each project has its own M&E system that, with adequate guidance, could incorporate key sustainability output and outcome indicators. The indicators selected should be consistent with the four critical dimensions of the ‘sustainability lens’ that formed the basis for the case studies: institutional sustainability, household/community resilience, environmental change, and empowerment. Examples of indicators for each of these dimensions of sustainability are provided in the annex “Indicators of multiple dimensions of sustainability”.

5 REVIEW OF LITERATURE

(Malhotra 2003). Drawing on the frameworks developed by diverse organizations, previous studies have developed potential indicators of women’s empowerment at different levels of aggregation. However, it is critical to note that changes in one or two indicators will not capture the state of women’s empowerment. An index needs to be developed that captures a number of different aspects of empowerment.

Over the years, the definition of sustainability in development literature has varied widely and broadened in scope. The concept arose in response to economic growth models that characterized development approaches over the last half century. It was eventually recognized that such models did not adequately address social inequalities and led to environmental degradation. The concept gained wider use after the World Commission on Environment and Development published *Our common future (Brundtland 1987)*

Future investment in improving the sustainability of IFAD-supported projects should include better means for measuring whether sustainable practices and systems are being attained. Indicators currently used to measure aspects of sustainability are not mandatory, leading to subjective monitoring **(TANGO International 2008a).**

5.1 Objectives of the Study

- The main objective of the study is to understand about the potential of rural development programmes
- To understand the Sustainability of rural development projects: best practices and lessons learned by IFAD in India
- To Define the concept of rural development and to elaborate it in the context of the major rural development schemes.

6 RESEARCH METHODOLOGY

This study is Conceptual in nature and tries to highlight working of “sustainability of rural development projects: best practices and lessons learned by IFAD in INDIA.

Secondary data has been collected from extensive research through E-library, different available published articles, journals, books, internet, magazines, and seminar papers and the world-wide web.

7 FINDINGS

The following section highlights important lessons for IFAD programmed sustainability, identified by both the desk review and the case studies.

- Development models leading to sustainability must be responsive to the operating environment

- Key elements of a sustainability strategy should be introduced early in the project design phase
- Promote household resilience by incorporating a risk management approach
- Country programmers should adopt flexible project design and implementation mechanisms responsive to changes in the operating environment
- Special attention should be devoted to improving monitoring and evaluation systems that facilitate and document progress towards sustainability
- To achieve sustainability, IFAD should consider alternatives for improving interventions in natural resource management
- In the interests of sustainability, projects should prioritize the involvement of existing community assets and structures over the establishment of new institutions

8 CONCLUSIONS

This review of issues related to the sustainability of IFAD programmes in the Asia and the Pacific region has touched on a number of factors that are particular to the organization, as well as many that are common to development agencies throughout the world. It has highlighted important gains made at both policy and field levels towards the lasting impact of IFAD interventions. It has also identified the remaining challenges in IFAD's organizational approach to programme sustainability and has provided further insight into various dimensions of sustainability, through analysis of activities carried out by a range of individual IFAD country programmes. The key findings of the review can be summarized according to the principal phases of the project cycle, in order to serve as the basis for formulation of IFAD's regional framework on sustainability.

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A RESEARCH STUDY ON ENVIRONMENTAL RESPONSIBILITY OF BUSINESS

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Abstract - The environment is a serious problem for everyone. Indeed, it is a matter of life and death for all nations. Companies have broader social responsibilities, including legal, ethical, economic and environmental obligations. You need to understand that business is also a social offering. Business organizations must proactively meet the needs and expectations of society as a whole while making profits through normal operations. This obligation has led to the development of the principle of corporate social responsibility. Awareness of social responsibility puts the spotlight on corporate environmental responsibility. It is now generally accepted that businesses must take steps to protect and protect the environment for the benefit of humankind. Protecting the environment is the joint responsibility of all individuals, groups, organizations and governments. The future of humanity depends on how honest, clean and healthy the corporate organization is and is responsible for its industry, commerce and commercial activities. Non-profit organizations that are as environmentally responsible as commercial organizations must act in the same way.

1. INTRODUCTION

With its complex ecosystem and amazing biodiversity, the Earth is a wonderful gift from nature. Perhaps it is the only planet in the vast universe with a unique physical environment of air, water and land that supports and maintains humans, animals and plants. However, advances in industrial civilization in pursuit of endless material prosperity are on the verge of a global catastrophe that mercilessly pollutes the Earth's natural environment and threatens the future of humankind. Boparl gas disaster (1984), the tragedy of the Rhine (1986) and the Chernobyl nuclear accident (1986) are pessimistic reminders of what could happen to men if the current wave of pollution continues unabated.

The environment is a serious problem for everyone. Indeed, it is a matter of life and death for all nations. There are no two opinions that a clean and safe environment is essential to our survival. Then it is no wonder that the right to live in India is equal to the right to a healthy environment. Therefore, environmental law is considered a fundamental human right in both our country and many other countries.

The industry is a major polluter. In search of a desire for endless money, they devastated nature. Persistent public pressure has led India, like most other countries, to enact many legislation to protect and protect the environment. Companies have broader social responsibilities, including

legal, ethical, economic and environmental obligations. It must play its legitimate role in managing and preventing pollution that threatens the lives of humans and animals.

The future of our civilization depends heavily on how efficiently businesses fulfill their responsibility to maintain a clean and healthy environment for humankind. From this perspective, this article seeks to focus on corporate social and ecological responsibility in the new scenario of comprehensive national and international efforts to save Mother Earth from the danger of pollution. ..

2. CONCEPT OF SOCIAL RESPONSIBILITY

A company's environmental responsibility is a derivative of broader social responsibility that is an integral part of a company's decision-making, policies and actions. Therefore, in order to understand a company's environmental responsibility, it is essential to understand the concept of social responsibility.

It is important to understand that business is also a social concern. Business organizations must proactively meet the needs and expectations of society as a whole while making profits through normal operations. This obligation has led to the development of the principle of corporate social responsibility.

Social responsibility refers to an organization's obligation to serve society in a way that goes beyond its primary goal of making a profit. There are three main reasons why corporate organizations adopt social responsibility. These are

- I. Companies are creatures of society. Therefore, they need to meet the needs and demands of society.
- II. The long-term self-interest of a company is best provided by fulfilling its social responsibilities.

Providing all resources and opportunities it is our ethical obligation to contribute to the progress and well-being of society.

If a company fails to fulfill its social responsibilities, society will either force the company by law or society will no longer allow the company to survive and continue its business.

3. ECONOMIC AND SOCIOECONOMIC MODELS OF BUSINESS

The concept of social responsibility became more important as the company moved from a pure economic model to a broader socio-economic model. The main features of the two models are shown in contrasting ways.

However, these two models are the two extreme ends of economic continuity. Together, companies have the freedom to design their own models for specific conditions. It is important to note that the socio-economic model is the basis of the economy of this century.

4. ENVIRONEMNTAL RESPONSIBILITY

Awareness of social responsibility puts the spotlight on corporate environmental responsibility. It is now generally accepted that businesses must take steps to protect and protect the environment for the benefit of humankind. Since the environment is our common heritage, there are national and international movements against its pollution. As a major cause of pollution, the industry faces increasing criticism and pressure from various disciplines. For example, the judiciary has extensively prosecuted industrial companies for polluting air, water, and soil. Governments, justice, and pollution control authorities are closely monitoring industrial pollution that has reached alert levels in all developed and developing countries.

The industry discharges large amounts of sewage, including toxic chemicals and heavy metals, into rivers, lakes and the sea. This has resulted in extensive pollution of the surface and groundwater in India. It is estimated that 30.5 million people die each year in India due to drinking contaminated water and poor hygiene and hygiene.

The industry is equally responsible for air pollution and soil degradation. They pumped large amounts of toxic gas into the air, increasing respiratory and other illnesses. Soil degradation has resulted in loss of soil fertility and biodiversity through deforestation, mining activities, and landfill of toxic waste.

5. ENVIRONMENT LAWS

Given that the environment is of paramount importance to people's lives, many environmental laws have been enacted in India since the 1970s. In addition, the judiciary closely monitored environmental pollution and established several legal concepts and principles in this direction. Listed below are important statues that are sometimes adopted in India to protect the environment:

1. The Wildlife (Protection) Act of 1972.
2. Water (Pollution Prevention and Management) Act of 1974.
3. Forest (Conservation) Act of 1980.
4. 1981 Air (Pollution Prevention and Control) Act.
5. Environmental Protection Act of 1986.
6. Public Liability Insurance Act of 1991.
7. National Environmental Court Law of 1995.
8. National Environmental Appeal Authority Act of 1997.

Companies must comply with Indian environmental law as part of their environmental responsibility. As has been shown many times, violating the law can be costly. Central and state pollution authorities, as well as many non-governmental organizations, regularly monitor, monitor, and evaluate the environment. If you violate the law, you will have to take strict measures.

Therefore, companies must face the situation and maximize their environmental responsibilities.

6. CONCLUSION

The environment is very important for the survival of life on earth. In India and elsewhere, there is increasing pressure to protect and preserve it. It is an important national and international agenda. Companies need to recognize their responsibility to contribute to a safe and clean environment, which is a national priority. If they do not address this imminent issue, they will have difficulty surviving, as severe penalties will be imposed for violations of pollution standards, including the closure of delinquent units.

Environmental protection is the joint responsibility of all individuals, groups, organizations and governments. The future of humanity depends on how honest, clean and healthy the corporate organization is and is responsible for its industry, commerce and commercial activities. Non-profit organizations that are as environmentally responsible as commercial organizations must act in the same way.

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उच्च शिक्षा पद्धति में पर्यावरणीय नैतिक मूल्य

मुकेश सारण

UGC, NET, छात्र – MLISC, पुस्तकालय एवं सूचना विज्ञान विभाग,
वर्धमान महावीर ओपन यूनिवर्सिटी, कोटा, राजस्थान

समाज का विकास प्रकृति के अनुरूप हुआ है। प्रकृति का प्रस्फुटन हमारे चतुर्दिक है। प्रकृति के तत्व चारों ओर हमारे विकास के प्रेरक हैं। मनुष्य बुद्धिमान है। बुद्धिमान मानव ने प्रकृति एवं पर्यावरण के अनुरूप अपने समाज के नियमों को गढ़ा और पर्यावरण के तत्वों का दैवीकरण उनमें गहरी आस्था व्यक्त की। भारतीय समाज का विकास अरण्य में हुआ, इसलिए भारतीय सभ्यता 'आरण्यक' सभ्यता कही जाती है। प्रकृति के प्रति समादर की भावना भारतीय समाज में रची बसी थी, भारतीय धर्म संस्कृति त्योहार एवं परम्पराएँ पर्यावरण के प्रति गहरी निष्ठा व्यक्त करती हैं। वेदों एवं पुराणों में जल, वनस्पति, वायु सूर्य, चंद्र, भूमि की प्रार्थना की गयी है। भारतीय धर्मप्राण जनता में पर्यावरणीय शिक्षा धर्म के माध्यम से दी गयी।

‘पृथ्वी संगस्था सरसास्तयापः स्पर्शी च वायुर्ज्वलितं च तेजः

नभः सशब्द महता सदैव कुर्वन्तु सर्वे मम् सुप्रभातय।।

(वामन पुराण 14/26)

(गन्धयुक्त पृथ्वी, रसयुक्त जल स्पर्श युक्त वायु, प्रज्वलित तेज शब्द सहित आकाश एवं महत्त्व ये सभी प्रातःकाल को मंगलमय करें।)

भारतीय समाज प्रगति करता गया और उसके मूल्य बनते गये। भारतीय नैतिक मूल्य को स्थापित करने में संस्कृति की बड़ी भूमिका रही। संस्कृति के अनुरूप मानव समाज सम्प्रति 'सदकर्म' की ओर अभिप्रेरित हुआ। संप्रति आवश्यकताओं के साथ पर्यावरण के तत्वों का रूपान्तरण कर मानवों ने उपयोगी बनाया है। तत्वों को लम्बे समय तक मानव की आवश्यकताओं की पूर्ति योग्य बनाया। प्रविधिक प्रगति ने अन्वेषण के अनेक आयाम सृजित किए। संसाधन बनते चले गये समाज अपनी आवश्यकताओं के अनुरूप प्रगति करता गया। लेकिन समय के साथ पर्यावरणीय शिक्षा का अभाव दिखने लगा।

वर्तमान उच्च शिक्षा पद्धति में पर्यावरण अध्ययन का विकास –

'डार्विन के जीवों के विकास क्रम' के सिद्धान्त के प्रतिपादन के साथ जैव जगत एवं उसके प्राकृतिक निवास के अन्तर्सम्बन्धों के समझने के प्रयास होने लगे। डार्विन के प्रेक्षण में 'प्राणी आकार के अध्ययन के साथ जीवों के क्रमिक विकास के विवेचना के लिए महत्वपूर्ण थे। हैकेल द्वारा प्रतिप्रादित पर्यावरण के अन्दर जीवों के पारिस्थितिक अनुकूलन पर्यावरणी शिक्षा की प्रगति में उत्कृष्ट सोपान था। वान हम्बोल्ट ने पर्यावरणीय अध्ययन की सहपरिस्थितिकी को आगे बढ़ाया जो जलवायु एवं पौधों की जातियों के सम्बन्धों पर प्रकाश डालती है। पर्यावरणीय अध्ययन की दिशा में बदलाव आया। परिस्थितिकी संरचना के विकास क्रम में मानव जैविक सामाजिक तत्व के रूप में स्वीकार किया गया। मानव द्वारा प्रकृति के सक्रिय रूपान्तरण के कारण मनुष्य को भौतिक संवृद्धि मिली। पूर्ववर्ती विचारों में 1965 में कार्ल सावर के नेतृत्व में आयोजित संगोष्ठी पृथ्वी तक के परिवर्तन मंय मानव की भूमिका पर्यावरण

एवं परिस्थितिकि अध्ययन का दिशा निर्देशन था। पर्यावरणीय अध्ययन को आगे बढ़ाते हुए विख्यात भूगोल वेता तुआन ने कहा कि— “हम एक प्रकार के जानवर हैं जिसमें बहुत शक्तियाँ हैं जिसका उपयोग हमने पृथ्वी की कठोरता को सीमित करने एवं उसे भोजन तथा अन्य आवश्यक वस्तुओं के उत्पादन में सक्षम बनाया है। किन्तु विकसित सभ्यता में हमने इस शक्ति का भरपूर दुरुपयोग किया है। जिसकी प्रतिभसगी केवल पृथ्वी ही नहीं अपितु कमजोर मानव भी है। आर्थिक शोषण एक प्रकार के खेल का नाम है।”

पर्यावरणीय अनुगामी मानव समाज में नैतिकता—

आज सर्वत्र असंतोष विषमता तथा अव्यवस्था का मुख्य कारण व्यक्ति एवं समाज का नैतिक पतन है। प्राविधिक अभ्युत्थाएं ने उत्पादन में विविधता की दिशा सुनिश्चित की और आर्थिक बदलाव लाए। प्रत्यक्ष पर्यावरण के तत्वों का उपयोग करने वाला समाज बदलाव की ओर अग्रसर हुआ और आर्थिक मानव का जन्म हुआ। प्रकृति के प्रति आदर की भावना में बदलाव आया अर्थात् हमारी ‘आरण्यक’ समादर की नैतिक स्थिति में आंशिक दुर्भाव आया, जो पर्यावरणीय अनादर के लिए उत्तरदायी हुआ। सामाजिक परिवर्तन में एक ‘पर्यावरण अनुगामी मानव समाज’ आर्थिक मानव समाज में परिवर्तित हो गया और लालची एवं स्वार्थी आर्थिक पर्यावरण का अभ्युदय हुआ। आर्थिक मानव की अवस्था पर्यावरण से लाभ कमाने की थी। पर्यावरण का संसाधन के रूप में दोहन प्रारम्भ हुआ। संसाधनों पर समाज के कतिपय लोगों का आधिपत्य स्थापित होने लगा। आर्थिक गुट बनने लगे जो पारम्परिक समाज के सामन्तों/कुलकों ने पारम्परिक सामाजिक मूल्यों को तोड़ा। लाभ कमाने की लालच ने उन्हें ‘शोषक’ बना दिया। सामाजिक परिवर्तन के दौर में लूट-पाट एवं युद्धों को प्रेरित किया जो किसी भी मानव समाज के लिए कलंक है।

सामाजिक परिवर्तन के साथ पर्यावरण के प्रति मानव के प्रति स्थापित मूल्यों में अवधानता आयी मानव-मानव का, प्रकृति का निरादर करने लगा। कतिपय विद्वानों का मानना है कि विश्व की प्राचीन संस्कृतियाँ मिट्टी एवं जल के अति उपयोग के कारण विनिष्ट हो गयी। ये संस्कृतियाँ अपने उत्पादों का व्यापार करती थी। कारवाँ एक संस्कृति स्थल से दूसरे संस्कृति तक जाते थे। अपने उत्कृष्ट उत्पादों का क्रय विक्रय उनकी निष्पत्ति थी। यथार्थ व्यापारिक क्रिया से पारम्परिक प्रविधिकी का उत्थान हुआ। स्थल एवं जल मार्ग का ज्ञान हुआ। लेकिन लालच में पर्यावरण के अति दोहन के फलस्वरूप बसाव का उत्कृष्ट ढांचा मानव विहिन हो गया और संस्कृतियाँ विनिष्ट हो गयी। लोग उजड़ गये। विदित है कि विकसित नदी सभ्यता काल के गर्त में समा गयी। जो यह नहीं समझ पायी कि प्रकृति एवं अपने समाज को स्थिरता देना उनकी नैतिकता का तकाजा था। यह उपभोक्तावाद का अति प्राचीन उदाहरण है। समासामयिक समाज ‘योग पूर्वक’ भोग करो कि प्राचीन उद्घोष को भूल गया। काल चक्र में अद्यतन समाज अपने नैतिक मूल्य विस्मृत हो गये हैं। आधुनिक आर्थिक मानव आर्थिक समाज उपभोक्तावाद की ओर अग्रसर है। रोस्टोव के आर्थिक ‘आशावादी मॉडल’ में परम्परागत समाज व उपभोक्तावादी समाज में परिवर्तित हो जाता है, उसे किस उपभोक्ता समाज का विकसित समाज माना जाता है। उस पर बाजारवाद का वर्चस्व बढ़ जाता है। सम्पूर्ण विश्व उपभोक्तावाद से त्रस्त है। विश्व के 10 प्रतिशत जनसंख्या अति

उपभोग कर रही है और प्रति वर्ष 1-2 करोड़ व्यक्ति कुपोषण से काल कवलित हो जाते हैं। लोगों को एक वक्त की रोटी के लाले पड़े हैं।

समाज पर्यावरणीय नैतिकता के विरुद्ध अग्रसर है —

समाज में परिवर्तन तो हो रहा है लेकिन दिशा विहीन कुछ अर्थों में पर्यावरणीय नैतिकता के विरुद्ध हैं। जल, थल, नभ, वायु, मृदा प्रदूषण एवं अतिदोहन से पीड़ित है। संसाधन विपुल क्षेत्रों पर घमासान मची हैं। विभाजित धरती विभाजित मानसिकता विभाजित एवं गुटों में बंटे लोग 'धरती' को बदहाल किए हुए है। आतंकवाद एवं विस्तारवाद लूट-घसोट में राज्यों की भागीदारी बढ़ रही हैं। नीति एवं नैतिकता का तिरोधान हो गया है। संसाधनों के अति दोहन से परिस्थितिक प्रणालियाँ मर रही है। वैश्विक स्तर पर वनस्पतियों प्राणियों का लुप्त होना, संसाधन अल्पता का सूचक है। प्रकृति के प्रति अनादर एवं उपभोक्तावाद के भयानक परिणाम मरुस्थलीकरण जल की कमी, जलवायु परिवर्तन के रूप में दुनिया के सामने हैं। हमारा भविष्य सांझी वैश्विक, सामाजिक नैतिकता पर आधारित है। हमने अकारण अपनी आवश्यकताएँ बढ़ा ली है। सुरक्षा के नाम पर आयुधों का निर्माण कर रहे हैं। कोई भी देश अपनी सीमाओं को सुरक्षित रखकर भी सुरक्षित नहीं रख सकता। अब ऐसे 'आयुध' बन गये हैं जो समस्त साझा पर्यावरण को एक साथ विनिष्ट कर देंगे। हमें लालच छोड़ 'सर्वजन सुखाय सर्वजन हिताय' का संकल्प लेना होगा। विकास के समतामूलक एवं आवश्यकता मूलक माडल को अपनाना होगा। महात्मा गांधी कहते थे 'प्रकृति हमारी जरूरत पूरी कर सकती है लालच नहीं।' हमारे आधुनिक समाज का ढांचा लालच पर आधारित है।

नैतिकता आत्म मंथन का विषय —

समसामयिक लालची समाज की नैतिकता आत्म मंथन का विषय है। पर्यावरणीय सन्दर्भ में नैतिकता एवं संरक्षण की पृष्ठभूमि व्यापक हो रही है। पारम्परिक धार्मिक मान्यताएं आस्थाएं पर्यावरण संरक्षण एवं सम्वर्द्धन से जुड़ रही है। उपभोक्तावाद एवं बाजारवाद के कारण से उपजी अनैतिकता के प्रश्नों को हल करने की दिशा में दार्शनिक तथ्य महत्वपूर्ण सिद्ध हो रहे हैं। सरला वेन का कहना है प्रकृति में समतोल है, सौन्दर्य है, शान्ति है, धैर्य है, तथा वह अपने आप उपजाऊ है। उसकी शक्ति मानव द्वारा ही प्रकट होती है लेकिन मनुष्य प्रकृति से इतना दूर हो गया है कि सब प्राणियों तथा वनस्पतियों की अनवार्यता का महत्व समझना उसके लिए कठिन हो गया है। ऐसा प्रतीत होता है कि इस सबके मूल में हमारा अज्ञान नहीं बल्कि लोभ है। हम आने वाले पीढ़ी को उनके आने से पहले ही समाप्त कर देना चाहते हैं। पर्यावरण उत्पादन का स्रोत है यह हमारे जीवन के सामाजिक, आर्थिक परिवर्तन का आधार हैं। हमें पर्यावरण का नैतिक एवं निर्वहनीय उपयोग करना चाहिए और पर्यावरण के प्रति आदरणीय भाव रखना चाहिए। जन्तु पर्यावरण के प्रति 'अद्वैत' भाव से ही सतत् विकास संभव है। सम्प्रति उच्च भौगोलिक अध्ययनों में पर्यावरण के क्षेत्र में (अ) पर्यावरण में मानव कृत परिवर्तनों का परिवेक्षण अर्थात् आर्थिक क्रिया कलापों के कारण प्राकृतिक पर्यावरण में होने वाले सारे परिवर्तनों के बारे में प्रतिकूल क्षेत्रों का निर्धारण। यह सम्भाव्य हानिकारक परिवर्तनों को रोकने में सहायक हो सकता है। यथा निर्ववनीकरण। (ब) भौगोलिक पूर्वानुमान द्वारा प्राकृतिक संसाधनों के उपयोगार्थ योजना बनाना यथ-भूमिउपायों, भूमि संरक्षण, जल संरक्षण

आदि। (स) प्राकृतिक विपत्तियों का नियंत्रण यथा भूक्षण, भूस्खलन, बाढ़-सूखा आदि
(द) प्राकृतिक एवं तकनीकी प्रणालियों को इष्टतम बनाने के अन्तर्गत सम्मिलित
नगरीय औद्योगिक, कृषि आदि। उल्लेखनीय तथ्य है।

उच्च शिक्षा पद्धति नैति मूल्यों के साथ भूगोल पर्यावरण सम्बन्धी
समस्याओं तथा लाभकारी अवस्थाओं के समझने में बहुत प्रभावकारी हैं।

सन्दर्भ ग्रंथ

1. रमा पाण्डेय – जैन धर्म में पर्यावरणीय चेतना (लेख) समकालीन विकासजन्य पर्यावरणीय
चुनौतियां (सम्पादक- मंगला सिंह, सजीव कुमार) प्रकाशन- कला प्रकाशन एवं कला धर्म
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SKILL DEVELOPMENT PROGRAMMED AND WOMEN EMPOWERMENT IN 21ST CENTURY

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Abstract - Women participation and empowerment are fundamental women's rights to enabling women to have control over their lives and put forth influence in society. Women often face discrimination and gender inequalities, with some women experiencing multiple discrimination and exclusion because of factors such as background or caste. Women empowerment is one of the biggest tools for 'effective development' of any country. It means freedom of women from the vicious circle of social, political, economic and gender-based discrimination. Making women aware of their rights and developing confidence in them – is a central issue. It is essential for them to be skilled in order to be able to better serve their families at home as well as professionally. Skill development not only creates employment opportunities but also empowers them. The aim of skill development, in case of women, is not just simply preparing them for jobs; but also to boost their performance by improving the quality of work in which they are involved. This paper clearly highlights the impact of skill development on women empowerment.

The basic need for empowering women is to instill the required skills and abilities in order to shape up their overall personality & raise their status within the society.

Keywords: IT, Skill Development, ICT and Digital India, etc...

1 INTRODUCTION

Women play an important role in the development of a family and society. From last few decades, they have been actively participating in various economic & social activities, but their efforts remain unrecognized. In this male-dominating society, they are still subjected to discrimination in the social, economic and educational field. Women are not only managing their families but are also playing an important role in the development of entire society. Making women aware of their rights and developing confidence in them – is a central issue. Women Empowerment means giving them freedom or power to live the way they want. It allows them to identify their skills, knowledge & abilities to make their own decisions. It is a dynamic & growth process for women which includes awareness, attainment & actualization of skills. For the socio-economic development of any society, women empowerment is essential. It is important for women to identify themselves with self confidence & esteem. The main aspect of empowerment is to give a sense of internal strength to them – to control their lives. The confident smile on the faces of women is the measurement of their empowerment.

Skills development is a key to success which improves productivity, employability and earning opportunities. It is the bridge between job and workforce. Today, it is considered as an important and indispensable tool for women empowerment. Indian women face the majority of barriers to accessing skills and productive employment. A large effort is needed to create a skilled workforce for creating an economic prosperity. The aim of skill development, in case of women, is not just simply preparing them for jobs; but also to boost their performance by improving the

quality of work in which they are involved. Looking at the importance of the role women play in the development of a nation, one can sense that there is a long way to go in that direction.

2 SKILL DEVELOPMENT FOR WOMEN

Women have shown their ability in community development. Hence, it is important that women be a part of skill development. In India, women are now participating in various areas like – education, art and culture, service sector, sports, politics, media, and science and technology. They form a substantial part of the workforce - but the working percentage rate of women in the total labor force is declining. A large number of them are working in the informal sectors. This represents lack of employment opportunities and skills for women workforce.

Currently, a majority of the female workforce in India is unskilled. They can be motivated to develop their life skills – that will give them high paying jobs with better livelihood & confidence to earn for their family. It will develop their ability & quality to move ahead and be self-dependent. It is observed, that the concept of training and skill development needs to move beyond imparting technical and managerial skills, with more focus on literacy, numeracy, political & life skills.

2.1 Shortfalls in the education system working against rural women

"People seek education for gaining knowledge, building insight, and becoming financially sufficient to fulfil daily needs," says Dabir. In her own words, here is the list of various problems faced by economically backward women which paints a dismal picture of employability:

- The formal education system in India often is geared towards creating learning opportunities for those who have the resources to access it
 - Women from economically weaker or marginalised backgrounds grow up experiencing discrimination in access to learning opportunities, economic resources and time
 - In a situation where a family's meagre resources need to be prioritised, boys get preference in being supported towards seeking education. Girls grow up accepting their lot in life and make do with whatever learning opportunity is on offer locally and stop at the level up to which it is available, which may be only up to high school in several cases
 - The education system has been unable to provide suitable and locally relevant programmes to women from economically weaker backgrounds due to lack of vision on the part of policy makers at the central level and local administration
 - Therefore, programmes for skilling women were restricted to tailoring, incense stick making, soap making etc. Finding a market for the products was left to the women. The training did not include marketing strategies. So, these programmes could not make an impact in the economic empowerment of women
 - Some courses offered through the government-run Industrial Training Institutes are rarely accessed by women or girls due to the fact that the trades for which training is offered are mostly traditional male bastions

2.2 Women are better managers than men

"Women are better able to handle managerial positions than men because they are temperamentally calmer, able to multi-task, prioritise and possess better

articulation and wider vision," says Dabir, "If they are supported, encouraged and most importantly trained, they can become better managers."

How vocational courses can benefit these women "A programme for skilling women has to be geared towards the needs of women in a particular context, keeping in view their local needs, culture and geographic realities," says Dabir.

In order to help rural women make the shift from manual labour to desk-oriented jobs, and "to encourage women for better roles and enhance their skills", Dabir stresses on the importance of imparting both soft skills and technical education.

Some requisite skills which skilling and training institutes should impart, according to her, are

- Communication skills
- Business etiquettes
- Language development
- Personality development
- Leadership skills
- Management skills
- Entrepreneurship skills
- Basic accounting skills
- Basic computer skills

The programmes designed by the School of Vocational Education, Tata Institute of Social Sciences, cater to the development of all of these necessary skills. "All these more than adequately equip women with skills to compete in the open market, whether it is for jobs or running their enterprises" says Dabir.

2.3 Vocational training available in numerous fields

There are various vocational courses available in numerous universities, colleges and institutes all over India. "Depending upon the area of work chosen by the women and commensurate qualifications required for their skills, women could be trained in several areas which would lead to job opportunities for them," says Dabir. For women coming from rural or economically lower backgrounds, counselling and personal development sessions are also provided at TISS SVE to help student face tough challenges and change the mindsets of their family members.

The various fields in which women can take up training are:

- Banking and financial services
- Geriatric care services
- Dialysis technology
- Hospitality industry
- Electronics
- Healthcare
- Media and entertainment industry
- Information technology enabled services
- Pharmaceuticals
- Travel and tourism
- Telecom industry
- Printing and packaging industry
- Management and entrepreneurship
- Child care

"To cite an example, BVoc in Early Child Development is a skill-based Bachelor's degree programme, which equips students with the knowledge base and practical experience to work as early child educators and/or care providers," says Dabir. "They would be equipped with knowledge and skills to work in pre-primary schools, primary schools, day care centres, crches and so on."

2.4 Importance of work-integrated training

Since it is not easy for rural women to get a job, their chosen vocational course has to be work integrated for the maximum skilling and employment opportunities.

"TISS-SVE gives that support to rural women by offering skill enhancement vocational programmes, which are work integrated. The BVoc programme under TISS-SVE is designed to give exposure and first-hand training in the field of one's choice," says Dabir.

"The course is provided in multiple locations across different sectors and industries. Currently, there are 19 industry verticals. Additionally, certification of the said course along with the experience letter from the practical training institute is provided," she adds.

2.5 Features of TISS SVE's Work Integrated Training Programme (WITP)

- In TISS-SVE's Work Integrated Training Programme (WITP), students pick up a particular skill by learning it in the real working space of the related company or industry. Thus, various industries and training partners are directly involved in skilling the students. Students are able to gain workplace-based industry experience as a part of their certification program
- The model ensures that only those courses are developed and those skills learned, which are relevant to the current job platform and have a demand in the industry. Training modules based on industrial needs and demands end in higher employability chances at the end of the course
- By the end of three years, when the students get a BVoc degree, they have already gained a work experience of three years in the field
- All these courses are offered in collaboration with different colleges of Social Work and other NGO partners spread across the country
- The TISS BVoc programme also equips students with the skills required to start their own enterprise
- The additional 'Earn while you Learn' feature of this model enables the trainee to earn a stipend during their on-the-job duration of training period in order to support their simultaneous vocational education
- TISS provides courses that encourage the SKP to provide the stipend to the student; the student pays the fees from the stipend they receive. Many courses provide the students with a good stipend so that they can pay their fees and meet their daily expenses. Many students leave their paying jobs for a BVoc degree and this feature makes sure that they do not lose out on earning an income, and instead, get a certification and even a stipend during the three-year BVoc course

TISS SVE provides more than 12 BVoc courses and several short term programmes with the help of 20 vertical anchors, more than 100 hub partners and 19 different industry partners who act as skill knowledge providers.

2.6 Problems faced by rural women in getting a job even after proper skilling

Even after proper training and skilling has been imparted to rural women, it is not easy for them to get a job. They face numerous problems, as stated by the TISS SVE Dean:

- Too much competition, many trained professionals, gender bias, language problems, family issues, long working hours are some of the issues
- Other problems faced by women include mindset related issues and lack of support from their family
- Since rural women marry off very early, they shoulder family responsibilities from a very early age, leaving them less time to develop an independent standing career
- Even after getting a job, many women are paid much less compared to male counterparts in the same field
- Along with this, women safety is a teething issue which puts many women on a back seat to take a job

3 CONCLUSION

Women are not less than men in any perspective. They compete men in every field of work whether it may be pilot, loco pilots, engineers, doctors, labour, etc. Irrespective of gender discrimination equal opportunities and training is to be provided to women to make them and our country's economy more efficient. Skill development through vocational training will be very effective to women especially in case of rural women who perform traditional crafts or manual labour work. Government of India has provided effective measures to promote and provide vocational training to women. Skill development through vocational training is must because it enhances the economic empowerment of women. Realizing that the process of social development has to take into account the needs, interests and viewpoints of both men & women alike; and looking at the situation of women, gender inequalities and inequities that existed, special gender specific programmes were formulated and organized to mainstream women into economic activities.

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ROLE OF GOVERNMENT SCHEMES AND PROGRAMMERS FOR RURAL DEVELOPMENT

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Abstract - Rural Development in India is one of the most important factors for the growth of the Indian economy. India is primarily an agriculture-based country. Agriculture contributes nearly one-fifth of the gross domestic product in India. In order to increase the growth of agriculture, the Government has planned several programs pertaining to Rural Development in India. Rural development in India has witnessed several changes over the years in its emphasis, approaches, strategies and programmes. It has assumed a new dimension and perspectives as a consequence.

Keyword: Rural Development, Unemployment Programme, Shashaktikaran.

1 INTRODUCTION

Rural development can be richer and more meaningful only through the participation of clienteles of development. Just as implementation is the touchstone for planning, people's participation is the centre-piece in rural development.

The term rural development describes the overall development of rural areas to improve the quality of life of rural people. And it is a process leading to sustainable improvement in the quality of life of rural people especially the poor.

1.1 Objective of the Study

The basic objectives of Rural Development Programmes are based on the poverty alleviation and diminishing unemployment status by arranging training programme for rural unemployed youth and it also focuses to enhance the economic status of marginal farmers.

2 GOVERNMENT PROGRAMME AND SCHEMES FOR RURAL DEVELOPMENT

The rural development programmes intend to reduce the poverty and unemployment to improve the health and educational status and to fulfill the basic needs such as food, shelter and clothing of the rural population. To improve the conditions of rural people, Government of India launched some schemes through the planning commission of India such as Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), Rastriya Sam Vikas Yojana (RSVY), Indira Awas Yojana (IAY), Sampoorna Grameen Rozgar Yojana (SGRY), Integrated Tribal Development Project (ITDP), Pradhan Mantri Gram Sadak Yojana (PMGSY), Integrated Child Development Services (ICDS), Development of Women and Children in Rural Areas (DWCRA), etc. All these schemes are aimed to reduce the gap between rural and urban people which would help reduce imbalances and speed up the development process.

2.1 Integrated Rural Development Programme (IRDP)

First introduced in 1978-79 Integrated Rural Development Programme has provided assistance to rural poor in the form of subsidy and bank credit for productive employment opportunities through successive plan periods. Subsequently Training of Rural Youth for Self Employment (TRYSEM), Development of Women and Children in Rural Areas (DWCRA).

2.2 Employment Assurance Scheme (EAS)

EAS was launched in October 1993 covering 1778 drought-prone, desert, tribal and hill area blocks. It was later extended to all the blocks in 1997-98. The EAS was designed to provide employment in the form of manual work in the lean agricultural season. The works taken up under the program were expected to lead to the creation of durable economic and social infrastructure and address the felt-needs of the people.

2.3 Indira Awaas Yojana

This scheme of Indira Awaas Yojana was introduced in 1995. It is a lead scheme of the Ministry of Rural Development to provide houses to the poverty stricken people in rural areas. The objective of the Indira Awaas Yojana is mainly to help in construction and up-gradation of the dwelling units of members belonging to Scheduled Castes (SC), Scheduled Tribes (ST), freed bonded labourers, minorities in below poverty line and other below poverty line, who are non-SC and ST rural households by providing them financial assistance.

2.4 Pradhan Mantri Gram Sadak Yojana

Pradhan Mantri Gram Sadak Yojana (PMGSY) was launched on 25th December, 2000 as a fully funded centrally sponsored scheme to provide all weather road connectivity in rural areas of the country. According to latest figures made available by the State Governments under a survey to identify the core network as part of the PMGSY programme, about 1.67 lakh unconnected habitations are qualified for attention under the programme.

2.5 Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA)

National Rural Employment Guarantee Act 2005 later it is renamed as the "Mahatma Gandhi National Rural Employment Guarantee Act" (MGNREGA) is an Indian labour law and social security measure that aims to guarantee the 'right to work'. It aims to enhance livelihood security in rural areas by providing at least 100 days of wage employment in a financial year to every household whose adult members volunteer to do unskilled manual work.

3 THE NATIONAL SOCIAL ASSISTANCE PROGRAMME

NSAP was initiated in 1995. It then comprised of National Old Age Pension Scheme (NOAPS), National Family Benefit Scheme (NFBS) and National Maternity Benefit Scheme (NMBS). These programmes were meant for providing social assistance benefit to the aged, the BPL households in the case of death of the primary breadwinner and for maternity.

These programmes were directed to make sure minimum national standards in addition to the benefits that the states were then providing or would provide in future. In the present, it comprises of five schemes, these are, Indira Gandhi National Old Age Pension Scheme, Indira Gandhi National Widow Pension Scheme, Indira Gandhi National Disability Pension Scheme, National Family Benefit Scheme and Annapurna.

3.1 Mahila Kisan Sashaktikaran Pariyojana

To progress the present status of women in agriculture, and to augment the opportunities for their empowerment, Government of India has announced Mahila Kisan Sashaktikaran Pariyojana (MKSP) as a sub-component of the National Rural Livelihood Mission. The major objective of the MKSP is to empower women in the agricultural sector by making organized investments to increase their contribution and production, as also generate and endure agriculture based on the livelihoods of rural women.

3.2 Rajiv Gandhi Grameen Vidyutikaran Yojana

Rural Electricity Infrastructure and Household Electrification Scheme started in 2005 and focussed on the electrification facility in rural area. In this scheme 90% sponsorship was invested by Central Government and 10% was invested by REC (Rural Electrification Corporation). The concept of this scheme came from Deen Dayal Upadhyaya Gram Jyoti Yojna.

3.3 National Rural Livelihoods Mission (NRLM)

The basic objective of the National Rural Livelihood Mission is to generate a competent, well-organized and an effective organized platform for the underprivileged, deprived and socio-economically backward sections of the communities living in rural areas. This scheme would enable them to have an increase in their household incomes through sustainable livelihood enhancements and improved access to financial services.

3.4 Sarva Siksha Abhiyan

SSA has been operational since 2000- 2001. Its main aim is to make free and compulsory education to children between the ages of 6 to 14, a fundamental right. This programme was pioneered by former Indian Prime Minister Atal Bihari Vajpayee. Right to education is related to the 86th Amendment to the Constitution of India. Currently its expenditure is shared by the centre and state into 50: 50 ratios.

3.5 Antyodaya Anna Yojna (AAY)

The scheme was launched by the Prime Minister Atal Bihari Bajpayi on 25th December 2000.

The scheme provides food grains to around 2 cr. Below Poverty Line (BPL) families at a very subsidized rate. Total 35 kgs of food grains is provided to a family. Rice is provided at the rate of Rs. 3/kg and wheat at Rs.2/kg.

3.6 National Rural Health Mission

The National Rural Health Mission (NRHM), now under National Health Mission was initiated on 12 April, 2005. Main aim of this plan is to provide accessible, affordable and accountable quality health services even to the poorest households in the remote rural regions. Accredited social health activists (ASHA) scheme is also operational under this scheme. It is run by the ministry of health and family welfare.

3.7 National Rural Drinking Water Programme (NRDWP)

The objective of this scheme is to provide sufficient safe water for domestic use on a sustainable basis. The NRDWP guidelines have allocated 20 percent of the NRDWP funds for sustainability of water supply, including long-term source sustainability. This basic requirement should meet minimum water quality standards and be readily and conveniently accessible at all times and in all situations.

3.8 Nirmal Bharat Abhiyan (NBA)

Formerly the Total Sanitation Campaign (TSC) is by its nature a green programme. A sanitation program which was established by the government of India in the year 1999. The main motive of this Nirmal Bharat Abhiyan Program is to create awareness among the people about the importance of sanitation particularly among the people from rural areas. In recent years, its possibility has been prolonged beyond. In recent years, its possibility has been prolonged beyond the elimination of open defecation to a wide-ranging sanitation.

4 CONCLUSION

Though we analyze these schemes of Rural Development, it has been perceived from the implementation method that without the participation of community a scheme can't be executed successfully. Social mobilization and organizing of rural people into functional groups, communities can effectively take charge in rural development method of opportunities. So various schemes of Rural Development are initiated by Govt. of India to be enthusiastically taken steps and supporting the rural people to maintain a good socio-economic status. The government has been, since country achieved its independence, formulating policies, programs, projects and schemes and investing significant financial resources through every Five Year Plans to accelerate rural development. All these programs and schemes are being put into operation by the concerned ministries and departments of the union and state governments in the area of education, health, drinking water, sanitation, transport and communication and supporting infrastructure.

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DEEP LEARNING FOR NATURAL LANGUAGE PROCESSING: TRENDS, APPLICATIONS, AND FUTURE DIRECTIONS

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Abstract - Deep learning has revolutionized the field of Natural Language Processing (NLP) by enabling complex language understanding, generation, and translation. With applications ranging from language translation and sentiment analysis to chatbots and summarization, deep learning models have transformed how machines interact with human language. This paper explores the major trends in deep learning-based NLP, including advancements in neural network architectures, pre-trained language models, and training techniques. It also discusses significant applications across various domains, examines the challenges faced in deploying NLP systems, and provides insights into potential future directions for research in deep learning-based NLP.

1. INTRODUCTION

Background

Natural Language Processing (NLP) enables computers to understand and process human language, facilitating applications like text analysis, translation, and conversational AI. Traditionally, NLP relied on rule-based approaches and statistical models, but deep learning has introduced methods that achieve higher accuracy and flexibility.

Importance of Deep Learning in NLP

Deep learning's contribution to NLP lies in its ability to capture intricate language patterns and dependencies. Architectures like Recurrent Neural Networks (RNNs), Convolutional Neural Networks (CNNs), and Transformers have enabled significant improvements in natural language understanding and generation.

Objective

This paper aims to explore the advancements in deep learning for NLP, showcasing its applications, identifying current challenges, and outlining possible future directions.

2. LITERATURE REVIEW

Evolution of NLP

Early NLP systems relied on rule-based approaches, followed by statistical models. Machine learning models, particularly deep learning, gained prominence due to their ability to handle vast datasets and capture nuanced linguistic features.

Transition to Deep Learning in NLP

Deep learning has enabled groundbreaking advancements in NLP, with neural network architectures, especially the Transformer model, providing state-of-the-art performance in tasks like language translation, text generation, and question answering.

Pre-trained Language Models

Pre-trained language models, such as BERT, GPT, and RoBERTa, have become crucial in NLP, allowing transfer learning to improve efficiency and accuracy. These models have been trained on vast text corpora and can be fine-tuned for specific tasks, reducing the need for large labeled datasets.

3. DEEP LEARNING MODELS AND ARCHITECTURES IN NLP

Recurrent Neural Networks (RNNs) and Variants

RNNs were among the first deep learning models applied in NLP, capable of handling sequential data through loops in their architecture. Long Short-Term Memory (LSTM) networks and Gated Recurrent Units (GRUs) improved on RNNs by addressing vanishing gradient issues, making them more suitable for language processing tasks.

Convolutional Neural Networks (CNNs) for NLP

Originally used in computer vision, CNNs have proven effective for NLP tasks that require local feature extraction, such as text classification and sentiment analysis.

Transformer Architecture

The Transformer model revolutionized NLP by introducing a self-attention mechanism, enabling parallel processing of input sequences. Models like BERT, GPT, and T5 are based on Transformers, achieving state-of-the-art results across numerous NLP benchmarks.

Attention Mechanisms

Attention mechanisms allow models to focus on relevant parts of the input sequence, enhancing performance in tasks like translation and summarization. Attention is crucial in Transformers and is integral to the success of deep learning in NLP.

4. APPLICATIONS OF DEEP LEARNING IN NLP

Text Classification

Deep learning models are widely used for text classification tasks, such as spam detection, sentiment analysis, and topic categorization. CNNs and LSTM networks, along with attention mechanisms, have improved classification accuracy and speed.

Machine Translation

Models like Google Translate leverage Transformer-based architectures for language translation, allowing for high-quality translations without requiring extensive linguistic rules or dictionaries.

Sentiment Analysis

Sentiment analysis involves determining the emotional tone behind text. Deep learning models can analyze product reviews, social media comments, and customer feedback, aiding businesses in understanding customer sentiment.

Question Answering and Chatbots

Deep learning-powered question-answering systems and chatbots are used in customer support, education, and healthcare, providing real-time responses to user queries.

Text Summarization

Deep learning models, such as sequence-to-sequence architectures, are effective in producing concise summaries of lengthy documents, assisting with information extraction in business, research, and media.

5. CURRENT TRENDS IN DEEP LEARNING FOR NLP

Transfer Learning and Pre-trained Models

Pre-trained models allow for transfer learning, where knowledge from large, general-purpose language models can be adapted for specific tasks with limited labeled data. This trend has led to efficient, resource-saving model training.

Few-Shot, One-Shot, and Zero-Shot Learning

Recent advancements allow models to perform tasks with minimal to no task-specific training data, expanding the potential applications of NLP in low-resource environments.

Multimodal NLP

Combining NLP with other modalities, such as images and audio, allows for richer data representations and applications in fields like interactive AI, where systems must interpret multiple data types simultaneously.

Reinforcement Learning in NLP

Reinforcement learning has enhanced models in interactive tasks, such as dialogue systems, where the model must adapt based on user feedback and responses.

6. CHALLENGES IN DEEP LEARNING-BASED NLP

Data Privacy and Ethical Concerns

NLP systems process sensitive information, raising privacy issues. Additionally, biases present in training data can lead to biased model outputs, requiring more research in ethical AI development.

Model Interpretability

Deep learning models, especially large pre-trained models, often function as black boxes, making it challenging to interpret their predictions. Techniques like attention visualization are steps toward interpretability, but further advancements are needed.

Computational Costs

Deep learning models, particularly Transformer-based architectures, require extensive computational resources for training and inference. Optimizing these models for lower costs and energy consumption remains a priority.

Multilingual and Low-Resource Language Processing

Most NLP models are trained on English, limiting their effectiveness in other languages. Expanding NLP capabilities for low-resource languages is critical for equitable AI development.

7. FUTURE DIRECTIONS

Enhanced Model Efficiency

Research into model compression techniques, such as pruning and knowledge distillation, can reduce the size and computational requirements of deep learning models, making them more accessible and sustainable.

Integration with Knowledge Graphs

Combining deep learning with knowledge graphs enables models to incorporate structured knowledge, improving their reasoning and inference abilities for complex NLP tasks.

Advanced Contextual Understanding

Future models will likely improve contextual understanding by capturing nuanced relationships between entities and concepts, enabling higher accuracy in tasks such as question answering and summarization.

Continual Learning and Adaptability

Developing models that learn and adapt continuously from new data, without forgetting prior knowledge, will make NLP systems more dynamic and responsive to real-world changes.

8. CONCLUSION

Deep learning has catalyzed significant advancements in NLP, enabling machines to understand and generate human language with unprecedented accuracy and fluency. From text classification to chatbots and translation, deep learning applications are transforming industries. However, challenges in ethical considerations, computational costs, and multilingual adaptability must be addressed. As research continues, future NLP models will likely become more efficient, interpretable, and contextually aware, further broadening their applications and impact.

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RECENT TREND OF COMMERCE, ARTS, SCIENCE, EDUCATION, MANAGEMENT AND HUMANITIES IN PRESENT SCENARIO

(International Conference Publication 26-27 Sept.2022)

Editors

**Dr. Sourabh Jain,
Prof. (Dr.) Ashok Kumar Gupta,
Dr. Ajay Jain, Dr. Anurag Geeta,
Dr. Rakesh Patel, Dr. Vishni Beswar,
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Editors

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RECENT TREND IN APPLICATION OF DIGITAL TECHNOLOGY IN DENTISTRY AND DENTOFACIAL ORTHOPEDICS

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Abstract - Digital and information technologies affect the economy of modern society. Today, with no doubts we entered an era of rapid change and, most likely, in the near future, the most significant areas of human activity (economic, managerial, scientific, security) will take on completely different formats and meaning. People are changing, and their views on social life too. Computer technology has long been an integral part of everyday life. However, with the advent of smartphones and computer tablets, the impact of computer technology has dramatically increased. The most prominent feature of modern society is the growing influence of digital technology on the way people live and work. This is due to the rapid development of microelectronic, information and telecommunication technologies. Thus, one can conclude that the "digitization" of public life is an objective and inevitable movement forward. Dentistry currently is undergoing a metamorphosis that will have a direct impact on practice performance and the profession. Oral health promotion is for upliftment of oral health of community rather than an individual and has long-term impact. Health promotion is implemented, significant advancements have happened in oral health promotion. There has been a significant focus on the comfort and convenience of patients in healthcare recently, and dentistry is no exception. Patients nowadays have several options when choosing healthcare providers, so it stands to reason that they will pick the easiest and most comfortable option.

1 INTRODUCTION

Digital in this age we intuitively know, but probably cannot define it. While "Digital Transformation" is a buzz-word today, the fact is that we have been working in a digital environment for more than a few decades now.

Let's start off with providing a definition of digital from the dictionary: digital (of signals or data) expressed as series of the digits 0 and 1, typically represented by values of a physical quantity such as voltage or magnetic polarization.

- Relating to, using, or storing data or information in the form of digital signals.
- Involving or relating to the use of computer technology.

Practices and orthodontic departments have been using “computer technology” for decades now. If that is what is meant by digital, then why is “Digital Transformation” in vogue now? As with most things, the dictionary just isn’t enough to explain. The current definition of being “digital” is the “re-imagining of processes to be by default a fully online, fully automated process from end user interaction to back office processing, with no or minimal need for human intervention.”

Digital technology in the orthodontic office will continue to become more sophisticated as bandwidths get faster and hardware devices become smaller and more mobile. In the beginning, the focus of employing digital technology was to increase accuracy of diagnosis; as a result, workflow became more streamlined. Technological advancements in the future will be aimed at perfecting treatment outcomes and also reducing chair-side and treatment time.

2 DIGITAL TECHNOLOGY FOR INDIRECT BONDING

The purpose of this text is to present an overview of the most recent technological advances and their impact on indirect bonding techniques. This will, by no means, be a complete analysis of all available equipment and software packages but will be a presentation of our current methods and procedures.

2.1 3D Data Capture

The ability to quickly and precisely capture the dentition and the occlusion with intra-oral scanners is now well known to orthodontists. The growth in scanner implementation in orthodontic practices is rapid and the choice of scanners expands almost monthly. As in many other orthodontic developments, the scanner market is largely driven by developments in the restorative and prosthodontic fields since they represent considerably bigger markets for the manufacturers.

Therefore, some scanners are more suitable for small regions of interest of only a few teeth. For orthodontics, we obviously need to capture the entire arch and our scanners must be accurate enough to build full arch appliances.

2.2 Directly Printed Bonding Trays

The advances in printing technology and bio-compatible resins for 3D printers has enabled us to directly print the indirect bonding trays for our patients. Until relatively recently, the only available bio-compatible printing materials were of high stiffness and, therefore, not amenable to indirect bonding tray fabrication.

The most significant advantage is that the entire process is virtual until the actual printing of the bracket transfer tray in the bio-compatible resin. The resin is to the best of our knowledge the only commercially available bio-compatible material with mechanical properties suitable for Indirect Bonding. The material is reported to

be available from other vendors rebranded with different with different names, but is to our understanding simply the same material.

The Insignia system byOrmco (Orange, Ca.) is available in most regions. After submitting the scan files, the company will develop a setup for review. Again, the doctor has the ability to modify the setup and request modifications. The Insignia system is currently available with self-ligating brackets but has more recently become available with conventional brackets. The system offers superimposition of the patients intra-oral scan data and Dicom data from CBCT imaging, thereby enabling the doctor to see the root positions more clearly.

2.3 3D Digital Models of the Dental Arches

The most common approach for generating digital models of the dental arches comprises the digitization of stone models mostly by using optically-based desktop scanner systems. This indirect approach is sufficiently accurate and achieves a largely complete model surface with relatively low equipment acquisition costs. In the recent decade, however, intraoral scanners are becoming ever more established and proven in clinical practice. The great advantage of this direct approach for generating digital models is that the intermediate step of stone cast fabrication can be omitted which eliminates material and space requirements for casts.

The various commercially available intraoral scanning systems are based on the application of different optical measurement techniques. (i.e., structured-light) projection and two or more camera systems lead to a bulky arrangement and to shadowing effects which limit the accessibility of undercuts and thin volume fractions such as incisal edges. Moreover, they usually require powder coating of the teeth.

Confocal laser scanners eliminate these disadvantages, although the required 3D movement of the scanner hand piece is disadvantageous with regard to scanning speed, accuracy and reliability. Intraoral scans generally contain a source of risk for inaccuracy, because multiple single 3D images are assembled to a complete model. Recent studies, however, have shown that the trueness and precision of intraoral scanners of commercially available scanning systems is already sufficient for orthodontic applications.

Current development of novel scanner technologies, e.g. based on multipoint chromatic confocal imaging and dual wavelength digital holography, will further improve the accuracy and clinical practicability of intraoral scanning. Hence, it is likely that in future intraoral scanning combined with 3D printing will completely replace conventional stone models of the dental arches.

3 USE OF DIGITAL MODELS IN ORTHODONTICS

Three-dimensional (3D) digital models of the maxillary and mandibular dental arches are increasingly used in clinical orthodontic practice. This trend is based on several aspects. Obviously, by using digital models in the orthodontic office, no space is required for storage, and virtual models are more easily accessible during treatment session compared to stone models.

Furthermore, for multidisciplinary treatment planning or if a new clinician takes over orthodontic treatment, digital models make the sharing of records much easier. Further advantages of virtual models of the dental arches are related to study model analysis, which is an essential step in orthodontic diagnostics and treatment planning.

Compared to measurements on physical casts using a measuring loop and/or a caliper, digital measurements on virtual models usually result in the same therapeutic decisions as evaluations performed the traditional way, offer more extensive possibilities for analysis, and offer comparably reliable information, 3–8 with similar or even less time requirement.

It should also be mentioned that digital model analysis contain less risk for transfer or calculation errors. This particularly concerns evaluation of complex parameters like dental midline shift or palatal height. Digital models can also be merged with face scans to obtain a combined dento-facial model which opens up new diagnostic opportunities. They also allow for digital treatment planning based on virtual setups.

Furthermore, digital models will greatly expand and improve the monitoring of the treatment progress through superimposition of follow-up models in individual clinical cases and also for research purposes. Furthermore, the availability of digital models of the full dental arches also enables computer-aided implementation of appliances.

3.1 Indirect Approaches to Create Digital Models of the Dental Arches

Digital models of the dental arches may be generated directly or indirectly. The indirect method is based either on scanning an impression taken from the teeth (i.e., a negative scan), or on pouring the impression and scanning the resulting plaster cast (positive scan). These indirect procedures may be either outsourced to a commercial provider or conducted in the orthodontist's own practice. There are several options with regard to the technical principle applied to indirectly acquire the surface data from the teeth and the adjacent gingiva via 3D images from the corresponding impressions or stone models.

A coordinate measuring machine is unsuited for practical clinical use in orthodontics, due to high acquisition costs and the fact that measurements rely on direct physical contact; such measurements are very slow and, if performed on impressions, may even cause surface deformations. 21 Nevertheless, this technology offers high precision in capturing 3D measuring points, 22 hence; it has been used extensively in studies to validate the precision of measurements performed on virtual models.

3.2 Present and the Future of Digital Orthodontics

Over the last three decades most offices have now become paperless and digital photography and radiography have replaced their analogue counterparts and become the mainstay. Intraoral scans and three dimensional radiography are rapidly replacing

study casts and two dimensional radiography. Today digital technology has touched on every aspect of orthodontic treatment and not only records collection and keeping. It is now common place to perform virtual treatment planning as well as translate the plans into treatment execution with digitally driven appliance manufacture and placement using various CAD/CAM techniques from printed models, indirect bonding trays and custom made brackets to robotically bent wires. Furthermore it is also becoming possible to remotely monitor treatment and control it.

3.3 The Digitization of Orthodontic Diagnosis and Treatment Planning

Considered as accurate if not more accurate than plaster models. The scanning process is more comfortable for patients especially with the reduced gag reflex. They are easily stored and also shared with any dental laboratory anywhere in the world through the internet without the need for the packing and sending impressions.

This also eliminates two possible sources of error and material variability in the impression taking and handling and pouring and manipulation of plaster casts. The digital files can be sent to the lab, which can print them into a physical model or use them for direct digital appliance design and manufacture. Additionally the models are immediately available chairside for analysis and viewing. It is then faster and more accurate to undergo study model analysis and accurately calculate things like Bolton's tooth size discrepancy in a speedy and more precise manner when compared to plaster models.

Furthermore the models can also be used in various orthodontic software platforms to allow the orthodontist to perform virtual treatment plans and explore various treatment plans within minutes as opposed to expensive and time consuming diagnostic setups and wax-ups. Performing digital setups not only allows the clinician to explore a number of treatment options in a simple manner it also facilitates better communication with other dental professional especially in cases that require combined orthodontic and restorative treatment.

The same technology can be used to increase success with miniscrews and temporary anchorage devices. The success of TADs for example is highly dependent among other things on the quality of bone at the site of insertion. Combining intraoral scans and CBCT data enables the production of implant insertion guides using CAD/CAM technology to insure placement of the TADs in the best possible locations.

Furthermore TAD supported appliances can be manufactured in advance using the same models so that the TADs and the appliances be placed at the same appointment greatly reducing chair time while increasing the precision and efficiency for the operator and the patient.

3.4 Digitization of Appliance Manufacture

Clear aligner therapy with Invisalign® introduced by Align Technology lead the way in using a virtual model, creating a virtual setup of the desired outcome and manufacturing appliances from digital models to deliver the pre-set treatment outcomes. The placement of attachments for control of tooth movement, the need for

interproximal reduction and or extractions and the planning for inter arch mechanics is all done in advance. This process allows the visualization of the tooth movement process and allows the operator to visualize their treatment mechanics and for the patient to review to outcome before starting treatment. At this stage however aligners are still moulded on individual printed models of every step in the sequence but it is to be expected that direct printing of aligners with biocompatible material will be introduced in the very near future.

Aside from customized bracket manufacturing digital technology now also allows virtual bracket position and the constructions of indirect bonding trays. One company even allows the simulation of the outcome when a virtual straight wire is inserted thus allowing the correction of bracket positioning errors and more ideal appliance placement. Indirect bonding trays are then directly printed and brackets simply placed into the positioning jigs for accurate transfer into the planned position. Indirect bonding with this method is thought to increase bracket positioning accuracy and thus reduce overall treatment times.

3.5 Orthodontic Education and Scientific Societies

More and more orthodontists and specialists are turning to social media for information and discussion forums with instant replies and instant access to knowledge and information becoming an expectation. Online forums are rapidly replacing scientific societies and the conventional model of peer reviewed journals and scientific meeting will have to rapidly adapt and innovate in order not to be left behind. Video lectures and live communications via the internet are rapidly becoming the mainstay of education.

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ANALYTICAL APPROACH FOR POWER ENERGY MANAGEMENT SYSTEM WITH TECHNO-ECONOMIC CONCEPT WITH SMALL SCALE INDUSTRIES (SSI) FOR SUSTAINABLE DEVELOPMENT STRATEGY: A STUDY

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Abstract. The global economy still relies heavily on the oil and gas sectors. Companies face complex investment challenges due to the harsh operational environment of exploration and production activities, while global demand for fossil fuels continues to rise. The goal of workforce regulations is to make the workplace safe and secure. However, exploration and production still pose environmental threats on a local and global scale, such as groundwater contamination or global warming. At the level of oil and gas companies, key performance indicators of sustainable development include mechanisms for analysis and reporting. However, it appears to be a persistent challenge to obtain and analyze the necessary data to determine how much these findings can influence oil and gas companies' routine and strategic decisions. Artificial intelligent technologies in extended monitoring and supervising E&P operations is known to be an effective prevention strategy for allowing oil and gas companies to measure, control, and manage incidents. These tools not only help oil and gas companies become more profitable, but they also make people more aware of the environment and climate change, which helps them act more responsibly. Through interviews with executives and stakeholders, this study looked into the significance of environmental policies. It found that companies' ability to implement environmental protection policies is influenced by their financial stability, and in tough economic times, companies appear less enthusiastic about doing so. With the intention of suggesting primary solutions for attempts at strategic planning, this paper provides a comprehensive review of emerging technologies for addressing existing and anticipated challenges in sustainable development in the oil and gas industries.

Keywords: The oil and gas industry, sustainability, policies, difficulties, innovation, and smart solutions.

1 INTRODUCTION

One of the most significant factors that has influenced the expansion of the global economy is the oil and gas industry, which continues to be the world's primary source of energy. Hydrocarbons are anticipated to remain the superior energy source in 2035, and the oil and gas industries account for more than half of global fuel consumption (BP, 2017b). In 2016, oil production was approximately 96.3 million barrels per day, or 2 liters per person per day (IEA, 2016a). BP's ongoing research indicates that natural gas will become the second-largest fuel source by 2035, indicating an increase in demand for fossil fuels resulting in ongoing global production

and exploration activities. According to the IEA, in order to meet the global energy needs, investments in the upstream sector are expected to cost 700 billion dollars per year until 2040. On the other hand, the daily production of more than 96 million barrels of oil generates billions of dollars in turnover for the global financial markets (IEA, 2016b), which has a negative economic impact on the regional markets of countries that either import or export fossil fuels. It appears that neither the demand nor the supply sides of the energy market have been accurately predicted to change. However, it is evident that for every barrel of oil produced, numerous barrels of waste are produced (Ite, Ibok, Ite, & Petters, 2013).

2 OVERVIEW OF THE O & G INDUSTRY

It is necessary to have a thorough understanding of the structure of this industry in order to properly assess the challenges and roles of each component of the oil business chain and the role that the oil and gas industry plays in sustainable development (Schweitzer, 2010a). The oil and gas industries typically fall into three broad categories: Downstream, Middle stream, and Upstream

- The upstream sector is referred to as "E & P," where "E" stands for exploration and "P" stands for production. Depending on the characteristics of the reservoir and the circumstances of the field, each of these subcategories may fall into different categories. Upstream, exploratory and appraisal wells are drilled, followed by the search for potential on- or off-shore crude oil and natural gas. Business creation then begins subsequent to penetrating various advancement wells and interfacing them to the surface creation unit and transportation offices.
- To get products to consumers, the upstream section is supplemented by the downstream and midstream sectors. The majority of midstream consists of means of transportation from the well to the processing facilities and refineries.
- The refinement of crude oil and the processing of natural gas, on the other hand, make up the majority of the downstream sector. In addition to petrochemicals, this process produces gasoline or petrol, kerosene, diesel, fuel or jet oil, lubricant waxes, asphalt, NLG, or LPG. A component of the downstream sector is also delivery to the end user.

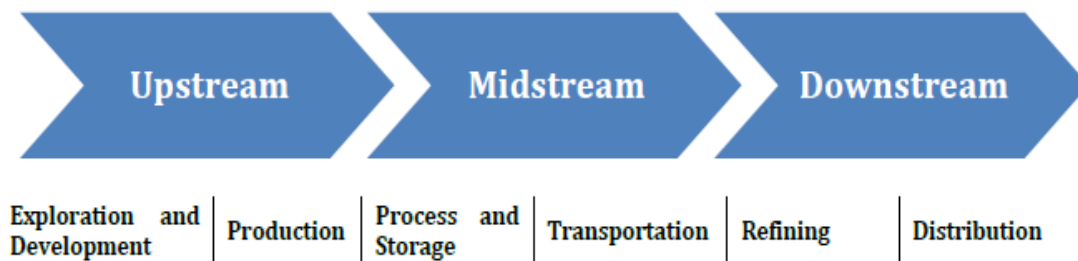


Figure 1 Oil and Gas value Chain

2.1 Oil and Gas Industry and Sustainability

The oil and gas industry has also been urged to consider environmental protection in recent years. Numerous societies have suffered severe consequences as a result of the

severity of environmental crises and climate change brought on by the production of oil and gas. Policymakers and the general public from all over the world have raised concerns about the reliability of major oil companies, and they have been accused of creating disorder in global environmental issues. Worldwide, people are reconsidering how they use fossil fuels (WEF, 2016). These environmental disasters have prompted the public to seek both measurable improvement in performance and greater transparency and operation in the oil and gas industries, pertaining to sustainability. Several evidences support this negative mentality, issues such as the Santa Barbara oil spill in 1969 in California and the Deep water Horizon disaster in the Gulf of Mexico in 2010. As a result, the oil and gas industries, like other industries, have rethought their business development strategy in light of sustainable development, and some of them have reacted to operational criticism (Weaver, 2003). The oil companies' adoption of environmentally friendly policies to guarantee safety measures during exploration and production activities.

As a result, terms like "Green Economy," "Sustainable Development," "Social Responsibility," and "Risk Management" have become commonplace in lectures and seminars given by oil companies (Schweitzer, 2010a). This is how the idea of sustainable development has entered the literature pertaining to the oil and gas industry. In a similar vein, the top management of oil companies are currently in favor of innovative solutions and implementations of smart solutions, such as Contaminated Site Management, Performance Assurance and Operation Risk Management, and Air Quality and Climate Change. However, there is always a gap between the sustainability claims made by oil companies and their actual actions. As a result, a lot of research has been done, and the overall conclusion is that major oil and gas producing companies are now seriously considering sustainable development when making decisions. However, the oil industry is still one of the main causes of environmental degradation and climate change (Schweitzer, 2010a). As a result, IPIECA, API, and OGP are very active in establishing sustainable development management standards for the oil and gas industry. They also make it a priority to encourage oil and gas companies and shareholders to provide voluntary reports as a means of consolidating with and adhering to strategies for sustainable development (Schneider et al., 2013). The findings of this study show that, despite the very clear and effective definitions of sustainability that have been provided over the past few decades, there are still a lot of ambiguities and, in practice, contradictory interpretations of this concept.

2. 2 Challenges of Sustainability in Oil and Gas Industry

The petroleum industry has faced a number of complex obstacles over the past few years. The oil industry ought to make investments proportional to the rising global demand for energy. On the other hand, due to the increased level of competition in these industries, the industry ought to lower the total cost of producing hydrocarbon resources while also adhering to environmental regulations and social responsibilities. A few huge difficulties for oil and gas industry include:

- Changes in prices (Regnier, 2007);
- shareholders' increasing pressure on managers to concentrate on value creation rather than output due to low investment returns (Ramos, Taamouti, Veiga, & Wang, 2017);
- The drilling and production procedure's complexity (Gupta & Grossmann, 2017);
- Rising oil and gas demand across the majority of regions (BP, 2017a);
- HSE compliance remains essential, particularly in the current climate of price volatility and cost savings (Neill, 2017);
- safeguarding the social operating license (Tomlinson, 2017) and corporate social responsibility (Banerjee, 2017);
- Changing fiscal policies;
- R&D and new product development (Hall & Vredenburg, 2003);
- Managing an expanding amount of data and knowledge (Bratianu & Bolisani, 2015); and
- NOC-IOC's unstable partnership: 2009, Whitson)

3 SUSTAINABLE DRIVERS

According to Perez-Lombard, Ortiz, & Pout (2008), the world's population is growing at a steady rate, necessitating the need for energy that is both more affordable and more readily available. The intense competition in the market for energy supply has resulted in price reductions as a result of the price fluctuations. Regional, cultural, and security disputes have steadily grown over the past few decades, reaching their recent zeniths. The provision of sustainable energy has significantly increased the risk prospects of corporate activities in such critical circumstances, resulting in higher investment costs. Every year, climate change gets worse in a steady way. Climate change is having devastating effects all over the world. The sea level could rise, and more towns and villages could experience flooding and storms. This is one aspect of challenges that requires long-term efforts to address. In the meantime, shareholders and business owners' expectations have grown in tandem with the steady rise in production costs. Shareholders expect executives of business entities to consistently increase profitability because they prioritize economic gain as the primary objective of their activities. Regional trade patterns are influenced by a variety of factors, including shareholder expectations, global climate change, rising competition, and an expanding population (Miron et al. 2010) are Sustainable Drivers that have created tension and risks in the business environment. Oil and gas companies are constantly striving to make their business plans as comprehensive and consistent as they can in order to win the battle of identifying and overcoming each obstacle. This paper discusses the statistical results of a survey on some sustainability indicators and offers insights into some of the current obstacles.

4 RESEARCH METHODOLOGY

Tantau, Khorshidi, and Sadeghi Mojarad primarily carried out the survey, which is presented and discussed in this study. The past two years have been the focus of the survey, which has been sent to 128 correspondents from various Middle Eastern oil and gas companies and service providers. During that time, the price of oil continued to fall, but in 2016 it began to slowly rise again. Some brand-new findings and in-depth discussions about their interpretations are included in this study. This study employs quantitative research to determine the relationship between a dependent variable, such as the type of organization, action plan, training, and relationship to customers in O & G company practice, and other independent variables, such as the idea of sustainability. All of the secondary data, which come from a variety of sources, including the annual reports of oil and gas companies, documents on sustainable development, the United Nations, and NGOs, highlight obstacles to sustainability. Additionally, this study looks at the constraints oil and gas companies face in order to maximize their participation in sustainability and the issues that influence expectations regarding the measurable efforts of oil and gas companies in sustainable development. This method is known to gather evidence and uncover information that has not previously been highlighted or given attention to. A group of statisticians have done the data analysis and interpretation, and the authors, who have been CEOs and managers in the oil and gas industry for more than 15 years, have discussed and interpreted the findings. It is necessary to investigate the interdependence of the evaluated parameters in order to carry out the analysis. The chi-square test is one of the best tools available. It measures the test's level of significance (sig), with a value of less than 0.05 indicating a significant relationship between the answers. Then, a thorough cross-section of these parameters is examined. The statistical data were gathered using IBM SPSS, and Microsoft Excel spreadsheets and graphs are used for further analysis. It is important to remember that this survey was done in the Middle East, so the results should be considered local. However, the results of this study may not apply to other parts of the world.

5 CONCLUSION

A number of measures that will restore public confidence in the oil industry are included in the use of information technology, intelligent control tools, intelligent maintenance programs, organizational reform, and targeted investment in the R & D sector to fulfill the goals of sustainable development. In fact, this research made it clear that the implementation of sustainable development necessitates a shift in the mindsets and policies of oil and gas producing companies. Due to their structural constitution and values, the private sector appeared to be better able to respond to price fluctuations, according to this study. During the industry downturn, the private sector prioritized skill development and job creation, whereas the government tended to freeze employment, minimizing their contribution to the job market. Larger businesses performed better when it came to reaping the benefits of customer intimacy, indicating the efficacy of the customer relationship policies they may have

implemented. Among private and state-owned businesses, efficiency and profitability were the primary performance indicators. All of these findings must be utilized if a company must improve its strategic plan to increase sustainability. Utilizing smart and intelligent tools to continuously monitor the activities and services provided to customers is one of the most effective tools, particularly in areas with a large number and variety of customers. Following this, dynamic and more responsive policies that can maximize the industry's values can be implemented. Another new, labor-intensive requirement in the petroleum industry is the upkeep of a biodiversity policy. Because businesses in the Middle East do not fully comprehend the significance of environmental protection policies, they continue their exploration and production activities without intending to put the environment at risk. A comprehensive approach must be taken to educate managers and employees to improve the quality of services provided to the industry and relevant customers both now and in the future due to the fact that almost half of respondents to this survey indicated that there is no specific department responsible for sustainability in their organization (Dima et al., 2017).

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A DECISION SUPPORT SYSTEM WITH MODIFIED MULTI-CRITERIA DECISION MAKING AND DATA MINING

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Abstract- Today's vast research community uses the increased global availability of data relating to many different fields of employment to uncover previously unknown knowledge. According to a related field study, classification schemes for data mining have been widely used by researchers to label data and identify the category or class of newly entered statistics. However, because each practical scheme has a different operational structure, it can produce different results even when evaluating the same data sets. Therefore, finding a variety of unique classification schemes remains a research issue in the associated topic. This study gives a thorough evaluation of some of the most popular classification methods together with a few benchmarked datasets accessed from the UCI repository to identify and demonstrate the suitability/unsuitability of an accessible classification scheme.

Keyword: Decision Support Systems, Data Mining, Multiple Criteria Decision Making, Knowledge discovery process, Naive Credal Classifier.

1 INTRODUCTION

The Healthcare industry consists of big and complex statistics that may be required to discover a captivating pattern of sicknesses & makes effective decisions with the help of different gadget-mastering strategies. Advanced data mining techniques are used to discover information in databases and for scientific research.

In recent times, sicknesses like coronary heart sickness and breast cancer are growing daily due to lifestyle, hereditary, and so on. Especially, heart disorder has come to be greater, not unusual in recent times, i.e., human lives are at hazard. Each person has diverse values for low cholesterol, Blood stress, pulse fee, and so forth. Understanding discovery in databases is a nicely-described process inclusive of several awesome steps. Fact mining is the center step, which ends with the discovery of hidden however beneficial understanding from massive databases. a formal definition of expertise discovery in databases is given as follows: "facts mining is the non-trivial extraction of implicit formerly unknown and doubtlessly beneficial information about information" [1]. typically, data mining is considered an in-depth place that mixes methods from numerous fields including statistics, database structures, pattern reputation, device getting to know, and artificial intelligence for investigating large quantities of records [2] [3]. Currently, health center facts structure the use of selection aid structures have different tools to be had to attain facts, but they are still constrained. those tools can just answer a few simple queries like "identifying the male patients who're beneath two decades antique, and single who's been handled for a coronary heart attack". However, they are now not capable of solving complex

queries “given affected person statistics, predicting the possibility of patients getting a heart disorder” as an example [4].

Data mining has been defined because of the non-trifling removal of formerly unidentified, inherent, and probable practical facts from facts. It's far one of the responsibilities which cope with the Revised Manuscript received on March 20, 2019. Sireesha Moturi, department of computer science and Engineering, KLEF, Vijayawada, India. Sireesha Moturi, department of laptop technological know-how and Engineering, Narasaraopeta Engineering university, Narasaraopet, India. Dr. S. N. Tirumala Rao, of laptop science and Engineering, Narasaraopeta Engineering College, Narasaraopet, India. Dr. Srikanth Vemuru, branch of laptop technology and Engineering, KLEF, Vijayawada, India. Development of detecting facts from the database. Data Mining is exploited to find information out of facts after which, its miles are depicted in an effortlessly understandable form. it is the system of investigating big quantities of records that are collected in an ordinary manner [5] [6] [7]. The detection of disease plays an enormous role in data mining. These forms of patterns are exploited for the clinical diagnosis of extensively disseminated raw scientific records. These records have to be amassed in a managed type. These accrued statistics may be mixed to shape a sanatorium statistics gadget [8]. Information mining era gives a consumer-oriented technique for exploiting hidden styles in the facts. The prediction of heart disease is modeled to prop up clinicians in their prognosis to predict the disease [9] [10] [11] [12], which offers [13] [14] a powerful manner to retrieve the data obscured within the information.

1.1 Data Mining

Data Mining is exploited to find records out of statistics after which, it's far depicted in a results easily understandable form. It's miles the technique of investigating large portions of information that might be accrued mechanically. Records mining is maximum positive in investigative scrutiny because of non-trifling information in huge portions of records [15][16].

It is feasible to put information-mining sports into considered one of two classes.

- **Predictive data mining:** Predictive fashions can be used to forecast explicit values, primarily based on patterns determined from recognized results. as an example, from a database of clients who have already replied to a selected offer, a version may be constructed that predicts which potentialities are likeliest to reply to the same provider.
- **Descriptive records mining:** Descriptive fashions describe styles in present facts, and are normally used to create significant subgroups consisting of demographic clusters.

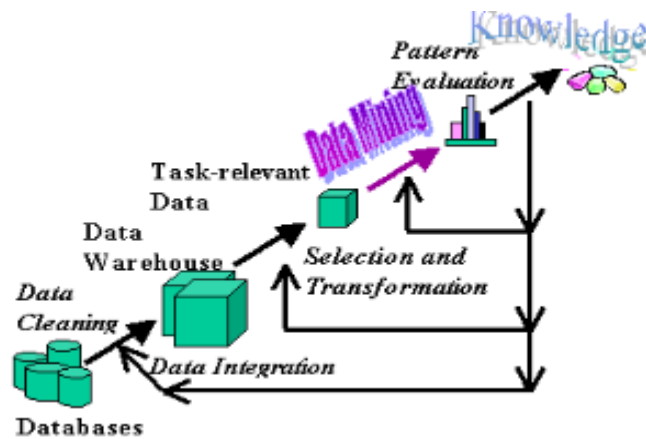


Figure 1 Process of Data Mining [19]

The iterative system includes the following steps records cleansing, information Integration, information selection, records transformation, data Mining, pattern evaluation, and understanding the middle for knowledge Discovery system.

It is an accommodating enterprise of human beings and computer systems. Preeminent effects are attained by matching the statistics of human authorities in defining difficulties and purposes with the exploration skills of computer systems.

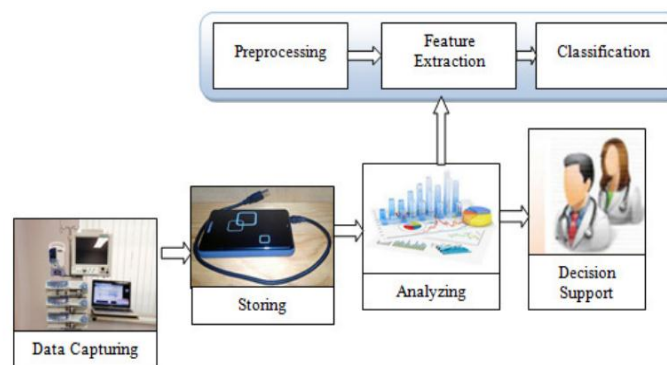


Figure 2 A Typical Health Informatics Processing

Predictive structures are the systems that are wont to are expecting some final results based on some pattern popularity, as shown in figure 1. Disease detection is the approach via which an affected person's analysis is carried out based totally on signs analyzed which can also purpose problem even as predicting disorder affect [17]. As an example, fever itself will be a symptom of many issues that don't inform the healthcare expert what exactly the ailment is. Due to the fact the consequences or evaluations vary from one health practitioner to exceptional, there may be a demand to assist a scientific health practitioner who may have similar opinions virtually signs and symptoms and problems [18]. This can be finished by using analyzing the statistics generated by using medical facts or medical statistics.

Clinical statistics Mining is a domain of challenges that involves a variety of imprecision and uncertainty. the provision of first-rate services at a cheap cost is an important project confronted within the health care corporation. A terrible clinical choice might also result in disastrous outcomes. health care facts are big. medical

choices are frequently made primarily based on a doctor's level in preference for the know-how-wealthy information hidden inside the database. This is few cases will bring about mistakes and immoderate clinical costs which have an effect on the high-quality of the carrier to the patients [20]

Statistics Mining is the system that analyzes the "know-how discovery procedure in a database (KDD)". There are many usages of information mining techniques. Prediction is considered one of them. In the long run, we get beneficial details from those facts. the following diagram indicates the expertise discovery system of information.



Figure 3 Knowledge discovery process using data mining [21]

First, get the records about records. Select a dataset and create a target dataset and following steps are performed.

1. **Records cleansing:** get rid of the noise or unusable facts. Records Integration: integrate multiple facts assets three.
2. **Facts selection:** applicable information is retrieved from the database four.
3. **Data Transformation:** rework the facts into the ideal pattern in keeping with the undertaking.
4. **Records mining:** pick the procedure from type, regression, clustering, and so forth to extract patterns.
5. **Sample assessment:** This step evaluates the sample. knowledge representation: get the located knowledge.

1.2 Clustering Techniques

The clustering system divides the records into cluster groups or subclasses. We used 4 clustering algorithms, specifically k-way, EM, PAM, and Fuzzy C-means [21]. The k-means class algorithm works by means of partitioning n observations in okay-subclasses described via centroids, in which ok is selected before the algorithm starts. Ok-manner and EM are two iterative algorithms. EM (expectation-maximization) is a statistical version that depends on the unobserved latent variables to estimate the maximum chance parameters. Partitioning around medoids (MAP) is similar to the approach that partitioning is based on the k-medoids approach, which divides statistics into numerous disjoint clusters [21].

1.3 Classification Techniques

Machine learning-primarily based type techniques may be used to classify numerous items primarily based on a sequence of training data whose result cost is thought classification algorithms are used: KNN, SVM, Naive Bayes, and C5.0. Inside the nearest neighbor KN, the object is assessed through most people of its neighbors, with the object being assigned to the maximum usually used class among its nearest pals. In SVM (Support Vector Machines), facts is first transformed into a set of factors after which classified that may be separated linearly. The Naive Bayes model calculates the chance of a hard and fast of records that may belong to a class the use of the Bayes rule. The C5.0 algorithm is a decision tree that recursively separates observations in branches to shape a tree to improve prediction accuracy. it's miles a progressed model of the C4.5 and ID3 algorithms.

1.4 Data Mining Methodologies for Medical Decision Support Device

But, in beyond decades a lot of algorithms had been offered by related area investigators to aid experts' selections. each implemented technique made an effort to extend the existing counsel act but the description of every set of rules isn't feasible to include in this paper, this examination has restrained to the 4 strategies that have been broadly considered using current investigators in the contemporary duration i.e., Naïve Bayes (NB), decision Tree (J48), guide Vector device (SVM) and Multilayer Perceptron (MLP).

1. Naïve Bayes

Naïve Bayes [22] is a type set of rules based on the Bayes theorem, which calculates a chance by way of counting the frequency of values and aggregate of values n historical data. Bayes theorem unearths the opportunity of an occasion happening given the opportunity of any other occasion that has already happened.

$$\text{pro (B given A)} = \text{pro (A and B)}/\text{pro(A)}$$

2. Decision Tree

Berry and Linoff described a decision tree as “a shape that may be used to divide up a big series of statistics into successive smaller sets of data by making use of a series of easy decision regulations. With each successive department, the individuals of the ensuing sets come to be increasingly much like each other”. ID3 (Iterative Dichotomiser three) is one of the choice tree models which builds a decision tree from a set set of training times. C4.5 is the present-day model of the ID3 induction set of rules, C5.0 is an extension of the C4.5 decision tree algorithm and the J48 decision tree is the implementation of the ID3 algorithm.

3. Genetic algorithm

In artificial Intelligence, a Genetic algorithm is a search technique that makes use of the technique of natural selection. Genetic algorithms provide optimization answers and seek troubles through the usage of strategies consisting of inheritance, mutation,

selection, and crossover. a standard genetic set of rules calls for a genetic illustration of the answer domain and a health function to evaluate the solution domain.

4.Support Vector Machine (SVM)

In SVM (Support Vector Machines), data is first converted into a fixed of points after which categories can be separated linearly. SVM is used to scale a huge quantity of monitored patients for the estimation of predicted variables.

2 LITERATURE REVIEW

In [23] the initial introduction of laboratory requirements. Then each parameter's impact on output and the value of the stated important data was determined by applying logistic regression and statistical analysis parameters, and finally, the proposed model with inputs and the probability of each of the outputs to accurately anticipate has been made possible by including the potential of output for each of the rules (neural network inputs) and its impact on the desired output. The recommended approach shows whether a person has the disease or not, allowing doctors to identify patients early and take the required steps to control the condition.

This paper [24] implies a brand-new disease prediction model with an improved classification technique. Coalesce rule generation, optimised feature extraction, and hybrid classification are the three stages of the proposed prediction model. Before the rules are formed, the given large data is first preprocessed by changing the data's format. A recently developed algorithm, the new levy Update based Dragonfly Algorithm, chooses the best characteristics (NL-DA). In order to determine an accurate disease prediction, the chosen best features are then sent to a new hybrid classifier that combines Deep Belief Network (DBN) and Support Vector Machine (SVM). In terms of Accuracy, Specificity, Sensitivity, Precision, F1Score, Negative Predictive Value (NPV), and other metrics, the suggested NL-DA model is compared to existing traditional approaches.

In [25] Examine briefly the possible application of vast amounts of healthcare data to classification-based data mining techniques including Rule-based, Decision Tree, Naive Bayes, and Artificial Neural Networks. One Dependency Augmented Naive Bayes Classifier (ODANB) and Naive Credal Classifier 2 (NCC2) are used for data preprocessing and efficient decision-making. This is a naive Bayes addition to imprecise probabilities that seeks to produce reliable classifications even when working with small or insufficient data.

Another approach suggests using data mining methods including neural networks, association rules, support vector machines (SVM), genetic algorithms, and rough set theory. SVM and Decision Tree are the most successful methods for treating heart disease among the ones mentioned above. By applying various data mining approaches, the qualities can be improved in future work to increase accuracy [26].

The three data mining methods—CART (Classification and Regression Tree), ID3 (Iterative Dichotomized 3), and decision table (DT)—are utilised and assessed in this study. How well the three classifiers performed. Various classifiers are researched

and evaluated to determine the finest for calculating the patient's diagnosis using a classifier. The top CART is an algorithm that provides more accuracy [27].

A clinical decision support system (CDSS) for diabetic retinopathy has been proposed by Saeed Piri et al. [29] Data from more than 1.4 million diabetes individuals have been analysed by the authors to explain how the build ensemble technique led to more success. Accurate results when compared to available techniques. To enhance the authors' approach to building quality taking into account the data preparation and cleansing analyse of the distribution of the data and the percentage of missing data choose important values that are sufficient and meaningful predicting abilities. et al. Emrana Kabir Hashi.

3 PROPOSED METHODOLOGY

Related published works show that no single classification approach is capable of maintaining its actions as statistics change. Each available effort also has several flaws, including rigidity, a lengthy model-building process, and the fabrication of a vast amount of inaccurate mark data. Such problems are a major factor in the failure of current algorithms. The suggested technique placed a significant priority on actively discovering the two best forecasting and feature selection processes over utilising statistics to create an extremely competent counsel scheme.

Five benchmarked datasets have been collected from the UCI repository to examine the classification act of various data mining schemes. Five popular data mining algorithms Naive Bayes, HMM, KStar, SVM, and Hoeffding tree with a combination of the CFS feature downsizing method and the GRAT methodology have been taken into consideration using various feature assortment actions and data sets to create competent and precise decision support models. Each algorithm was tested using different sets of features over the data set, and finally, the classification method was chosen with a feature selection process that led to results with a better degree of accuracy. Two of the best classification methods have been chosen based on the performance evaluation of each approach using a proposed mechanism that combines the methods into a layer form. Without requiring manual work, the suggested mechanism automatically chooses the two best classification mechanisms and feature selection processes for the given data set.

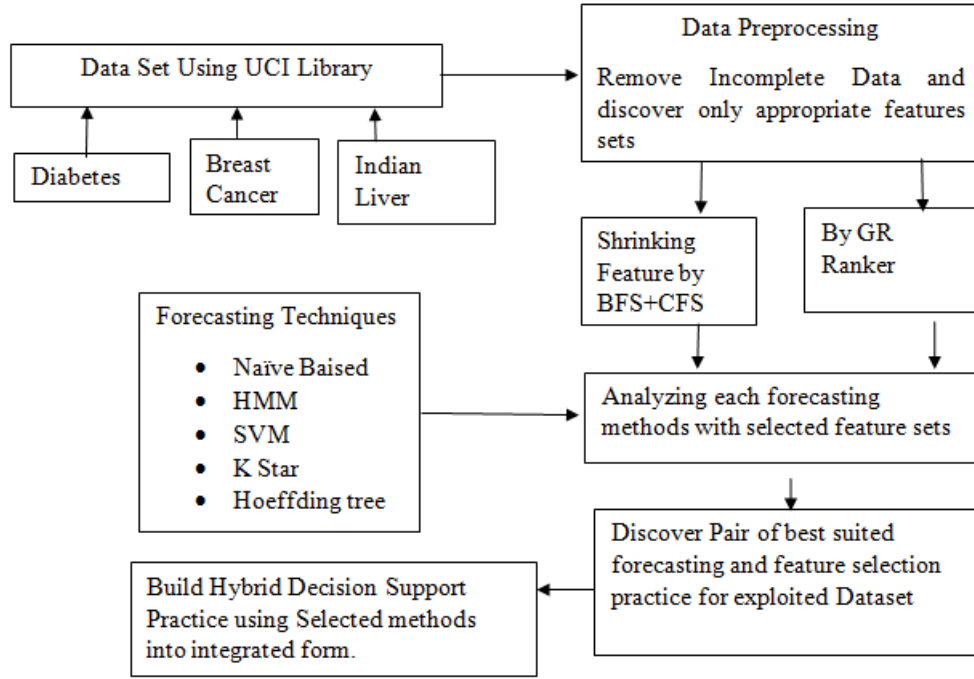


Figure 4 Research Methodology

4 RESULT ANALYSIS

Equation: To elaborate an act, the effectiveness of offered strategy attained precision has been considered as a crucial parameter.

$$\text{Accuracy} = \frac{TP+TN}{TP+TN+FP+FN}$$

Where,

1. **True Positive (TP):** The total of data that were accurately predicted against the class type.
2. **True Negative (TN):** Without sounding the alert, the record is checked and placed correctly.
3. **False Positive (FP):** A situation where statistics are not linked to their fitted class.
4. **False Negative (FN):** Facts of one class estimated as a component of another.

Several tests have been conducted using a wide range of statistics collected from one of the most well-known open access data libraries, UCI, to monitor actual behavior and the dominance of the designed advice scheme in contrast to other available approaches. To evaluate a planned action in comparison to the currently available approaches, statistics utilising N. Sneha's methodology [28], may be accessible through the 768 people who hold the record at UCI. Authors of previously published works suggested a modified technique using Naive Bayes, Random Forest, SVM, KNN, and Decision Tree algorithms

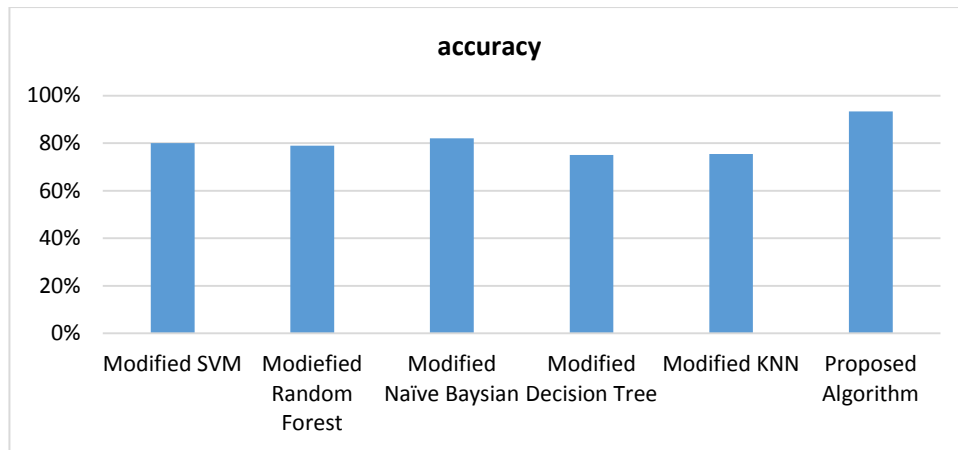


Figure 5 Proposed Approach V/s N. Sneha Modified Algorithm over Diabetes Dataset [28]

5 CONCLUSION

To identify the two most appropriate methods, the Hidden Markov Model (HMM), Support Vector Machine (SVM), KStar, and a type of Hoeffding tree algorithm were automatically analysed over an exploited dataset in this research. Additionally, the build practise integrates the methods that have been developed and uses them in liner mode in conjunction with feature selection processes that combine correlation-based feature selection with the best initial search and Gain ratio with the Ranker method. Numerous simulations have been run to show the effectiveness of the suggested technique. Every single comparable result has shown the effectiveness and acceptability of the adopted strategy. However, evaluation results demonstrate the superiority of the proposed algorithm over some obtainable processes and some contemporary approaches in terms of the high accuracy attained. However, the proposed model also has some distinctive limitations that can be improved with further research. Future work can be done on a plan to create the best self-motivated process with the integration of different approaches in a well-organized manner.

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UNDERUTILIZED GREEN LEAFY VEGETABLES: UTILIZE THE UNDERUTILIZE

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Abstract- Vegetables are an important part in every one's life and also as a part of Indian cuisine. These underutilized greens helps in preventing various deficiencies and provide a long term approach in treating several micronutrient deficiencies. Underutilized greens possess immense nutritional potential which can contribute towards nutritional security. Underutilized greens are micronutrient dense nature's gift to mankind that provides vitamins and minerals along with antioxidants. These underutilized greens are easily available in the vegetable market at free of cost. These are not utilized in daily diet rather used for cattle feed due to lack of awareness about their nutritional value. Intake of underutilized greens in the daily diet can be one of the strategies for improving nutritional status. The underutilized vegetable greens are gaining importance as a means to increase the per capita availability of food hence, it can be explored to improve the nutritional status of the country and helps in preventing many malformations by incorporating these greens in daily diet.

Keywords: Underutilization, Utilize, Green Leafy Vegetables.

1 INTRODUCTION

Every group has its own benefits to serve mankind. Green Leafy Vegetables are important group of nutrient dense commodity regarded as nature's anti-ageing wonders, inexpensive food resource and a future herbal medicine owing to its concentrated and overloaded source of nutrients and phytochemicals. As leafy vegetable serve an important and diverse component in regular diet of rural and tribal communities satisfying nutritional need and contribute to livelihood as a food and medicine, hence can be considered as potential tool to obtain sustainable agriculture, safeguarding the nature thus can incorporate other commercial crops leading to minimizing the scarcity of traditional food availability and danger of extinction. Leafy greens of vegetables such as beetroot, carrot, cauliflower, colocasia, radish, turnip, etc., are the examples of underutilized greens. These underutilized greens are easily available in the vegetable market at free of cost. Various value-added products can be developed by incorporating underutilized greens in various Indian recipes. The developed products will provide an alternative way to increase the consumption of underutilized greens among community. Also, utilization of unexplored food items by incorporating in different food items is being considered. Vegetable greens, such as the leaves of carrot, cauliflower, Beet greens, colocasia, radish, and turnip are rich in micronutrients and antioxidants but are usually discarded or not used for human

consumption due to lack of knowledge regarding health benefits and nutritional importance of these underutilized green leaves.

Red beetroot (*Beta vulgaris rubra*) - The Beta Vulgaris, is a traditional and most popular vegetable in many parts of the world. Beet root leaves are rich source of potent nutrient, potassium and Vit A, K and C, which are important for CVD health. Beetroot leaves are used to reduce blood pressure and also as a tool to fight against cancer. The beetroot leaves can be advised to children, adults, pregnant women and diabetes patients. The beetroot juice helps to improve the haemoglobin in the blood. The price of beetroot is cheaper as compared to others and can be stored easily when its dehydrated.

Incorporating beet root in diet has been reported to reduce systolic and diastolic blood pressure, inhibit platelet aggregation, improve vascular and endothelial function, reduce blood glucose and improve insulin homeostasis, and possess renoprotective properties. Beetroot contains high concentration of phytochemicals and essential nutrients and is abundant in inorganic Bioactive compounds are believed to play crucial roles within the mechanistic pathways and be responsible for the promising clinical effects.

Beetroot leaves are also one of the most underutilized vegetables which are highly nutritious. The iron content of Beetroot leaves is even better than that of spinach. The nutritional composition of beet leaves is similar to the beetroot which is rich in carbohydrates, fibre, protein, and many minerals such as Sodium, Potassium, Calcium as well as Iron. Due to lack of nutritional profile among people, these greens leaves are underutilized.

Cauliflower leaves (*Brassica oleracea* var. *botrytis*) - Cauliflower is a popular winter vegetable that is widely produced in India. Typically, we cook the white or yellow flower section and discard the green leaves in the garbage can or feed them to domestic animals. Cauliflower leaf is a good source of iron, with 40mg/100g making it a good choice for preventing and treating anaemia in children, adolescent girls, and women. Many Scientific studies have shown that cauliflower leaf powder is anti-inflammatory. Cauliflower leaves are high in protein and minerals such as calcium and iron, which are important for children, appropriate growth and development. Cauliflower leaves are extremely useful to undernourished children when consumed on daily basis. This aids in development of their height, weight and Haemoglobin. Cauliflower are dark green colored, abundantly available in the vegetable market during winter. These leaves are an excellent source iron but highly underutilized in regular diet. The problem is it's seasonal. It needs to be stored well. Due to very high moisture content (80%), it gets spoilt within a day at room temperature. Even keeping the greens in the refrigerator, the freshness is lost within a couple of days. Cauliflower Leaf Powder is Dry (looks like Kasurimethi) containing a negligible amount of moisture and thus, it can be stored for a long time, (around 3months) without

refrigeration. If you kept this homemade cauliflower leaf powder in the refrigerator, you can also store the leaf powder for longer time.

Cauliflower Leaf Powder can be incorporated into any day to day recipe to improve the overall health and nutritional status of the family members. It is specially good for the Diabetic as it contains moderate carbohydrate with high protein and fiber content. Cardiac patients as it is low fat, high fiber food stuff. Anyone who suffers from constipation because it is rich in fiber which helps to clear bowel.

Save-Store-Mix-Consume- to cure and prevent anemia. Anemic person as the cauliflower leaf is a very good source of iron. Don't forget to drink fresh lemon water after the meal to ensure better absorption of Iron.

2 METHODOLOGY

Value-added products from Underutilized greens. Underutilized vegetable greens are a powerhouse of essential vitamins, micronutrients, protein, and other phytonutrients that have the potential to play a major role in strategies to attain food and nutritional security. Various value-added products have been developed by incorporating underutilized greens in various forms. The developed products provide an alternative way to increase the consumption of underutilized greens with various health benefits by incorporating in daily lives.

Various researcher used these underutilized healthy greens in value addition of the products:

Kulkarni (2003) developed a number of value added food products using underutilized leafy vegetables. In another study, Singh and Awasthi (2003) studied the nutrient composition of products namely murukku, biscuits, mathri and namakpare incorporated by colocasia, drumstick and curry leaves.

Banka et al., (2017) The results of the study revealed that products incorporated with 5% of dried leaves were found most acceptable. The study Revealed that the development and use of iron-rich value-added products from unconventional leaves can serve as a dietary approach to combat iron deficiency anemia.

Joshi and Mathur (2015) The leaf mixture was incorporated in the chapati. The results of the study revealed that fortification of food products with leaf mixture improved the hemoglobin level of anemic adolescent girls.

Buvaneswari and Ramya (2014) studied the overall acceptability of food products incorporated with cauliflower leaves and its impact on treating anemic college going girls. The results of the nutrient analysis revealed that cauliflower leaves were rich in vitamin C (54.27mg/100g), β -carotene (42.58mg/100g), protein (28.98 gm/100g) and iron (60.78mg/100g). The leaf powder incorporated at a 5% level was highly acceptable in chocolate, cookies and green gram balls. The study revealed that the supplementation of cauliflower leaves can be helpful in treating anemic adolescent college girls.

Kaur and Kochhar (2009) incorporated fresh and dehydrated carrot greens in commonly consumed food preparations. The level of incorporation of fresh and dried carrot greens ranged between 40 to 80% and 7 to 9%, respectively. In fresh carrot greens incorporated food preparations, the maximum and most acceptable level was 80% in saags and minimum (40%) in puri and kadhi. In dry carrot greens incorporated food preparations, the most acceptable level was 9% in mathri.

Verma and Jain (2012) studied the nutritional composition of mathri supplemented with fresh and dried leaves of spinach, mint, and carrot. The nutritional evaluation showed that protein (7.44 g) and iron (5.37 mg) in dried vegetable mathri was higher as compared to fresh vegetables mathri.

Kowsalya and Mohandas (1999) also studied the acceptability and nutrient profile of cauliflower leaves. Cauliflower leaves were incorporated into South Indian preparations such as porialand kotu. The results of the study revealed that cauliflower leaves are accepted well in its meal form as well as in the incorporated recipes (10 and 20%). The nutrient profile of cauliflower leaves showed the presence of 32mg/100g vitamin C, 21861mg/100g total carotene, 14731mg/100g beta carotene, 490mg/100g calcium, 40mg/100g phosphorus and 1310mg/100g potassium. The leaves were excellent sources of antioxidants like β carotene, vitamin C and minerals like selenium, copper, zinc, and iron. It was concluded that the development of products based on these vegetables may increase the nutritional value of regular Indian diets. The proper use of underutilized vegetable leaves can be an effective effort towards achieving the nutritional security of masses at low cost. Thus, it is recommended that the various value-added products from underutilized greens if incorporated in regular dietary patterns can be a healthy option for the general masses.

3 RESULTS AND DISCUSSION

Results of the present study clearly revealed the less utilized greens of beet root (*B. vulgaris*) and cauliflower (*B. oleracea*) are packed with various nutrients. Development of products based on these vegetables will increase the nutritional value of the regular Indian diet as well as this can contribute to the food security among the people of the region at low cost. The dried leaf powder of beetroot and cauliflower, which are generally discarded and have a higher waste ratio. These green leave are nutrient-dense but seldom find a place in the diet of people due to ignorance and lack of awareness. These underutilized greens have been utilized for enhancing the nutrient content of the developed value added Products. For the nutritional enhancement in any Indian reciepe, powder has also been incorporated for further value enhancement. This is a food-based approach for nutrient (Iron) deficiency. Hence, through this article, an effort has been made to boost nutrition and food security by incorporating these leaves in daily diet. There is a strong need to popularize these natural resources which are rich in iron and utilize them for food purposes.

4 CONCLUSION

The use of these Underutilized green vegetables should be encouraged particularly in areas where they are not utilized properly in daily lives and discarded due to lack of proper nutritional knowledge, produced through nutrition education in order to promote the food use of these underutilized greens. And Promote Development of product based on underutilized vegetables greens. It will increase the nutritional value of the regular Indian diet, and treat many deficiencies by diet instead of supplementation and it will a long term approach to treat deficiencies. And it can contribute to the food security among the people of the region by proper use of these nutrient dense underutilized green leaves.

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E-COMMERCE IN THE POST COVID-19 ERA: A STUDY ON CHALLENGES AND OPPORTUNITIES IN INDIA

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Abstract- E-Commerce is growing rapidly and it is most exciting business opportunity over the globe and in India as well before the Covid-19 pandemic. Lockdown followed by covid-19 affected the gaining momentum of E-commerce due to the announcement of containment zones, restrictions imposed on products, timings and limitations imposed on the physical delivery of necessary goods and services. Before the pandemic, buyers buying behaviour towards shopping on the internet had clear differentiation between for those whom it involved suitability, whether it be products or food and staples or supporting items and for those whom it was basic to shop from physical markets since they are traditional and more active places for shopping. The pandemic has made a clear change in the buying mentalities and their purchasing, directly influencing the E-Commerce business. During the pandemic, only necessities and medicinal supplies are being made accessible and people are restricting their cash expenditures as per their necessities, which offers both challenges as well as opportunities for the E-commerce industry. This paper is an effort to discuss the challenges and opportunities faced by the E-commerce industry in the post-Covid-19 era.

Keywords: E-commerce, Covid-9, Business Opportunity, Internet, Challenges, Consumer Behavior, Opportunities.

1. INTRODUCTION

E-commerce (electronic commerce) is the buying and selling of goods and services, or the transmitting of funds or data, over an electronic network, primarily the internet.

The introduction of internet in India in 1995 opened doors for many business opportunities including E-commerce in the country. K Vaitheeswaran, father of e-commerce in India started India's first e-commerce company Fabmart.com (later rebranded as Indiaplaza.com) in 1999.

Generally, there are seven models of ecommerce that businesses can be divided into:

Sl. No	Model Name	Full Form	Example
1.1	B2C	Business to Consumer	Wal-Mart, e-bay
1.2	B2B	Business to Business	indiaMart, TradeIndia
1.3	C2C	Consumer to Consumer	OLX, quikr
1.4	C2B	Consumer to Business	Bazee.com Fotolia
1.5	B2A	Business to Administration	TurboTax, H&R Block
1.6	C2A	Consumer to Administration	T App Folio
1.7	D2A	Direct to Consumer	Netflix

1.1 Business to Consumer: B2C ecommerce encompasses transactions made between a business and a consumer. B2C is one of the most popular sales models in the ecommerce context. For example, when you buy shoes from an online retailer, it's a business-to-consumer ecommerce transaction.

1.2 Business to Business: Unlike B2C, B2B ecommerce encompasses sales made between businesses, such as a manufacturer and a wholesaler or retailer. B2B is not consumer-facing and happens only between businesses.

1.3 Consumer to Consumer: One of the earliest forms of ecommerce, consumer-to-customer ecommerce relates to the sale of products or services between customers. This includes C2C selling relationships, such as those seen on eBay or Amazon.

1.4 Consumer to Business: C2B reverses the traditional retail model, meaning individual consumers make their products or services available for business buyers. One example of a C2B ecommerce business is iStock, an online store where stock photos are available for purchase directly from different photographers.

1.5 Business to Administration: B2A covers the transactions made between online businesses and administrations. An example would be the products and services related to legal documents, social security, etc.

1.6 Consumer to Administration: Consumer to Administration encompasses electronic transactions online between the individuals and public administration. C2A can include online consulting for education, online tax preparation, etc.

1.7 Direct to Consumer: A newer model of ecommerce, D2C refers to a business that sells products directly to the end customer instead of going through a retailer, distributor or wholesaler. One common example of D2C ecommerce is a subscription-based brand such as Netflix or Dollar Shave Club.

2. LITERATURE REVIEW

Chang, and Meyerhoefer (2020) referenced in their review that requirements for grain, organic products, new vegetables and precooked food varieties have risen, helping and benefiting small-scale farmers in agronomy.

Bhatti.et al., (2020) talked about in his study that there is an impact of Coronavirus overall online business of the world. The idea of business has changed because of this pandemic. As indicated by the examination over 50% of the customers are abstaining from going for offline shopping and crowded places.

Neger and Uddin (2020) reviewed that less tedious, various methods of payments and installment, etc. have an impact on online shopping.

Charumathi and Rani (2017) examined that web-based purchasing or E-purchasing is a sort of electronic business that offers types of assistance to customers

to buy goods and services from an e-retailer by utilizing Internet innovation with the assistance of an internet browser directly.

Saravanan and Devi (2015) indicated that because of expanding utilization of the Internet, the buying conduct of customers is changing and their fascination with E-purchasing is increasing day by day. Because changing perception of customers in purchasing and selling of goods and services prompts enormous climb in the count of online purchasers.

Rastogi (2010) found in his review paper that because of expanding usage of the web, buyers can buy anything, from any place they need to shop with opportune and secured value installment alternatives. Buyers can look and compare different products and websites to improve shopping. There are different reasons or drivers of online shopping like various kinds of items, advantageous purchasing, sensible costs, and various alternatives for installments.

3. RESEARCH METHODOLOGY

This study is exploratory in nature. The researcher has explored various studies on E-commerce before and post covid-19 era.

3.1 Research Objectives

The objectives of the study are

1. To explore the trends in Indian e-commerce market
2. To explore the opportunities the E-commerce industry has in the post-covid-19 era.
3. To explore the challenges faced by the E-commerce industry in the post-covid-19 era.

3.2 Data Collection

The study is based on secondary data, sourced from various databases like research articles, google scholars, websites, journals, etc.

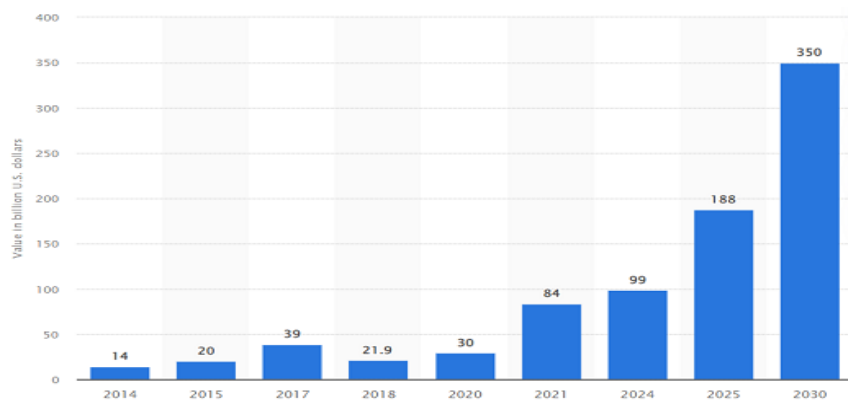
4. E-COMMERCE AND COVID-19 PANDEMIC

Coronavirus impact the whole e-commerce of the world; it has changed the nature of business. Despite the Covid-19 crisis and economic downturn, the e-commerce industry in India saw an upward trend post lockdown, registering a 17 per cent increase in order volume as of June 2020, when compared to the pre lockdown period.

4.1 India E-commerce Market Key Players:

- eBay • Amazon • Phone pay • Google • Flipkart • Snapdeal • Jabong • Myntra • Paytm
- Make My Trip • Infibeam • Limeroad • Shopclues • Naaptol Online Shopping Pvt. Ltd
- Nykaa • Yepme -Vas Data Services Pvt Ltd • Tata Cliq • Cleartrip.com

4.2 Market size of e-commerce industry across India from 2014 to 2018, with forecasts up to 2030 (in billion U.S. dollars)



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Owing to the increasing internet usage and favorable market conditions, India has a lot of potential in the e-commerce segment. After China and the US, India had the third-largest online shopper base of 150 million US dollars in 2025 and is expected to be 350 million US dollars by 2030.

Indian consumers are increasingly adopting 5G smartphones even before the rollout of the next-gen mobile broadband technology in the country. Smartphone shipments reached 169 million in 2021 with 5G shipments registered a growth of 555% year on year 2021. Smart phone shipments reached 150 million units and 5G smartphone shipments crossed 4 million in 2020, driven by high consumer demand post-lockdown. According to a report published by IAMAI and Kantar Research, India's internet users are expected to reach 900 million by 2025 from 622 million internet users in 2020, increasing at a CAGR of 45% until 2025.

4.3 Future of online retail in India

"The pandemic has made people comfortable with online shopping," said Ashutosh Sharma, VP and research director at Forrester. More importantly, this has resulted in a consumer behavioral change.



Source: Forrester

The number of online buyers in India shot up from 71.5 million in 2016 to 179.5 million in 2020, and Forrester forecasts this number to rise to 291.5 million by 2025. This growth will largely be driven from smaller towns and rural areas.

5. OPPORTUNITIES

5.1. E-Commerce Becomes Global: Because of the epidemic, more people are turning to online shopping, particularly for necessities. This presents a significant opportunity to increase cross-border sales to nations where e-commerce penetration has previously been slow to grow.

5.2. Safe and secure: With an online store, one need not to step out and this keeps you safe and secured. Choose an e-commerce website and order gets delivered at your door step.

5.3. Lower search costs: The Internet brings low search costs and high price lucidity. E-business has proved to be highly cost effective for business concerns as it cuts down the cost of marketing, processing, inventory management, customer care etc. It also reduces the load of infrastructure required for conducting business.

5.4. Round the clock: Customers can do transactions for the product or enquiry about any product/services provided by a company anytime, anywhere from any location.

5.5. Use of augmented reality (AR): In the current scenario where customers are not willing to venture out of their homes, e-commerce companies are likely to increase their use of AR. This will help in creating a personalized customer experience by blurring the line between the physical reality and the virtual one. Increase in use of chatbots and personal assistance apps will make transactions on e-commerce more seamless. This will also make consumers feel more comfortable and gives the retailers that credibility that helps them earn the consumers' trust and increase conversions. For instance, if a customer wants to buy new spectacles, he/she can upload their picture on the website and try multiple frames to select the one best suited option. The AR creates a modeled version of it by visualizing the product on customer's face. Similar technologies will be used by apparel retailers which will help in pushing up the sales.

5.6. Critical mass of Internet users: With more than 600 million Internet users, the country is beginning to achieve a critical mass of users who are familiar with web services. The unexploited ecommerce market in India shows a huge opportunities and scope for investment.

6. CHALLENGES

6.1. Cyber security Laws: Other big challenge associated with e-commerce market is the near absence of cyber laws to regulate online transactions. The India's Information Technology Bill passed by the Indian Parliament on May 17, 2000 intends to tackle legislatively the growing areas in e-commerce. As it stands today, the Bill deals with only commercial and criminal areas of law. However, it does not take care of issues

such as individual property rights, content regulation to privacy and data protection specific legislation.

6.2. Quality website traffic and visitor conversion: To turn your traffic into converting customers, you must have a website that is modern, clean, user-friendly, trustworthy and virus-free. Every industry is different, so understanding your audience is crucial to designing a website that resonates with your audience

6.3. Consumer Demand & Stock Fluctuations: Many individuals left jobless, income levels affected badly and inflation touching high. This brought massive fluctuations in consumer behavior. Even stores that had managed inventory well have suffering a lot.

6.4. Return and refund policies: A good return and refund policy could be the difference between success and failure. That sounds extreme, but it's true. Be transparent and create a smooth, fast and easy return policy.

6.5. Supply chain Challenges: Issues related to lack of supply chain integration, high delivery charges for products, delay in delivery and lack of proper courier services in some areas also make customers frustrated.

6.6. Touch and Feel' factors: Indian customers are more comfortable in buying products physically. They tend to choose the product by touching the product directly. Thereby, Indian buyers are more inclined to do ticketing and booking online in Travel sectors, books and electronics. Companies dealing with products like apparel, handicrafts, jewelry have to face challenges to sell their products as the buyers want to see and touch before they buy these stuffs.

6.7. Trust: Trust is another issue that affects the e-commerce businesses in India such as assurance of the quality product, guaranteed refund & return in case of faulty goods and trust in the privacy of the personal data.

6.8. Payment gateways have a high failure rate. As if the preference for cash on delivery was not bad enough, Indian payment gateways have an unusually high failure rate by global standards. E-business companies using Indian payment gateways are losing out on business, as several customers do not attempt making payment again after a transaction fails.

7 CONCLUSION

Covid-19 has had a significant impact on businesses around the world. Covid-19 has made new difficulties for some online e-businesses. From loss of profit to loss of employment, the pandemic is impacting all spaces of both life and business. This is a period for businesses to move their concentration to better opportunities, instead of panicking. The future of E-Commerce is difficult to predict. Despite of challenges, there

are some of serious opportunities in the e-commerce space. If the correct methods and practices are followed, a business will prosper in an e-commerce setting with much success and profitability.

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ANALYTICAL APPROACHES OF COMMUNICATION AND MEDIA

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1 INTRODUCTION

In our life, the role played by Communication is very significant. Most of the human beings spend up to 80% of the waking hours engaged in some form of communication; listening and responding to others, occupy much of this time; the rest includes talking, reading and writing. Verbal and non-verbal information assaults our senses and contribute as many as 2000 units of interaction in a single day. However, communication is not conducted by words alone. Gesture, a facial expression, a level of loudness, laughter and kiss - all these carry information.

The art of communication is primitive and the role of media is modern. The system of communication is common to all living things, (i.e.) the plant, animal and human being. The living things express their needs and necessities through their physical means from the inception. The special creation of God or nature, the human being, with the brain of questioning as the sixth sense, has created the system of Media.

The term media is the plural form of the word 'Medium'. Communication is an art of human evaluation.

Communication is the act of transmitting information, ideas and attitudes from one person to another. It is the interaction between two or more living beings, when they transfer thoughts, feelings and messages; it is a process of transmitting and receiving information. For communication to take place, there must be a sender who originates a message, a receiver to receive and interpret the message and the medium through which the transaction takes place. Success in communication depends upon the ability of the sender to transmit the message properly and the ability of the receiver to receive and interpret the message accurately.

2 CORE AREAS

The urge to communicate with our fellowmen is as old as mankind. Human beings communicate instinctively. From birth, a child's development is measured by its ability to communicate. It cries to relay the message of discomfort, hunger, pain, etc. Soon it learns to interpret the messages from the other people, interpreting body contact, facial expression and voice tones and response by gurgling and cooing. Later it shares the common language core to communicate with others.

According to an eminent sociologist Charles Cooley, communication is "the mechanism through which human relations exist and develop - all the symbols of mind, together with the means of conveying them through space and preserving in

time”.

Hence when we study communication, we have to study people in relation to one another and to their groups, organizations and societies. To understand human communication, we should understand how people are related to one another even before language was developed. Pre-Homo Sapiens communicated with each other with the help of non-verbal cues who might have sent some particular voice signal indicating that help was forthcoming. This could have been the beginning of communication by voice.

Language, a means of communicating thoughts between human beings was the next to evolve. Sir G. Elliot Smith “maintained that discovery of speech and language marked the beginning of man.”

Wilbur Schramm relates the origin of language to the development of crude tools; “tools such as sharp tools for cutting or scrapping may have existed as early as a million years ago.”

When an early hunter had a tool in his hands, he must have found it very hard to make the gestures that formed such an important part of the non-verbal communication that preceded language.

When he made his spears or knives, he was able to go for hunting. Hunting by night, living in dark caves, he must have discovered that voice signals instead of being incidental to his main activities could take over many of the functions of visual signals and gestures and so he learnt to be skilful with his vocal mechanism as with his hands.

- i. The Bow-wow theory
- ii. The Ding-dong theory
- iii. The pooh-pooh theory
- iv. The Gesture Theory

These are the four chief theories concerning the origin of human speech. Dr. Wilbur M. Urban dismisses the first three theories and argues that “even when combined they do not explain everything. Such theories assume that single words are the units of communication and develop in isolation, whereas it is probable that sentences and larger units came first and that words are the result of analysis, helped by written language.”

The term media is very popular today. Media-system has got many devices to convey message, to the mass. The technological advancement has ushered in a new era of transmission.

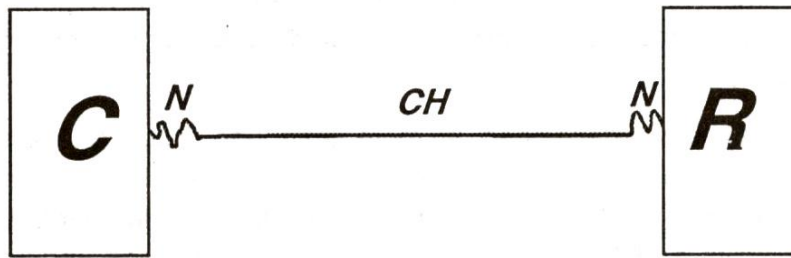
Other electronic systems such as cinema, radio, T.V., and video are the modern media, which have their own way of serving people. They serve not only as sources of entertainment, but also as the source of economic development, cultural exchange, national integration and world peace.

Aspects of the Communication Process

There are four aspects of the communication process.

1. The communicator or the sender or the encoder
2. The message

3. The channel
4. The audience of the receiver of the decoder



The communication process

C – Communicator

R – Receiver

N – Noise

CH – Channel

The sender of the message is called the source or the encoder. The receiver is the decoder. Communication involves people who send and receive messages, sometimes simultaneously. An important factor in the communication process is the existence of co-operation between the sender and the receiver. If you speak to a person who is totally lost in his thoughts or use a language he does not understand no communication will take place. Communication, in fact, is a social function and each community develops a common medium for the purpose. The medium may consist of a language or code—a set of symbols which stand for certain ideas, feelings, notions, etc. To encode a message, relevant symbols are selected and arranged into a pattern to convey meaning.

“Language is the dress of thought”, says Dr. Samuel Johnson, the famous English critic, in his ‘Lives of the English Poets.’

A communicator should begin with praise and honest appreciation. Lincoln said, “You can catch more flies with a spoonful of honey than with a pound of gall.” Don’t forget the words ‘Please’ and ‘Thank you’.

An effective communicator is one who is alert and aware of many things. ‘Aware’ can be an acronym for us to use in remembering how to communicate well.

- A – Assemble your message. In your mind outline in order the things you want to say.
- W – Watch your listener to see if you are getting through and to recognize distraction.
- A – Adapt your delivery to the situation. Deliver it in the way in which it will be received best.
- R – Relate your message in the order you assembled it. Relate it to the interests of your listeners.
- E – Evaluate how well you have communicated by asking questions and observing actions.

From the time of his civilized life man communicated message in artistic methods which became art and literature later. The signs of bodily expression and vociferous expression of human beings have been pruned, polished and changed as architecture. The outcome of this art are ballads, story telling, dramas etc. This is considered as the starting point of modern media of communication.

3 CONCLUSION

The modern system of media has got a very long history which can be traced even from the pre historic period. The concept of various media, it is essential to have a classification according to its nature and functioning.

- i. Classification according to period**
 - a. Media in the Ancient period.
 - b. Media in the medieval age.
 - i. Traditional media.
 - ii. Folk media.
 - c. Media in the Modern age.
- ii. Classification according to time value**
 - a. Permanent Media
 - b. Semi-permanent Media
 - c. Impermanent Media
- iii. Classification according to perception**
 - a. Visual Media
 - b. Audio Media
 - c. Audio-Visual Media
- iv. Classification of mass media according to technology**
 - a. Traditional Media
 - b. Print Media
 - c. Electronic Media
- v. Classification according to Media participants**
 - a. Individual Media
 - b. Group Media

The modern media system is efficient and effective. the invention of the printing press was the starting point of the modern media system. The introduction of the electric and the electronic devices and soft wares, has created a marvelous media system and made media a part and parcel of everyday life.

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GENERALIZATION OF NUMERICAL INTEGRATION

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1 DERIVATION OF NEWTON QUADRATURE FORMULA

Let $I = \int_a^b f(x) dx$

Where $f(x)$ takes the values $y_0, y_1, y_2, \dots, y_n$ for $x = x_0, x_1, x_2, \dots, x_n$.

Let us divide the interval (a, b) into n - sub intervals of width $h = \frac{b-a}{n}$ so that

$x_0 = a, x_1 = x_0 + h, x_2 = x_0 + 2h, \dots, x_n = x_0 + nh = b$.

Taking a new variater such that

$$r = \frac{x - x_0}{h}$$

$$x = x_0 + rh, \quad dx = h dr$$

$$\text{Then } I = \int_{x_0}^{x_0 + nh} f(x) dx = h \int_0^n f(x_0 + rh) dr$$

Using Newton's forward interpolation formula, we have

$$I = h \int_0^n \left[y_0 + r \Delta y_0 + \frac{r(r-1)}{2!} \Delta^2 y_0 + \frac{r(r-1)(r-2)}{3!} \Delta^3 y_0 + \frac{r(r-1)(r-2)(r-3)}{4!} \Delta^4 y_0 + \frac{r(r-1)(r-2)(r-3)(r-4)}{5!} \Delta^5 y_0 + \dots + \frac{r(r-1)(r-2)\dots(r-n+1)}{n!} \Delta^n y_0 \right] dr$$

$I =$ Integrating term by term, we obtain

$$I = h \int_0^n y_0 dr + h \int_0^n r \Delta y_0 dr + h \int_0^n \frac{r(r-1)}{2!} \Delta^2 y_0 dr + h \int_0^n \frac{r(r-1)(r-2)}{3!} \Delta^3 y_0 dr +$$

$$h \int_0^n \frac{r(r-1)(r-2)(r-3)}{4!} \Delta^4 y_0 dr + h \int_0^n \frac{r(r-1)(r-2)(r-3)(r-4)}{5!} \Delta^5 y_0 dr + \dots \quad (3.1.1)$$

$$\int_{x_0}^{x_0 + nh} f(x) dx = h \left[ny_0 + \frac{n^2}{2} \Delta y_0 + \left(\frac{n^3}{3} - \frac{n^2}{2} \right) \frac{\Delta^2 y_0}{2!} + \left(\frac{n^4}{4} - n^3 + n^2 \right) \frac{\Delta^3 y_0}{3!} + \left(\frac{n^5}{5} - \frac{3n^4}{2} + \frac{11n^3}{3} - 3n^2 \right) \frac{\Delta^4 y_0}{4!} + \left(\frac{n^6}{6} - 2n^5 + \frac{35n^4}{4} - \frac{50n^3}{3} + 12n^2 \right) \frac{\Delta^5 y_0}{5!} + \dots \right] \quad (3.1.2)$$

Which is the general quadrature formula and is known as Newton's- Cotes quadrature formula. From this general formula we get number of quadrature formulae by putting $n = 1, 2, 3, 4, \dots$

Now we shall derive some important quadrature formulae taking $n = 1, 2, 3, 4, 5, 6, 7$ and 9 .

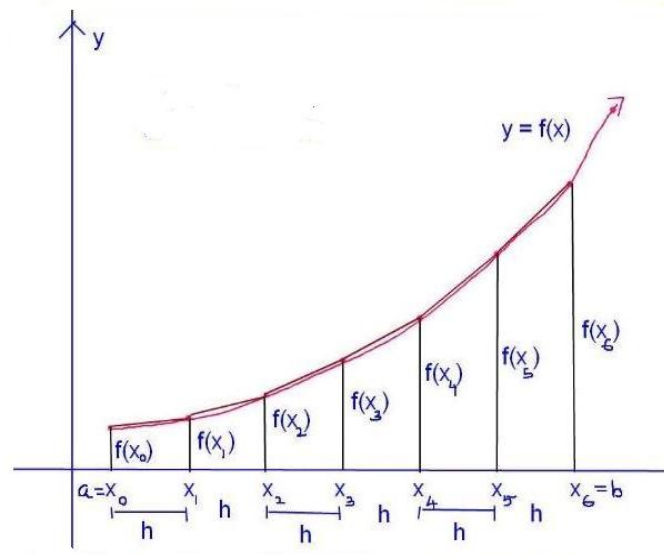
2 ERROR IN QUADRATURE FORMULAE

The error in the quadrature formulae is given by

$$E = \int_a^b y dx - \int_a^b P(x) dx \quad \text{----- (3.2.1)}$$

Where the function $y = f(x)$ is approximated by polynomial $P(x)$ on the interval $[a, b]$.

3 TRAPEZOIDAL RULE :



By Newton's cotes quadrature formula, we have

$$\int_{x_0}^{x_0 + nh} f(x) dx = h \left[ny_0 + \frac{n^2}{2} \Delta y_0 + \left(\frac{n^3}{3} - \frac{n^2}{2} \right) \frac{\Delta^2 y_0}{2!} + \left(\frac{n^4}{4} - n^3 + n^2 \right) \frac{\Delta^3 y_0}{3!} + \left(\frac{n^5}{5} - \frac{3n^4}{2} + \frac{11n^3}{3} - 3n^2 \right) \frac{\Delta^4 y_0}{4!} + \left(\frac{n^6}{6} - 2n^5 + \frac{35n^4}{4} - \frac{50n^3}{3} + 12n^2 \right) \frac{\Delta^5 y_0}{5!} + \dots \right] \quad \text{----- (Using 3.1.2)}$$

Putting $n = 1$ in (3.1.2) and taking the curve through (x_0, y_0) and (x_1, y_1) as a straight line i.e., polynomial of first order so that different order higher than first become zero, we get $\int_{x_0}^{x_0 + h} f(x) dx = h \left(y_0 + \frac{1}{2} \Delta y_0 \right)$

$$\begin{aligned} &= h \left[y_0 + \frac{1}{2} (y_1 - y_0) \right] \\ &= \frac{h}{2} (y_0 + y_1) \quad \text{----- (3.3.1)} \end{aligned}$$

R.H.S. of equation (3.3.1) is the area of trapezium bounded by the ordinates $x = x_0$ and $x = x_0 + h$.

$$\begin{aligned} \text{Similarly } \int_{x_0 + h}^{x_0 + 2h} f(x) dx &= h \left(y_1 + \frac{1}{2} \Delta y_1 \right) \\ &= \frac{h}{2} (y_1 + y_2) \end{aligned}$$

$$\int_{x_0 + (n-1)h}^{x_0 + nh} f(x) dx = \frac{h}{2} (y_{n-1} + y_n)$$

Adding these n integrals, we obtain

$$\begin{aligned} \int_{x_0}^{x_0 + nh} f(x) dx &= \int_{x_0}^{x_0 + h} f(x) dx + \dots + \int_{x_0 + (n-1)h}^{x_0 + nh} f(x) dx = \int_{x_0}^{x_0 + nh} f(x) dx \\ \int_{x_0}^{x_0 + nh} f(x) dx &= \frac{h}{2} [(y_0 + y_n) + 2(y_1 + y_2 + \dots + y_{n-1})] \quad \text{----- (3.3.2)} \end{aligned}$$

$$\int_{x_0}^{x_0+nh} f(x)dx = \frac{h}{2} [(\text{sum of first and last ordinates}) + 2 (\text{sum of all the intermediate ordinates})] \quad \text{----- (3.3.3)}$$

This is the required equation for trapezoidal rule.

3.1 Error composition:-

Expanding $y = f(x)$ around $x = x_0$ by Taylor's series, we get

$$y = y_0 + (x-x_0) y_0' + \frac{(x-x_0)^2}{2!} y_0'' + \dots \quad \text{----- (3.4.1)}$$

$$\begin{aligned} \int_{x_0}^{x_0+h} y dx &= \int_{x_0}^{x_0+h} [y_0 + (x-x_0) y_0' + \frac{(x-x_0)^2}{2!} y_0'' + \dots] dx \\ &= y_0 h + \frac{h^2}{2!} y_0' + \frac{h^3}{3!} y_0'' + \dots \quad \text{----- (3.4.2)} \end{aligned}$$

$$\begin{aligned} \text{Also } A_1 &= \text{area of the first trapezium in the interval } [x_0, x_1] = \\ &= \frac{h}{2} (y_0 + y_1) \quad \dots \dots \dots \text{ (3.4.3)} \end{aligned}$$

Putting $x = x_0 + h$ and $y = y_1$ in (3.4.1)

$$Y_1 = y_0 + h y_0' + \frac{h^2}{2!} y_0'' + \frac{h^3}{3!} y_0''' + \dots$$

Putting this value of y_1 in (3.4.3) we get

$$\begin{aligned} A_1 &= \frac{h}{2} (y_0 + y_0 + h y_0' + \frac{h^2}{2!} y_0'' + \frac{h^3}{3!} y_0''' + \dots) \\ &= y_0 h + \frac{h^2}{2} y_0' + \frac{h^3}{2.2!} y_0'' + \dots \quad \text{----- (3.4.4)} \end{aligned}$$

$$\text{Error in the interval } [x_0, x_1] = \int_{x_0}^{x_1} y dx - A_1$$

$$\begin{aligned} &= \int_{x_0}^{x_1} (y_0 + h y_0' + \frac{h^2}{2!} y_0'' + \frac{h^3}{3!} y_0''' + \dots) dx - (y_0 h + \frac{h^2}{2} y_0' + \frac{h^3}{2.2!} y_0'' + \dots) \\ &= (\frac{1}{3!} - \frac{1}{2.2!}) h^3 y_0'' \dots \\ &= (\frac{1}{6} - \frac{1}{4}) h^3 y_0'' \dots \\ &= -(\frac{1}{12}) h^3 y_0'' \dots \end{aligned}$$

$$\text{i.e., principal part of the error in } [x_0, x_1] = -(\frac{1}{12}) h^3 y_0''$$

$$\text{Similarly principal part of the error in } [x_1, x_2] = -(\frac{1}{12}) h^3 y_1''$$

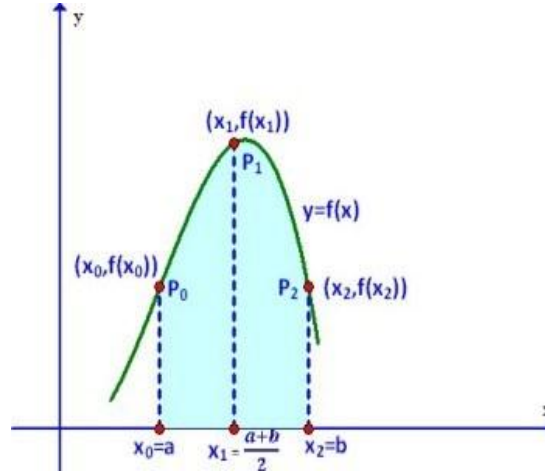
$$\text{Hence the total error } E = -(\frac{1}{12}) h^3 (y_0'' + y_1'' + \dots + y_{n-1}'')$$

Assuming that $y_0''(X)$ is the largest of the n quartiles $y_0'', y_1'', \dots, y_{n-1}''$

$$\begin{aligned} \text{We obtain } E &< -\frac{nh^3}{12} y_0''(X) \quad \text{----- (3.4.5)} \\ &= -\frac{(b-a)h^2}{12} y_0''(X) \quad nh = b-a \end{aligned}$$

Hence the error in the trapezoidal rule is of the order h^2 .

3.2 Simpson's one- third rule:



By Newton's cotes quadrature formula, we have

$$\int_{x_0}^{x_0+n h} f(x) dx = h \left[n y_0 + \frac{n^2}{2} \Delta y_0 + \left(\frac{n^3}{3} - \frac{n^2}{2} \right) \frac{\Delta^2 y_0}{2!} + \left(\frac{n^4}{4} - n^3 + n^2 \right) \frac{\Delta^3 y_0}{3!} + \left(\frac{n^5}{5} - \frac{3n^4}{2} + \frac{11n^3}{3} - 3n^2 \right) \frac{\Delta^4 y_0}{4!} + \left(\frac{n^6}{6} - 2n^5 + \frac{35n^4}{4} - \frac{50n^3}{3} + 12n^2 \right) \frac{\Delta^5 y_0}{5!} + \dots \right] \quad \text{..... (Using 3.1.2)}$$

Putting $n = 2$ in eq (3.1.2) and taking the curve through (x_0, y_0) , (x_1, y_1) and (x_2, y_2) as a parabola i.e., a polynomial of second order so that different order higher than second vanishes.

$$\begin{aligned} \int_{x_0}^{x_0+2h} f(x) dx &= h \left(2y_0 + \frac{2^2}{2} \Delta y_0 + \left(\frac{2^3}{3} - \frac{2^2}{2} \right) \frac{\Delta^2 y_0}{2!} \right) \\ &= h \left[2y_0 + 2(y_1 - y_0) + \left(\frac{8}{3} - 2 \right) \left(\frac{y_2 - 2y_1 + y_0}{2} \right) \right] \\ &= \frac{h}{3} (y_0 + 4y_1 + y_2) \quad \text{----- (3.5.1)} \end{aligned}$$

Clearly eq (3.5.1) determines the area of two strips bounded by the ordinates at x_0 , $x_0 + h$, $x_0 + 2h$, at a time.

Similarly

$$\begin{aligned} \int_{x_0+2h}^{x_0+4h} f(x) dx &= \frac{h}{3} (y_2 + 4y_3 + y_4) \\ \int_{x_0+(n-2)h}^{x_0+nh} f(x) dx &= \frac{h}{3} (y_{n-2} + 4y_{n-1} + y_n) \quad , n \text{ being even} \end{aligned}$$

Adding these n integrals we obtain

$$\int_{x_0}^{x_0+h} f(x)dx = \int_{x_0}^{x_0+h} f(x)dx + \int_{x_0+h}^{x_0+2h} f(x)dx + \dots + \int_{x_0+(n-2)h}^{x_0+nh} f(x)dx = \int_{x_0}^{x_0+nh} f(x)dx$$

$$\int_{x_0}^{x_0+nh} f(x)dx = \frac{h}{3} [(y_0 + y_n) + 4(y_1 + y_3 + \dots + y_{n-1}) + 2(y_2 + y_4 + \dots + y_{n-2})]$$

----- (3.5.2)

$$\int_{x_0}^{x_0+nh} f(x)dx = \frac{h}{3}[(\text{sum of first and last ordinates}) + 4(\text{sum of odd ordinates}) + 2(\text{sum of even ordinates})]$$

This is the required formula for Simpson's one third rule.

3.3 Error composition for Simpson's one-third rule:-

Expanding $y = f(x)$ around $x = x_0$ by Taylor's series, we get

$$Y = y_0 + (x-x_0) y_0' + \frac{(x-x_0)^2}{2!} y_0'' + \dots \quad (\text{By 3.4.1})$$

$$\int_{x_0}^{x_0+h} y dx = \int_{x_0}^{x_0+2h} [y_0 + (x-x_0) y_0' + \frac{(x-x_0)^2}{2!} y_0'' + \dots] dx$$

$$= 2 y_0 h + \frac{4h^2}{2!} y_0' + \frac{8h^3}{3!} y_0'' + \frac{16h^4}{4!} y_0''' + \frac{32h^5}{5!} y_0'''' + \dots \quad (3.6.1)$$

Also $A_1 =$ area over the first doubt strip by Simpson's one-third in the interval $[x_0, x_1]$

$$= \frac{h}{3} (y_0 + 4y_1 + y_2) \quad \dots \quad (3.6.2)$$

Putting $x = x_0 + h$ and $y = y_1$ in (3.4.1)

$$Y_1 = y_0 + h y_0' + \frac{h^2}{2!} y_0'' + \frac{h^3}{3!} y_0''' + \dots$$

Putting $x = x_0 + 2h$ and $y = y_2$ in (3.4.1)

$$Y_2 = y_0 + 2h y_0' + \frac{4h^2}{2!} y_0'' + \frac{8h^3}{3!} y_0''' + \dots$$

Putting this value of y_1 and y_2 in (3.6.2) we get

$$A_1 = \frac{h}{3} [(y_0 + 4(y_0 + h y_0' + \frac{h^2}{2!} y_0'' + \frac{h^3}{3!} y_0''' + \dots) + (y_0 + 2h y_0' + \frac{4h^2}{2!} y_0'' + \frac{8h^3}{3!} y_0''' + \dots))]$$

$$= 2y_0 h + 2 \frac{h^2}{1!} y_0' + \frac{4h^3}{3} y_0'' + \frac{2h^4}{3} y_0''' + \frac{5h^5}{18} y_0'''' + \dots \quad (3.6.3)$$

$$\text{Error in the interval } [x_0, x_2] = \int_{x_0}^{x_2} y dx - A_1$$

$$= \int_{x_0}^{x_2} [(2h y_0 + \frac{4h^2}{2!} y_0' + \frac{8h^3}{3!} y_0'' + \frac{16h^4}{4!} y_0''' + \frac{32h^5}{5!} y_0'''' + \dots) dx - (2 y_0 h + 2 \frac{h^2}{1!} y_0' + \frac{4h^3}{3} y_0'' + \frac{2h^4}{3} y_0''' + \frac{5h^5}{18} y_0'''' + \dots)]$$

$$= (\frac{32}{5!} - \frac{1}{5!}) h^5 y_0'''' \dots$$

$$= (\frac{4}{15} - \frac{5}{18}) h^5 y_0'''' \dots$$

$$= -(\frac{1}{90}) h^5 y_0'''' \dots \quad \dots \quad (3.6.4)$$

i.e., principal part of the error in $[x_0, x_2] = -\left(\frac{1}{90}\right) h^5 y_0''''$

Similarly principal part of the error in $[x_2, x_4] = -\left(\frac{1}{90}\right) h^5 y_0''''$

Hence the total error $E = -\left(\frac{1}{90}\right) h^5 (y_0'''' + y_1'''' + y_2'''' + \dots + y_{2(n-1)}'')$

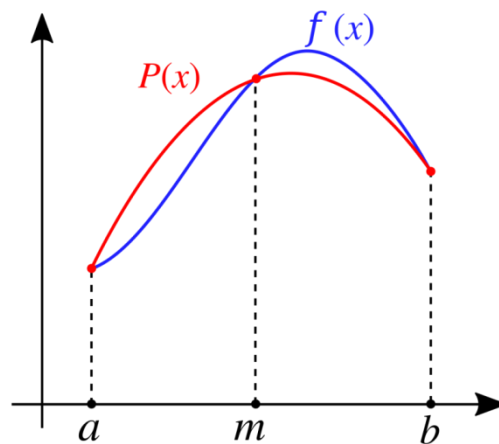
Assuming that $y_0''(X)$ is the largest of the n quartiles $y_0''', y_1''', \dots, y_{2(n-1)}'''$

We obtain

$$\begin{aligned} E &< -\frac{nh^5}{90} y_0''''(X) \\ &= -\frac{(b-a)h^4}{180} y_0''''(X) \quad 2nh = b-a \end{aligned} \quad (3.6.5)$$

Hence the error in the Simpson's one - third rule is of the order h^4 .

4 SIMPSON'S THREE BY EIGHT RULE:-



By Newton's cotes quadrature formula, we have

$$\int_{x_0}^{x_0+n h} f(x) dx = h \left[n y_0 + \frac{n^2}{2} \Delta y_0 + \left(\frac{n^3}{3} - \frac{n^2}{2} \right) \frac{\Delta^2 y_0}{2!} + \left(\frac{n^4}{4} - n^3 + n^2 \right) \frac{\Delta^3 y_0}{3!} + \left(\frac{n^5}{5} - \frac{3n^4}{2} + \frac{11n^3}{3} - 3n^2 \right) \frac{\Delta^4 y_0}{4!} + \left(\frac{n^6}{6} - 2n^5 + \frac{35n^4}{4} - \frac{50n^3}{3} + 12n^2 \right) \frac{\Delta^5 y_0}{5!} + \dots \right] \quad \text{..... (by 3.1.2)}$$

When $n = 3$, the polynomial to be fitted is of degree 3 and hence all differences above third order are zero.

$$\begin{aligned} \int_{x_0}^{x_0+3h} f(x) dx &= h \left[3y_0 + \frac{3^2}{2} \Delta y_0 + \left(\frac{3^3}{3} - \frac{3^2}{2} \right) \frac{\Delta^2 y_0}{2!} + \left(\frac{3^4}{4} - 3^3 + 3^2 \right) \frac{\Delta^3 y_0}{3!} \right] \\ &= h \left[3y_0 + \frac{9}{2} (y_1 - y_0) + \frac{9}{4} (y_2 - 2y_1 + y_0) + \frac{3}{8} (y_3 - 3y_2 + 3y_1 - y_0) \right] \\ &= \frac{3}{8} h (y_0 + 3y_1 + 3y_2 + y_3) \quad \dots (3.7.1) \end{aligned}$$

Clearly eq (3.7.1) determines the area of three strips bounded by the ordinates at $x_0, x_0+h, x_0+2h, x_0+3h$ at a time. Similarly, using the formula (3.7.1) and by taking n as multiple of 3, we find

$$\int_{x_0+3h}^{x_0+6h} f(x) dx = \frac{3}{8} h (y_3 + 3y_4 + 3y_5 + y_6)$$

Adding all the above results, we get

$$\begin{aligned}
\int_{x_0}^{x_0+h} f(x)dx &= \int_{x_0}^{x_0+3h} f(x)dx + \int_{x_0+3h}^{x_0+6h} f(x)dx + \dots + \int_{x_0+(n-3)h}^{x_0+nh} f(x)dx = \\
&\int_{x_0}^{x_0+nh} f(x)dx \\
&= \frac{3h}{8} [(y_0 + y_1) + 3(y_1 + y_4 + y_7 + \dots + y_{n-2}) + 3(y_2 + y_5 + y_8 + \dots + y_{n-1}) + \\
&2(y_3 + y_6 + y_9 + \dots + y_{n-3})] \\
&= \frac{3h}{8} [(y_0 + y_n) + 3(y_1 + y_2 + y_4 + y_5 + y_7 + y_8 + \dots + y_{n-2} + y_{n-1}) + 2(y_3 + y_6 + y_9 + \\
&\dots + y_{n-3})] \quad (3.7.2)
\end{aligned}$$

This rule is called Simpson's three by eight rules.

5 ERROR COMPOSITION:

Expanding $y = f(x)$ around $x = x_0$ by Taylor's series, we get

$$Y = y_0 + (x-x_0) y_0' + \frac{(x-x_0)^2}{2!} y_0'' + \dots \quad (\text{By 3.4.1})$$

$$\begin{aligned}
\int_{x_0}^{x_3} y dx &= \int_{x_0}^{x_0+3h} [y_0 + (x-x_0) y_0' + \frac{(x-x_0)^2}{2!} y_0'' + \dots] dx \\
&= 3y_0 h + \frac{9h^2}{2!} y_0' + \frac{27h^3}{3!} y_0'' + \frac{8h^4}{4!} y_0''' + \frac{243h^5}{5!} y_0'''' \dots \quad (3.8.1)
\end{aligned}$$

Also A_1 = area over the first triple strip by Simpson's three- eighth in the interval $[x_0, x_3]$

$$= \frac{3}{8} h (y_0 + 3y_1 + 3y_2 + y_3) \quad (3.8.2)$$

Putting $x = x_0 + h$ and $y = y_1$ in (3.4.1)

$$Y_1 = y_0 + h y_0' + \frac{h^2}{2!} y_0'' + \frac{h^3}{3!} y_0''' + \dots$$

Putting $x = x_0 + 2h$ and $y = y_2$ in (3.4.1)

$$Y_2 = y_0 + 2h y_0' + \frac{4h^2}{2!} y_0'' + \frac{8h^3}{3!} y_0''' + \dots$$

Putting $x = x_0 + 3h$ and $y = y_3$ in (3.4.1)

$$Y_3 = y_0 + 3h y_0' + \frac{9h^2}{2!} y_0'' + \frac{27h^3}{3!} y_0''' + \frac{81h^4}{4!} y_0'''' \dots$$

Putting this value of y_1, y_2 and y_3 in (3.8.2) we get

$$\begin{aligned}
A_1 &= \frac{3h}{8} [(y_0 + 3(y_0 + h y_0' + \frac{h^2}{2!} y_0'' + \frac{h^3}{3!} y_0''' + \dots) + 3(y_0 + 2h y_0' + \frac{4h^2}{2!} y_0'' + \\
&\frac{8h^3}{3!} y_0''' + \dots) + (y_0 + 3h y_0' + \frac{9h^2}{2!} y_0'' + \frac{27h^3}{3!} y_0''' + \frac{81h^4}{4!} y_0'''' \dots)] \\
&= \frac{3h}{8} [8y_0 + 12 \frac{h^1}{1!} y_0' + \frac{24h^2}{2!} y_0'' + \frac{54h^3}{3!} y_0''' + \frac{132h^4}{4} y_0'''' + \dots] \\
&= 3h y_0 + \frac{9h^2}{2} y_0' + \frac{9h^3}{2} y_0'' + \frac{27h^4}{8} y_0''' + \frac{33h^5}{16} y_0'''' + \dots \quad (3.8.3)
\end{aligned}$$

Error in the interval $[x_0, x_3] = \int_{x_0}^{x_3} y dx - A_1$

$$\begin{aligned}
&= \left(3y_0h + \frac{9h^2}{2!}y_0' + \frac{27h^3}{3!}y_0'' + \frac{8h^4}{4!}y_0''' + \frac{243h^5}{5!}y_0'''' + \dots \right) - \left(3hy_0 + \frac{9h^2}{2}y_0' + \right. \\
&\left. \frac{9h^3}{2}y_0'' + \frac{27h^4}{8}y_0''' + \frac{33h^5}{16}y_0'''' + \dots \right) \\
&= \left(\frac{243}{5!} - \frac{33}{16} \right) h^5 y_0'''' \dots \\
&= - \left(\frac{3}{80} \right) h^5 y_0'''' \dots \quad (3.8.4)
\end{aligned}$$

i.e., principal part of the error in $[x_0, x_3] = - \left(\frac{3}{80} \right) h^5 y_0''''$

Similarly principal part of the error in $[x_3, x_6] = - \left(\frac{3}{80} \right) h^5 y_3''''$

Hence the total error $E = - \left(\frac{3}{80} \right) h^5 (y_0'''' + y_3'''' + y_6'''' + \dots + y_{3(n-1)}'')$

Assuming that $y_0''''(X)$ is the largest of the n quartiles y_0'''' , y_3'''' , $\dots$, $y_{3(n-1)}''''$

We obtain $E < - \frac{nh^5}{80} y_0''''(X)$ (3.8.5)

$$= - \frac{(b-a)h^4}{160} y_0''''(X) \quad 2nh = b-a$$

Hence the error in the Simpson's three by eight rule is of the order h^4 .

6 BOOLE'S RULE:-

By Newton's cotes quadrature formula, we have

$$\begin{aligned}
\int_{x_0}^{x_0+nh} f(x)dx &= h \left[ny_0 + \frac{n^2}{2}\Delta y_0 + \left(\frac{n^3}{3} - \frac{n^2}{2} \right) \frac{\Delta^2 y_0}{2!} + \left(\frac{n^4}{4} - n^3 + n^2 \right) \frac{\Delta^3 y_0}{3!} + \left(\frac{n^5}{5} - \frac{3n^4}{2} + \frac{11n^3}{3} - \right. \right. \\
&\left. \left. 3n^2 \right) \frac{\Delta^4 y_0}{4!} + \left(\frac{n^6}{6} - 2n^5 + \frac{35n^4}{4} - \frac{50n^3}{3} + 12n^2 \right) \frac{\Delta^5 y_0}{5!} + \dots \right] \quad \dots \quad (\text{By 3.1.2})
\end{aligned}$$

When $n = 4$ means $f(x)$ can be approximated by a polynomial of 4th order so that 5th and higher order differences are vanishes in the general quadrature formula.

$$\begin{aligned}
\int_{x_0}^{x_0+4h} f(x)dx &= h \left[4y_0 + 8\Delta y_0 + \left(\frac{64}{3} - 8 \right) \frac{\Delta^2 y_0}{2!} + (64 - 64 + 16) \frac{\Delta^3 y_0}{3!} + \left(\frac{1024}{5} - 384 \right. \right. \\
&\left. \left. + \frac{704}{3} - 48 \right) \frac{\Delta^4 y_0}{4!} \right] \\
&= h \left[4y_0 + 8\Delta y_0 + \frac{20}{3}\Delta^2 y_0 + \frac{8}{3}\Delta^3 y_0 + \frac{14}{45}\Delta^4 y_0 \right] \\
&= h \left[4y_0 + 8(y_1 - y_0) + \frac{20}{3}(y_2 - 2y_1 + y_0) + \frac{8}{3}(y_3 - 3y_2 + 3y_1 - y_0) + \frac{14}{45}(y_4 - 4y_3 + 6y_2 - 4y_1 + y_0) \right] \\
&= \frac{2h}{45}(7y_0 + 32y_1 + 12y_2 + 32y_3 + 7y_4) \quad (3.9.1)
\end{aligned}$$

Clearly eq (3.9.1) determines the area of four strips bounded by the ordinates at x_0 , $x_0 + h$, $x_0 + 2h$, $x_0 + 3h$, $x_0 + 4h$ at a time. Similarly, using the formula (3.9.1), we find

$$\int_{x_0+4h}^{x_0+8h} f(x)dx = \frac{2h}{45}(7y_4 + 32y_5 + 12y_6 + 32y_7 + 7y_8)$$

Adding all the above results, we get

$$\begin{aligned}
\int_{x_0}^{x_0+nh} f(x)dx &= \int_{x_0}^{x_0+4h} f(x)dx + \int_{x_0+4h}^{x_0+8h} f(x)dx + \dots + \int_{x_0+(n-4)h}^{x_0+nh} f(x)dx = \\
&\int_{x_0}^{x_0+nh} f(x)dx
\end{aligned}$$

$$= \frac{2h}{45} [7(y_0 + y_n) + 2(y_4 + y_8 + y_{12} + \dots + y_{n-4}) + 32(y_1 + y_3 + y_5 + y_7 + \dots + y_{n-3} + y_{n-1}) + 12(y_2 + y_6 + y_{10} + \dots + y_{n-2})] \quad (3.9.2)$$

This is required Boole's rule for $n = 4$

7 ERROR COMPOSITION

Expanding $y = f(x)$ around $x = x_0$ by Taylor's series, we get

$$Y = y_0 + (x-x_0) y_0' + \frac{(x-x_0)^2}{2!} y_0'' + \dots \quad (\text{By 3.4.1})$$

$$\begin{aligned} \int_{x_0}^{x_0+4h} y dx &= \int_{x_0}^{x_0+4h} [y_0 + (x-x_0) y_0' + \frac{(x-x_0)^2}{2!} y_0'' + \dots] dx \\ &= 4y_0 h + \frac{16h^2}{2!} y_0' + \frac{64h^3}{3!} y_0'' + \frac{256h^4}{4!} y_0''' + \frac{1024h^5}{5!} y_0'''' + \frac{4096h^6}{6!} y_0''''' + \frac{16384h^7}{7!} y_0'''''' \\ &\dots \dots \dots (3.10.1) \end{aligned}$$

Also A_1 = area over the first four strip by Boole's in the interval $[x_0, x_4]$

$$= \frac{2h}{45} (7y_0 + 32y_1 + 12y_2 + 32y_3 + 7y_4) \quad (3.10.2)$$

Putting $x = x_0 + h$ and $y = y_1$ in (3.4.1)

$$Y_1 = y_0 + h y_0' + \frac{h^2}{2!} y_0'' + \frac{h^3}{3!} y_0''' + \dots$$

Putting $x = x_0 + 2h$ and $y = y_2$ in (3.4.1)

$$Y_2 = y_0 + 2h y_0' + \frac{4h^2}{2!} y_0'' + \frac{8h^3}{3!} y_0''' + \dots$$

Putting $x = x_0 + 3h$ and $y = y_3$ in (3.4.1)

$$Y_3 = y_0 + 3h y_0' + \frac{9h^2}{2!} y_0'' + \frac{27h^3}{3!} y_0''' + \frac{81h^4}{4!} y_0'''' + \dots$$

Putting $x = x_0 + 4h$ and $y = y_4$ in (3.4.1)

$$\begin{aligned} Y_4 &= y_0 + 4h y_0' + \frac{16h^2}{2!} y_0'' + \frac{64h^3}{3!} y_0''' + \frac{256h^4}{4!} y_0'''' + \frac{1024h^5}{5!} y_0''''' + \frac{4096h^6}{6!} y_0'''''' \\ &+ \frac{16384h^7}{7!} y_0'''''' + \dots \end{aligned}$$

Putting this value of y_1, y_2, y_3 and y_4 in (3.10.2) we get

$$\begin{aligned} A_1 &= \frac{2h}{45} [(7y_0 + 32(y_0 + h y_0' + \frac{h^2}{2!} y_0'' + \frac{h^3}{3!} y_0''' + \dots) + 12(y_0 + 2h y_0' + \frac{4h^2}{2!} y_0'' + \frac{8h^3}{3!} y_0''' + \dots) + 32(y_0 + 3h y_0' + \frac{9h^2}{2!} y_0'' + \frac{27h^3}{3!} y_0''' + \frac{81h^4}{4!} y_0'''' + \dots) + 7(y_0 + 4h y_0' + \frac{16h^2}{2!} y_0'' + \frac{64h^3}{3!} y_0''' + \frac{256h^4}{4!} y_0'''' + \frac{1024h^5}{5!} y_0''''' + \frac{4096h^6}{6!} y_0'''''' + \frac{16384h^7}{7!} y_0'''''' + \dots)] \\ &= \frac{2h}{45} [90y_0 + 180h y_0' + \frac{480h^2}{2!} y_0'' + \frac{1440h^3}{3!} y_0''' + \frac{4608h^4}{4!} y_0'''' + \frac{15360h^5}{5!} y_0''''' + \frac{52800h^6}{6!} y_0'''''' + \frac{186240h^7}{7!} y_0'''''' + \dots] \\ &= 4h y_0 + 8h^2 y_0' + \frac{160h^3}{15} y_0'' + \frac{160h^4}{15} y_0''' + \frac{128h^5}{15} y_0'''' + \frac{256h^6}{45} y_0''''' + \frac{880h^7}{270} y_0'''''' + \dots \quad (3.10.3) \end{aligned}$$

Error in the interval $[x_0, x_4] = \int_{x_0}^{x_4} y dx - A_1$

$$\begin{aligned}
 &= \left[\left(4y_0h + \frac{16h^2}{2!} y_0' + \frac{64h^3}{3!} y_0'' + \frac{256h^4}{4!} y_0''' + \frac{1024h^5}{5!} y_0'''' + \frac{4096h^6}{6!} y_0''''' + \frac{16384h^7}{7!} y_0'''''' \right. \right. \\
 &\quad \left. \left. \dots \dots \dots \right) - \left(4hy_0 + 8h^2y_0' + \frac{160h^3}{15} y_0'' + \frac{160h^4}{15} y_0''' + \frac{128h^5}{15} y_0'''' + \frac{256h^6}{45} y_0''''' \right. \right. \\
 &\quad \left. \left. + \frac{880h^7}{270} y_0'''''' + \dots \dots \right) \right] \\
 &= \left(\frac{16384}{7!} - \frac{880}{270} \right) h^7 y_0'''''' \dots \dots \dots \\
 &= - \left(\frac{8}{945} \right) h^7 y_0'''''' \dots \dots \dots \quad (3.10.4)
 \end{aligned}$$

i.e., principal part of the error in $[x_0, x_4] = - \left(\frac{8}{945} \right) h^7 y_0''''''$

Similarly principal part of the error in $[x_4, x_8] = - \left(\frac{8}{945} \right) h^7 y_0''''''$

Hence the total error $E = - \left(\frac{8}{945} \right) h^7 (y_0'''''' + y_4'''''' + y_8'''''' + \dots + y_{4(n-1)}''''')$

Assuming that $y_0''''''(X)$ is the largest of the n quartiles y_0'''''' , y_4'''''' , $\dots$, $y_{4(n-1)}''''''$

We obtain

$$E < - \left(\frac{8}{945} \right) h^7 y_0''''''(X) \quad (3.10.5)$$

8 DERIVING QUADRATURE FORMULA FOR $n=5$.

By Newton's cotes quadrature formula, we have

$$\begin{aligned}
 \int_{x_0}^{x_0+n h} f(x) dx &= h \left[ny_0 + \frac{n^2}{2} \Delta y_0 + \left(\frac{n^3}{3} - \frac{n^2}{2} \right) \frac{\Delta^2 y_0}{2!} + \left(\frac{n^4}{4} - n^3 + n^2 \right) \frac{\Delta^3 y_0}{3!} + \left(\frac{n^5}{5} - \frac{3n^4}{2} + \frac{11n^3}{3} - \right. \right. \\
 &\quad \left. \left. 3n^2 \right) \frac{\Delta^4 y_0}{4!} + \left(\frac{n^6}{6} - 2n^5 + \frac{35n^4}{4} - \frac{50n^3}{3} + 12n^2 \right) \frac{\Delta^5 y_0}{5!} + \left(\frac{n^7}{7} - \frac{15n^6}{6} + 17n^5 - \frac{225n^4}{4} + \frac{274n^3}{3} - 60n^2 \right) \right. \\
 &\quad \left. \frac{\Delta^6 y_0}{6!} + \left(\frac{n^8}{8} - 3n^7 + \frac{175n^6}{6} - 147n^5 + 406n^4 - 588n^3 + 360n^2 \right) \frac{\Delta^7 y_0}{7!} + \dots \dots \dots \right] \quad \dots \dots \dots (
 \end{aligned}$$

By 3.1.2)

When $n = 5$ means $f(x)$ can be approximated by a polynomial of 5th order so that 6th and higher order differences are vanishes in the general quadrature formula.

$$\begin{aligned}
 \int_{x_0}^{x_0+5h} f(x) dx &= h \left[5y_0 + \frac{25}{2} \Delta y_0 + \frac{175}{12} \Delta^2 y_0 + \frac{75}{8} \Delta^3 y_0 + \frac{425}{144} \Delta^4 y_0 + \frac{95}{288} \Delta^5 y_0 \right] \\
 &= 5h \left[y_0 + \frac{5}{2} \Delta y_0 + \frac{35}{12} \Delta^2 y_0 + \frac{15}{8} \Delta^3 y_0 + \frac{85}{144} \Delta^4 y_0 + \frac{19}{288} \Delta^5 y_0 \right] \\
 &= 5h \left[y_0 + \frac{5}{2} (y_1 - y_0) + \frac{35}{12} (y_2 - 2y_1 + y_0) + \frac{15}{8} (y_3 - 3y_2 + 3y_1 - y_0) + \frac{85}{144} (y_4 - 4y_3 + 6y_2 - \right. \\
 &\quad \left. 4y_1 + y_0) + \frac{19}{288} (y_5 - 5y_4 + 10y_3 - 10y_2 + 5y_1 - y_0) \right] \\
 &= \frac{5h}{288} (19y_0 + 75y_1 + 50y_2 + 50y_3 + 75y_4 + 19y_5) \quad \dots \dots (3.11.1)
 \end{aligned}$$

Clearly eq (3.11.1) determines the area of five strips bounded by the ordinates at x_0 , $x_0 + h$, $x_0 + 2h$, $x_0 + 3h$, $x_0 + 4h$, $x_0 + 5h$ at a time. Similarly, using the formula (3.11.1), we find

$$\int_{x_0+5h}^{x_0+10h} f(x) dx = \frac{5h}{288} (19y_5 + 75y_6 + 50y_7 + 50y_8 + 75y_9 + 19y_{10})..$$

$$\int_{x_0+(n-5)h}^{x_0+nh} f(x)dx = \frac{5h}{288}(19y_{n-5} + 75y_{n-4} + 50y_{n-3} + 50y_{n-2} + 75y_{n-1} + 19y_n)$$

Adding all the above results, we get

$$\begin{aligned} \int_{x_0}^{x_0+nh} f(x)dx &= \int_{x_0}^{x_0+h} f(x)dx + \int_{x_0+h}^{x_0+2h} f(x)dx + \dots + \int_{x_0+(n-5)h}^{x_0+nh} f(x)dx \\ &= \int_{x_0}^{x_0+nh} f(x)dx \\ &= \frac{5h}{288}\{19[(y_0 + y_n) + 2(y_5 + y_{10} + y_{15} + \dots + y_{n-5})] + 75(y_1 + y_4 + y_6 + y_9 + \\ & y_{11} + y_{14} + \dots + y_{n-4} + y_{n-1}) + 50(y_2 + y_3 + y_7 + y_8 + y_{12} + y_{13} + \dots + y_{n-3} + y_{n-2}) \\ & \dots \dots \dots (3.11.2) \end{aligned}$$

9 ERROR COMPOSITION

Expanding $y = f(x)$ around $x = x_0$ by Taylor's series, we get

$$Y = y_0 + (x-x_0) y_0' + \frac{(x-x_0)^2}{2!} y_0'' + \dots \dots \dots \quad (\text{By 3.4.1})$$

$$\int_{x_0}^{x_0+5h} [y_0 + (x-x_0) y_0' + \frac{(x-x_0)^2}{2!} y_0'' + \dots \dots \dots] dx$$

$$\begin{aligned} &= 5y_0h + \frac{25h^2}{2!} y_0' + \frac{125h^3}{3!} y_0'' + \frac{625h^4}{4!} y_0''' + \frac{3125h^5}{5!} y_0'''' + \frac{15625h^6}{6!} y_0''''' + \frac{78125h^7}{7!} \\ & y_0'''''' + \dots \dots \dots (3.12.1) \end{aligned}$$

Also A_1 = area over the first four strip by Boole's in the interval $[x_0, x_5]$

$$= \frac{5h}{288}(19y_0 + 75y_1 + 50y_2 + 50y_3 + 75y_4 + 19y_5) \dots (3.12.2)$$

Putting $x = x_0 + h$ and $y = y_1$ in (3.4.1)

$$Y_1 = y_0 + hy_0' + \frac{h^2}{2!} y_0'' + \frac{h^3}{3!} y_0''' + \dots \dots \dots$$

Putting $x = x_0 + 2h$ and $y = y_2$ in (3.4.1)

$$Y_2 = y_0 + 2hy_0' + \frac{4h^2}{2!} y_0'' + \frac{8h^3}{3!} y_0''' + \dots \dots \dots$$

Putting $x = x_0 + 3h$ and $y = y_3$ in (3.4.1)

$$Y_3 = y_0 + 3hy_0' + \frac{9h^2}{2!} y_0'' + \frac{27h^3}{3!} y_0''' + \frac{81h^4}{4!} y_0'''' \dots \dots \dots$$

Putting $x = x_0 + 4h$ and $y = y_4$ in (3.4.1)

$$\begin{aligned} Y_4 &= y_0 + 4hy_0' + \frac{16h^2}{2!} y_0'' + \frac{64h^3}{3!} y_0''' + \frac{256h^4}{4!} y_0'''' + \frac{1024h^5}{5!} y_0''''' + \frac{4096h^6}{6!} y_0'''''' \\ &+ \frac{16384h^7}{7!} y_0'''''' + \dots \dots \dots \end{aligned}$$

Putting $x = x_0 + 5h$ and $y = y_5$ in (3.4.1)

$$\begin{aligned} Y_5 &= y_0 + 5hy_0' + \frac{25h^2}{2!} y_0'' + \frac{125h^3}{3!} y_0''' + \frac{625h^4}{4!} y_0'''' + \frac{3125h^5}{5!} y_0''''' + \frac{15625h^6}{6!} y_0'''''' \\ &+ \frac{78125h^7}{7!} y_0'''''' + \dots \dots \dots \end{aligned}$$

Putting this value of y_1, y_2, y_3, y_4 and y_5 in (3.12.2) we get

$$\begin{aligned}
A_1 = & \frac{5h}{288} \left[19y_0 + 75(y_0 + hy_0' + \frac{h^2}{2!} y_0'' + \frac{h^3}{3!} y_0''' + \dots) + 50(y_0 + 2hy_0' + \frac{4h^2}{2!} y_0'' + \frac{8h^3}{3!} y_0''' + \dots) \right. \\
& + \dots + 50(y_0 + 3hy_0' + \frac{9h^2}{2!} y_0'' + \frac{27h^3}{3!} y_0''' + \frac{81h^4}{4!} y_0'''' + \dots) + 75(y_0 + 4hy_0' + \frac{16h^2}{2!} y_0'' + \frac{64h^3}{3!} y_0''' + \frac{256h^4}{4!} y_0'''' + \frac{1024h^5}{5!} y_0''''' + \frac{4096h^6}{6!} y_0'''''' + \frac{16384h^7}{7!} y_0'''''' + \dots) \\
& \left. + 19(y_0 + 5hy_0' + \frac{25h^2}{2!} y_0'' + \frac{125h^3}{3!} y_0''' + \frac{625h^4}{4!} y_0'''' + \frac{3125h^5}{5!} y_0''''' + \frac{15625h^6}{6!} y_0'''''' + \frac{78125h^7}{7!} y_0'''''' + \dots) \right] \\
= & \frac{5h}{288} \left[288y_0 + 720hy_0' + \frac{2400h^2}{2!} y_0'' + \frac{9000h^3}{3!} y_0''' + \frac{36000h^4}{4!} y_0'''' + \frac{150000h^5}{5!} y_0''''' + \frac{643800h^6}{6!} y_0'''''' + \dots \right] \quad \text{..... (3.12.3)}
\end{aligned}$$

$$\begin{aligned}
\text{Error in the interval } [x_0, x_5] = & \int_{x_0}^{x_5} y dx - A_1 = \left[5y_0h + \frac{25h^2}{2!} y_0' + \frac{125h^3}{3!} y_0'' + \frac{625h^4}{4!} y_0''' + \frac{3125h^5}{5!} y_0'''' + \frac{15625h^6}{6!} y_0''''' + \frac{78125h^7}{7!} y_0'''''' + \dots \right] - \frac{5h}{288} \left[288y_0 + 720hy_0' + \frac{2400h^2}{2!} y_0'' + \frac{9000h^3}{3!} y_0''' + \frac{36000h^4}{4!} y_0'''' + \frac{150000h^5}{5!} y_0''''' + \frac{643800h^6}{6!} y_0'''''' + \dots \right] \\
= & \left(\frac{78125}{7!} - \frac{26825}{1728} \right) h^7 y_0'''''' \dots \\
= & - \left(\frac{275}{12096} \right) h^7 y_0'''''' \dots \quad \text{..... (3.12.4)}
\end{aligned}$$

i.e., principal part of the error in $[x_0, x_5] = - \left(\frac{275}{12096} \right) h^7 y_0'''''' \dots$

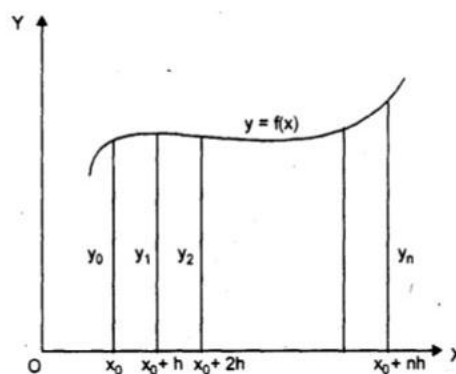
Similarly principal part of the error in $[x_5, x_{10}] = - \left(\frac{275}{12096} \right) h^7 y_0'''''' \dots$

Hence the total error $E = - \left(\frac{275}{12096} \right) h^7 (y_0'''''' + y_5'''''' + y_{10}'''''' + \dots + y_{5(n-1)}''''')$

Assuming that $y_0''''''(X)$ is the largest of the n quartiles y_0'''''' , y_5'''''' , ..., $y_{5(n-1)}'''''$

We obtain $E < - \left(\frac{275}{12096} \right) h^7 y_0''''''(X) \quad \text{..... (3.12.5)}$

10 WEDDLE'S RULE



By Newton's cotes quadrature formula, we have

$$\begin{aligned}
\int_{x_0}^{x_0 + nh} f(x) dx = & h \left[ny_0 + \frac{n^2}{2} \Delta y_0 + \left(\frac{n^3}{3} - \frac{n^2}{2} \right) \frac{\Delta^2 y_0}{2!} + \left(\frac{n^4}{4} - n^3 + n^2 \right) \frac{\Delta^3 y_0}{3!} + \left(\frac{n^5}{5} - \frac{3n^4}{2} + \frac{11n^3}{3} - \right. \right. \\
& \left. \left. 3n^2 \right) \frac{\Delta^4 y_0}{4!} + \left(\frac{n^6}{6} - 2n^5 + \frac{35n^4}{4} - \frac{50n^3}{3} + 12n^2 \right) \frac{\Delta^5 y_0}{5!} + \left(\frac{n^7}{7} - \frac{15n^6}{6} + 17n^5 - \frac{225n^4}{4} + \frac{274n^3}{3} - 60n^2 \right) \right. \\
& \left. \frac{\Delta^6 y_0}{6!} + \left(\frac{n^8}{8} - 3n^7 + \frac{175n^6}{6} - 147n^5 + 406n^4 - 588n^3 + 360n^2 \right) \frac{\Delta^7 y_0}{7!} + \dots \right] \quad \text{..... (By 3.1.2)}
\end{aligned}$$

When $n = 6$ means $f(x)$ can be approximated by a polynomial of 6th order so that 7th and higher order differences are vanishes in the general quadrature formula.

$$\int_x^{x_0+6h} f(x)dx = h[6y_0+18\Delta y_0+\frac{54}{2}\Delta^2 y_0+24\Delta^3 y_0+\frac{123}{10}\Delta^4 y_0+\frac{66}{20}\Delta^5 y_0+\frac{41}{140}\Delta^6 y_0]$$

If we replace $\frac{41}{140}\Delta^6 y_0$ by $\frac{3}{10}\Delta^6 y_0$, the error will be negligible.

$$\begin{aligned}\int_x^{x_0+6h} f(x)dx &= h[6y_0+18\Delta y_0+27\Delta^2 y_0+24\Delta^3 y_0+\frac{123}{10}\Delta^4 y_0+\frac{33}{10}\Delta^5 y_0+\frac{3}{10}\Delta^6 y_0] \\ &= h[6y_0+18\Delta y_0+27\Delta^2 y_0+24\Delta^3 y_0+\frac{123}{10}\Delta^4 y_0+\frac{33}{10}\Delta^5 y_0+\frac{3}{10}\Delta^6 y_0] \\ &= h[6y_0+18(y_1-y_0)+27(y_2-2y_1+y_0)+24(y_3-3y_2+3y_1-y_0)+\frac{123}{10}(y_4-4y_3+6y_2-4y_1+y_0)+\frac{33}{10}(5y_4+10y_3-10y_2+5y_1-y_0)+\frac{3}{10}(y_6-6y_5+15y_4-20y_3+15y_2-y_1+y_0)] \\ &= \frac{3h}{10}(y_0+5y_1+y_2+6y_3+y_4+5y_5+y_6) \quad \text{----- (3.13.1)}\end{aligned}$$

Clearly eq (3.13.1) determines the area of six strips bounded by the ordinates at $x_0, x_0+h, x_0+2h, x_0+3h, x_0+4h, x_0+5h, x_0+6h$ at a time. Similarly, using the formula (3.13.1), we find

$$\begin{aligned}\int_{x_0+6h}^{x_0+12h} f(x)dx &= \frac{3h}{10}(y_6+5y_7+y_8+6y_9+y_{10}+5y_{11}+y_{12}) \\ \int_{x_0+(n-6)h}^{x_0+nh} f(x)dx &= \frac{3h}{10}(y_{n-6}+5y_{n-5}+y_{n-4}+6y_{n-3}+y_{n-2}+5y_{n-1}+y_n)\end{aligned}$$

Adding all the above results, we get

$$\begin{aligned}\int_{x_0}^{x_0+h} f(x)dx &= \int_{x_0+h}^{x_0+6h} f(x)dx + \int_{x_0+6h}^{x_0+12h} f(x)dx + \dots + \int_{x_0+(n-6)h}^{x_0+nh} f(x)dx = \\ \int_{x_0}^{x_0+nh} f(x)dx &= \frac{3h}{10}[(y_0+y_n)+5(y_1+y_5+y_7+y_{11}+\dots+y_{n-5}+y_{n-1})+(y_2+y_4+y_8+y_{10} \\ &+ \dots + y_{n-4}+y_{n-2})+2(y_6+y_{12}+y_{18} \\ &+ \dots + y_{n-6})+6(y_3+y_9+y_{15}+\dots+y_{n-3})] \quad \text{----- (3.13.2)}\end{aligned}$$

This is known as Weddle's rule.

11 ERROR COMPOSITION

Expanding $y = f(x)$ around $x = x_0$ by Taylor's series, we get

$$\begin{aligned}Y &= y_0 + (x-x_0)y_0' + \frac{(x-x_0)^2}{2!}y_0'' + \dots \quad \text{.....(By 3.4.1)} \\ \int_{x_0}^{x_6} ydx &= \int_{x_0}^{x_0+6h} [y_0 + (x-x_0)y_0' + \frac{(x-x_0)^2}{2!}y_0'' + \dots] dx \\ &= 6y_0h + \frac{36h^2}{2!}y_0' + \frac{216h^3}{3!}y_0'' + \frac{1296h^4}{4!}y_0''' + \frac{7776h^5}{5!}y_0'''' + \frac{46656h^6}{6!}y_0''''' + \frac{279936h^7}{7!}y_0'''''' \\ &+ \dots \quad \text{----- (3.14.1)}\end{aligned}$$

Also A_1 = area over the first six strip by Weddle's in the interval $[x_0, x_6]$

$$= \frac{3h}{10}(y_0+5y_1+y_2+6y_3+y_4+5y_5+y_6) \quad \text{.....(3.14.2)}$$

Putting $x = x_0 + h$ and $y = y_1$ in (3.4.1)

$$Y_1 = y_0 + hy_0' + \frac{h^2}{2!}y_0'' + \frac{h^3}{3!}y_0''' + \dots$$

Putting $x = x_0 + 2h$ and $y = y_2$ in (3.4.1)

$$Y_2 = y_0 + 2hy_0' + \frac{4h^2}{2!} y_0'' + \frac{8h^3}{3!} y_0''' + \dots$$

Putting $x = x_0 + 3h$ and $y = y_3$ in (3.4.1)

$$Y_3 = y_0 + 3hy_0' + \frac{9h^2}{2!} y_0'' + \frac{27h^3}{3!} y_0''' + \frac{81h^4}{4!} y_0'''' + \dots$$

Putting $x = x_0 + 4h$ and $y = y_4$ in (3.4.1)

$$Y_4 = y_0 + 4hy_0' + \frac{16h^2}{2!} y_0'' + \frac{64h^3}{3!} y_0''' + \frac{256h^4}{4!} y_0'''' + \frac{1024h^5}{5!} y_0''''' + \frac{4096h^6}{6!} y_0'''''' + \frac{16384h^7}{7!} y_0''''''' + \dots$$

Putting $x = x_0 + 5h$ and $y = y_5$ in (3.4.1)

$$Y_5 = y_0 + 5hy_0' + \frac{25h^2}{2!} y_0'' + \frac{125h^3}{3!} y_0''' + \frac{625h^4}{4!} y_0'''' + \frac{3125h^5}{5!} y_0''''' + \frac{15625h^6}{6!} y_0'''''' + \frac{78125h^7}{7!} y_0''''''' + \dots$$

Putting $x = x_0 + 6h$ and $y = y_6$ in (3.4.1)

$$Y_6 = y_0 + 6hy_0' + \frac{36h^2}{2!} y_0'' + \frac{216h^3}{3!} y_0''' + \frac{1296h^4}{4!} y_0'''' + \frac{7776h^5}{5!} y_0''''' + \frac{46656h^6}{6!} y_0'''''' + \frac{279936h^7}{7!} y_0''''''' + \dots$$

Putting this value of y_1, y_2, y_3, y_4, y_5 and y_6 in (3.14.2) we get

$$\begin{aligned} A_1 &= \frac{3h}{10} (y_0 + 5y_1 + y_2 + 6y_3 + y_4 + 5y_5 + y_6) \\ &= [y_0 + 5(y_0 + hy_0' + \frac{h^2}{2!} y_0'' + \frac{h^3}{3!} y_0''' + \dots) + (y_0 + 2hy_0' + \frac{4h^2}{2!} y_0'' + \frac{8h^3}{3!} y_0''' + \dots) + \\ &6(y_0 + 3hy_0' + \frac{9h^2}{2!} y_0'' + \frac{27h^3}{3!} y_0''' + \frac{81h^4}{4!} y_0'''' + \dots) + (y_0 + 4hy_0' + \frac{16h^2}{2!} y_0'' + \frac{64h^3}{3!} y_0''' + \\ &\frac{256h^4}{4!} y_0'''' + \frac{1024h^5}{5!} y_0''''' + \frac{4096h^6}{6!} y_0'''''' + \frac{16384h^7}{7!} y_0''''''' + \dots) + 5(y_0 + 5hy_0' + \frac{25h^2}{2!} y_0'' + \\ &\frac{125h^3}{3!} y_0''' + \frac{625h^4}{4!} y_0'''' + \frac{3125h^5}{5!} y_0''''' + \frac{15625h^6}{6!} y_0'''''' + \frac{78125h^7}{7!} y_0''''''' + \dots) + (y_0 + 6hy_0' + \\ &\frac{36h^2}{2!} y_0'' + \frac{216h^3}{3!} y_0''' + \frac{1296h^4}{4!} y_0'''' + \frac{7776h^5}{5!} y_0''''' + \frac{46656h^6}{6!} y_0'''''' + \frac{279936h^7}{7!} y_0''''''' + \dots)] \\ &= \frac{3h}{10} [20y_0 + 60hy_0' + 120h^2y_0'' + 180h^3y_0''' + 216h^4y_0'''' + 216h^5y_0''''' + \frac{1111h^6}{6} y_0'''''' + \dots] \end{aligned} \quad \dots (3.14.3)$$

Error in the interval $[x_0, x_6] = \int_{x_0}^{x_6} y dx - A_1$

$$\begin{aligned} &= [(6y_0h + \frac{36h^2}{2!} y_0' + \frac{216h^3}{3!} y_0'' + \frac{1296h^4}{4!} y_0''' + \frac{7776h^5}{5!} y_0'''' + \frac{46656h^6}{6!} y_0'''''' \\ &+ \frac{279936h^7}{7!} y_0''''''' + \dots) - (\frac{3h}{10} 20y_0 + 60hy_0' + 120h^2y_0'' + 180h^3y_0''' + \\ &216h^4y_0'''' + 216h^5y_0''''' + \frac{1111h^6}{6} y_0'''''' + \dots)] \\ &= (\frac{279936}{7!} - \frac{1111}{30}) h^7 y_0'''''' \dots \\ &= -(\frac{1}{140}) h^7 y_0'''''' \dots (3.14.4) \end{aligned}$$

i.e., principal part of the error in $[x_0, x_6] = -(\frac{1}{140}) h^7 y_0''''''$

Similarly principal part of the error in $[x_6, x_{12}] = -(\frac{1}{140}) h^7 y_0''''''$

Hence the total error $E = -\left(\frac{1}{140}\right) h^7 (y_0'''''' + y_6'''''' + y_{12}'''''' + \dots + y_{6(n-1)}''''')$

Assuming that $y_0''''''(X)$ is the largest of the n quartiles y_0'''''' , y_6'''''' , $\dots$, $y_{6(n-1)}''''''$

We obtain

$$E < -\left(\frac{1}{140}\right) h^7 y_0''''''(X) \quad \dots (3.14.5)$$

This is the required error in Weddle's rule.

12 DERIVING THE GENERAL FORMULA FOR $n=7$

By Newton's cotes quadrature formula, we have

$$\begin{aligned} \int_{x_0}^{x_0+n h} f(x) dx = & h \left[n y_0 + \frac{n^2}{2} \Delta y_0 + \left(\frac{n^3}{3} - \frac{n^2}{2} \right) \frac{\Delta^2 y_0}{2!} + \left(\frac{n^4}{4} - n^3 + n^2 \right) \frac{\Delta^3 y_0}{3!} + \left(\frac{n^5}{5} - \frac{3n^4}{2} + \frac{11n^3}{3} - \right. \right. \\ & \left. \left. 3n^2 \right) \frac{\Delta^4 y_0}{4!} + \left(\frac{n^6}{6} - 2n^5 + \frac{35n^4}{4} - \frac{50n^3}{3} + 12n^2 \right) \frac{\Delta^5 y_0}{5!} + \left(\frac{n^7}{7} - \frac{15n^6}{6} + 17n^5 - \frac{225n^4}{4} + \frac{274n^3}{3} - 60n^2 \right) \right. \\ & \left. \frac{\Delta^6 y_0}{6!} + \left(\frac{n^8}{8} - 3n^7 + \frac{175n^6}{6} - 147n^5 + 406n^4 - 588n^3 + 360n^2 \right) \frac{\Delta^7 y_0}{7!} + \dots \right] \end{aligned}$$

(By 3.1.2)

When $n = 7$ means $f(x)$ can be approximated by a polynomial of 7th order so that 8th and higher order differences are vanishes in the general quadrature formula.

$$\begin{aligned} \int_{x_0}^{x_0+7h} f(x) dx = & 7h \left[y_0 + \frac{7}{2} \Delta y_0 + \frac{77}{12} \Delta^2 y_0 + \frac{175}{24} \Delta^3 y_0 + \frac{3731}{720} \Delta^4 y_0 + \frac{357}{160} \Delta^5 y_0 + \frac{4417}{8640} \Delta^6 y_0 \right. \\ & \left. + \frac{751}{17280} \Delta^7 y_0 \right] \\ = & 7h \left[y_0 + \frac{7}{2} (y_1 - y_0) + \frac{77}{12} (y_2 - 2y_1 + y_0) + \frac{175}{24} (y_3 - 3y_2 + 3y_1 - y_0) + \frac{3731}{720} (y_4 - 4y_3 + 6y_2 - 4y_1 + y_0) + \right. \\ & \left. \frac{357}{160} (y_5 - 5y_4 + 10y_3 - 10y_2 + 5y_1 - y_0) + \frac{4417}{8640} (y_6 - 6y_5 + 15y_4 - 20y_3 + 15y_2 - 6y_1 + y_0) + \frac{751}{17280} (y_7 - \right. \\ & \left. 7y_6 + 12y_5 - 35y_4 + 35y_3 - 21y_2 + 7y_1 - y_0) \right] \\ \int_{x_0}^{x_0+7h} f(x) dx = & \frac{7h}{17280} (751y_0 + 3577y_1 + 1323y_2 + 2989y_3 + 2989y_4 + 1323y_5 + 3577y_6 \\ & + 751y_7) \quad \dots (3.15.1) \end{aligned}$$

Clearly eq (3.15.2) determines the area of five strips bounded by the ordinates at x_0 , $x_0 + h$, $x_0 + 2h$, $x_0 + 3h$, $x_0 + 4h$, $x_0 + 5h$, $x_0 + 6h$ and $x_0 + 7h$ at a time. Similarly, using the formula (3.15.2), we find

$$\begin{aligned} \int_{x_0+7h}^{x_0+14h} f(x) dx = & \frac{7h}{17280} (751y_7 + 3577y_8 + 1323y_9 + 2989y_{10} + 2989y_{11} + 1323y_{12} + 3577y_{13} \\ & + 751y_{14}) \\ \int_{x_0+(n-7)h}^{x_0+nh} f(x) dx = & \frac{7h}{17280} (751y_{n-7} + 3577y_{n-6} + 1323y_{n-5} + 2989y_{n-4} + 2989y_{n-3} + 1323y_{n-2} \\ & + 3577y_{n-1} + 751y_n) \end{aligned}$$

Adding all the above results, we get

$$\begin{aligned} \int_{x_0}^{x_0+h} f(x) dx = & \int_{x_0+h}^{x_0+7h} f(x) dx + \int_{x_0+7h}^{x_0+14h} f(x) dx + \dots + \int_{x_0+(n-7)h}^{x_0+nh} f(x) dx = \\ & \int_{x_0}^{x_0+nh} f(x) dx \end{aligned}$$

$$\int_{x_0}^{x_0+nh} f(x)dx = \frac{7h}{17280} \{ 751[(y_0 + y_n) + 2(y_7 + y_{14} + y_{21} + \dots + y_{n-7})] + 3577(y_1 + y_6 + y_8 + y_{13} + y_{15} + y_{20} \dots + y_{n-6} + y_{n-1}) + 1323(y_2 + y_5 + y_9 + y_{12} + y_{16} + y_{19} \dots + y_{n-5} + y_{n-2}) + 2989(y_3 + y_4 + y_{10} + y_{11} + y_{17} + y_{18} \dots + y_{n-4} + y_{n-3}) \dots \dots \dots \}$$

(3.15.3)

This is the required general formula for n = 7.

13 ERROR COMPOSITION

Expanding $y = f(x)$ around $x = x_0$ by Taylor's series, we get

$$Y = y_0 + (x-x_0)y_0' + \frac{(x-x_0)^2}{2!}y_0'' + \dots \dots \dots \text{ (By 3.4.1)}$$

$$\begin{aligned} \int_{x_0}^{x_7} y dx &= \int_{x_0}^{x_0+7h} [y_0 + (x-x_0)y_0' + \frac{(x-x_0)^2}{2!}y_0'' + \dots \dots \dots] dx \\ &= 7y_0h + \frac{49h^2}{2!}y_0' + \frac{343h^3}{3!}y_0'' + \frac{2401h^4}{4!}y_0''' + \frac{16807h^5}{5!}y_0'''' + \frac{117649h^6}{6!}y_0''''' + \frac{823543h^7}{7!}y_0'''''' + \\ &\frac{5764801h^8}{8!}y_0'''''' + \frac{40353607h^9}{9!}y_0'''''' + \dots \quad (3.16.1) \end{aligned}$$

Also A_1 = area over the first seven strip in the interval $[x_0, x_7]$

$$= \frac{7h}{17280} (751y_0 + 3577y_1 + 1323y_2 + 2989y_3 + 2989y_4 + 1323y_5 + 3577y_6 + 751y_7)$$

-- (3.16.2)

Putting $x = x_0 + h$ and $y = y_1$ in (3.4.1)

$$Y_1 = y_0 + hy_0' + \frac{h^2}{2!}y_0'' + \frac{h^3}{3!}y_0''' + \dots \dots \dots$$

Putting $x = x_0 + 2h$ and $y = y_2$ in (3.4.1)

$$Y_2 = y_0 + 2hy_0' + \frac{4h^2}{2!}y_0'' + \frac{8h^3}{3!}y_0''' + \dots \dots \dots$$

Putting $x = x_0 + 3h$ and $y = y_3$ in (3.4.1)

$$Y_3 = y_0 + 3hy_0' + \frac{9h^2}{2!}y_0'' + \frac{27h^3}{3!}y_0''' + \frac{81h^4}{4!}y_0'''' \dots \dots \dots$$

Putting $x = x_0 + 4h$ and $y = y_4$ in (3.4.1)

$$Y_4 = y_0 + 4hy_0' + \frac{16h^2}{2!}y_0'' + \frac{64h^3}{3!}y_0''' + \frac{256h^4}{4!}y_0'''' + \frac{1024h^5}{5!}y_0''''' + \frac{4096h^6}{6!}y_0'''''' + \frac{16384h^7}{7!}y_0'''''' + \dots \dots \dots$$

Putting $x = x_0 + 5h$ and $y = y_5$ in (3.4.1)

$$Y_5 = y_0 + 5hy_0' + \frac{25h^2}{2!}y_0'' + \frac{125h^3}{3!}y_0''' + \frac{625h^4}{4!}y_0'''' + \frac{3125h^5}{5!}y_0''''' + \frac{15625h^6}{6!}y_0'''''' + \frac{78125h^7}{7!}y_0'''''' + \dots \dots \dots$$

Putting $x = x_0 + 6h$ and $y = y_6$ in (3.4.1)

$$Y_6 = y_0 + 6hy_0' + \frac{36h^2}{2!}y_0'' + \frac{216h^3}{3!}y_0''' + \frac{1296h^4}{4!}y_0'''' + \frac{7776h^5}{5!}y_0''''' + \frac{46656h^6}{6!}y_0'''''' + \frac{279936h^7}{7!}y_0'''''' + \dots \dots \dots$$

Putting $x = x_0 + 7h$ and $y = y_7$ in (3.4.1)

$$Y_7 = y_0 + 7hy_0' + \frac{49h^2}{2!} y_0'' + \frac{343h^3}{3!} y_0''' + \frac{2401h^4}{4!} y_0'''' + \frac{16807h^5}{5!} y_0''''' + \frac{117649h^6}{6!} y_0'''''' + \frac{823543h^7}{7!} y_0''''''' + \frac{5764801h^8}{8!} y_0'''''''' + \frac{40353607h^9}{9!} y_0''''''''' + \dots$$

Putting this value of $y_1, y_2, y_3, y_4, y_5, y_6$ and y_7 in (3.16.2) we get

$$\begin{aligned} A_1 &= \frac{7h}{17280} (751y_0 + 3577y_1 + 1323y_2 + 2989y_3 + 2989y_4 + 1323y_5 + 3577y_6 + 751y_7) \\ &= \frac{7h}{17280} [751y_0 + 3577(y_0 + hy_0' + \frac{h^2}{2!} y_0'' + \frac{h^3}{3!} y_0''' + \dots) + 1323(y_0 + 2hy_0' + \frac{4h^2}{2!} y_0'' + \frac{8h^3}{3!} y_0''' + \dots) \\ &\quad + 2989(y_0 + 3hy_0' + \frac{9h^2}{2!} y_0'' + \frac{27h^3}{3!} y_0''' + \frac{81h^4}{4!} y_0'''' + \dots) + 2989(y_0 + 4hy_0' \\ &\quad + \frac{16h^2}{2!} y_0'' + \frac{64h^3}{3!} y_0''' + \frac{256h^4}{4!} y_0'''' + \frac{1024h^5}{5!} y_0''''' + \frac{4096h^6}{6!} y_0'''''' + \frac{16384h^7}{7!} y_0''''''' + \dots) + \\ &\quad 1323(y_0 + 5hy_0' + \frac{25h^2}{2!} y_0'' + \frac{125h^3}{3!} y_0''' + \frac{625h^4}{4!} y_0'''' + \frac{3125h^5}{5!} y_0''''' + \frac{15625h^6}{6!} y_0'''''' + \frac{78125h^7}{7!} y_0''''''' + \dots) \\ &\quad + 3577(y_0 + 6hy_0' + \frac{36h^2}{2!} y_0'' + \frac{216h^3}{3!} y_0''' + \frac{1296h^4}{4!} y_0'''' + \frac{7776h^5}{5!} y_0''''' + \frac{46656h^6}{6!} y_0'''''' + \frac{279936h^7}{7!} y_0''''''' + \dots) \\ &\quad + 751(y_0 + 7hy_0' + \frac{49h^2}{2!} y_0'' + \frac{343h^3}{3!} y_0''' + \frac{2401h^4}{4!} y_0'''' + \frac{16807h^5}{5!} y_0''''' + \frac{117649h^6}{6!} y_0'''''' + \frac{823543h^7}{7!} y_0''''''' + \frac{5764801h^8}{8!} y_0'''''''' + \frac{40353607h^9}{9!} y_0''''''''' + \dots)] \\ &= \frac{7h}{17280} (17280y_0 + 60480hy_0' + 141120h^2y_0'' + 246960h^3y_0''' + 345744h^4y_0'''' + 403368h^5y_0''''' + 403368h^6y_0'''''' + 352947h^7y_0''''''' + 1.106998906 \times 10^{10}h^8y_0'''''''' + \dots) \\ &\text{----- (3.16.3)} \end{aligned}$$

Error in the interval $[x_0, x_7] = \int_{x_0}^{x_7} y dx - A_1$

$$\begin{aligned} &= [7y_0h + \frac{49h^2}{2!} y_0' + \frac{343h^3}{3!} y_0'' + \frac{2401h^4}{4!} y_0''' + \frac{16807h^5}{5!} y_0'''' + \frac{117649h^6}{6!} y_0''''' + \frac{823543h^7}{7!} y_0'''''' + \frac{5764801h^8}{8!} y_0'''''''' + \frac{40353607h^9}{9!} y_0''''''''' + \dots] - [\frac{7h}{17280} (17280y_0 + 60480hy_0' + 141120h^2y_0'' + 246960h^3y_0''' + 345744h^4y_0'''' + 403368h^5y_0''''' + 403368h^6y_0'''''' + 352947h^7y_0''''''' + 1.106998906 \times 10^{10}h^8y_0'''''''' + \dots)] \\ &= [111.203723h^9y_0'''''''' - 111.2195081h^9y_0'''''''' \dots] \\ &= -0.015785106h^9y_0'''''''' \dots \\ &= -\frac{8183}{518400} h^9 y_0'''''''' \text{ (3.16.4)} \end{aligned}$$

i.e., principal parts of the error in $[x_0, x_7] = -\frac{8183}{518400} h^9 y_0''''''''$

Similarly principal part of the error in $[x_6, x_{12}] = -\frac{8183}{518400} h^9 y_0''''''''$

Hence the total error $E = -\frac{8183}{518400} h^9 (y_0'''''''' + y_7'''''''' + y_{14}'''''''' + \dots + y_{7(n-1)}''''''')$

Assuming that $y_0''''''''(X)$ is the largest of the n quartiles $y_0''''''''', y_7''''''''', \dots, y_{7(n-1)}'''''''$

We obtain

$$E \leq -\frac{8183}{518400} h^9 y_0''''''''(X) \quad \dots (3.16.5)$$

Required error for $n = 7$.

14 DERIVING THE GENERAL FORMULA FOR $n = 9$

By Newton's cotes quadrature formula, we have

$$\int_{x_0}^{x_0+n h} f(x)dx = h [ny_0 + \frac{n^2}{2}\Delta y_0 + (\frac{n^3}{3} - \frac{n^2}{2})\frac{\Delta^2 y_0}{2!} + (\frac{n^4}{4} - n^3 + n^2)\frac{\Delta^3 y_0}{3!} + (\frac{n^5}{5} - \frac{3n^4}{2} + \frac{11n^3}{3} - 3n^2)\frac{\Delta^4 y_0}{4!} + (\frac{n^6}{6} - 2n^5 + \frac{35n^4}{4} - \frac{50n^3}{3} + 12n^2)\frac{\Delta^5 y_0}{5!} + (\frac{n^7}{7} - \frac{15n^6}{6} + 17n^5 - \frac{225n^4}{4} + \frac{274n^3}{3} - 60n^2)\frac{\Delta^6 y_0}{6!} + (\frac{n^8}{8} - 3n^7 + \frac{175n^6}{6} - 147n^5 + 406n^4 - 588n^3 + 360n^2)\frac{\Delta^7 y_0}{7!} + (\frac{n^9}{9} - \frac{7}{2}n^8 + 46n^7 - \frac{980n^6}{3} + \frac{6769}{5}n^5 - 3283n^4 + 4356n^3 - 2520n^2)\frac{\Delta^8 y_0}{8!} + (\frac{n^{10}}{10} - \frac{29}{9}n^9 + \frac{273}{4}n^8 - 648n^7 + \frac{7483n^6}{2} - \frac{67284}{5}n^5 + \frac{53181}{2}n^4 - \frac{15488}{3}n^3 + 20160n^2)\frac{\Delta^9 y_0}{9!} \dots \text{(By 3.1.2)}$$

When $n = 9$ means $f(x)$ can be approximated by a polynomial of 9th order so that 10th and higher order differences are vanishes in the general quadrature formula.

$$\begin{aligned} \int_{x_0}^{x_0+9h} f(x)dx &= 9h [y_0 + \frac{9}{2}\Delta y_0 + \frac{45}{4}\Delta^2 y_0 + \frac{147}{8}\Delta^3 y_0 + \frac{1629}{80}\Delta^4 y_0 + \frac{495}{32}\Delta^5 y_0 + \frac{17691}{2240}\Delta^6 y_0 \\ &+ \frac{11493}{4480}\Delta^7 y_0 + \frac{2961}{6400}\Delta^8 y_0 + \frac{2857}{89600}\Delta^9 y_0] \\ &= 9h [y_0 + \frac{9}{2}(y_1 - y_0) + \frac{45}{4}(y_2 - 2y_1 + y_0) + \frac{147}{8}(y_3 - 3y_2 + 3y_1 - y_0) + \frac{1629}{80}(y_4 - 4y_3 + 6y_2 - 4y_1 + y_0) + \\ &\frac{495}{32}(y_5 - 5y_4 + 10y_3 - 10y_2 + 5y_1 - y_0) + \frac{17691}{2240}(y_6 - 6y_5 + 15y_4 - 20y_3 + 15y_2 - 6y_1 + y_0) + \frac{11493}{4480}(y_7 - \\ &7y_6 + 21y_5 - 35y_4 + 35y_3 - 21y_2 + 7y_1 - y_0) + \frac{2961}{6400}(y_8 - 8y_7 + 28y_6 - 56y_5 + 75y_4 - 56y_3 + 28y_2 - 8y_1 + y_0) \\ &+ \frac{2857}{89600}(y_9 - 9y_8 + 36y_7 - 84y_6 + 126y_5 - 126y_4 + 84y_3 - 36y_2 + 9y_1 - y_0)] \\ \int_{x_0}^{x_0+9h} f(x)dx &= \frac{9h}{89600}(2857y_0 + 15741y_1 + 1080y_2 + 19344y_3 + 5778y_4 + 5778y_5 + \\ &19344y_6 + 1080y_7 + 15741y_8 + 2857y_9) \quad \text{--- (3.17.1)} \end{aligned}$$

Clearly eq (3.17.1) determines the area of nine strips bounded by the ordinates at $x_0, x_0 + h, x_0 + 2h, x_0 + 3h, x_0 + 4h, x_0 + 5h, x_0 + 6h, x_0 + 7h, x_0 + 8h$ and $x_0 + 9h$ at a time.

Similarly, using the formula (3.17.1), we find

$$\begin{aligned} \int_{x_0+9h}^{x_0+18h} f(x)dx &= \frac{9h}{89600}(2857y_9 + 15741y_{10} + 1080y_{11} + 19344y_{12} + 5778y_{13} + 5778y_{14} + \\ &19344y_{15} + 1080y_{16} + 15741y_{17} + 2857y_{18}) \\ \int_{x_0+(n-9)h}^{x_0+nh} f(x)dx &= \frac{9h}{89600}(2857y_{n-9} + 15741y_{n-8} + 1080y_{n-7} + 19344y_{n-6} + 5778y_{n-5} \\ &+ 5778y_{n-4} + 19344y_{n-3} + 1080y_{n-2} + 15741y_{n-1} + 2857y_n) \end{aligned}$$

Adding all the above results, we get

$$\begin{aligned} \int_{x_0}^{x_0+h} f(x)dx &= \int_{x_0+h}^{x_0+9h} f(x)dx + \int_{x_0+9h}^{x_0+18h} f(x)dx + \dots + \int_{x_0+(n-9)h}^{x_0+nh} f(x)dx = \\ &\int_{x_0}^{x_0+nh} f(x)dx \\ \int_{x_0}^{x_0+nh} f(x)dx &= \frac{9h}{89600}\{2857[(y_0 + y_n) + 2(y_9 + y_{18} + \dots + y_{n-9})] + 15741(y_1 + y_8 + y_{10} + \\ &y_{17} + \dots + y_{n-8} + y_{n-1}) + 1080(y_2 + y_7 + y_{11} + y_{16} + \dots + y_{n-7} + y_{n-2}) + 19344(y_3 + y_6 + y_{12} \\ &+ y_{18} + \dots + y_{n-6} + y_{n-3}) + 5778(y_4 + y_5 + y_{13} + y_{14} + \dots + y_{n-5} + y_{n-4})\} \\ &\dots \text{(3.17.2)} \end{aligned}$$

Required general formula for $n = 9$.

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EXPLORING CHALLENGES IN ONLINE EDUCATION AND VIRTUAL LABORATORIES

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Abstract - With the rapid advancement of technology, online education has emerged as a prominent platform for delivering educational content. Virtual laboratories, in particular, have gained significant attention as they provide hands-on learning experiences in a digital environment. However, despite their potential benefits, online education and virtual laboratories come with their own set of challenges. This paper aims to explore these challenges comprehensively, addressing issues related to technology, pedagogy, accessibility, and assessment. By identifying and understanding these challenges, educators and policymakers can work towards creating more effective and inclusive online learning environments.

1. INTRODUCTION

The landscape of education has undergone a profound transformation with the advent of online learning platforms and virtual laboratories. These technological advancements have not only expanded access to education but have also revolutionized the way knowledge is disseminated and acquired. Online education, characterized by its flexibility, scalability, and accessibility, has gained traction across diverse educational settings, from K-12 to higher education and professional development.

Virtual laboratories, in particular, represent a significant innovation in the field of STEM (Science, Technology, Engineering, and Mathematics) education. These digital environments simulate real-world laboratory experiences, allowing students to conduct experiments, analyze data, and gain practical skills remotely. Virtual laboratories offer numerous advantages, including cost-effectiveness, safety, and the ability to replicate experiments in controlled settings.

However, alongside the benefits, online education and virtual laboratories present a myriad of challenges that must be addressed to ensure their effectiveness and inclusivity. Technological limitations, pedagogical considerations, content development challenges, assessment issues, and equity concerns are among the key obstacles that educators and policymakers must navigate.

This paper aims to explore these challenges comprehensively, providing insights into the complexities of online education and virtual laboratories. By identifying and understanding these challenges, stakeholders can work towards implementing strategies and solutions to create more engaging, equitable, and effective online learning environments.

In the subsequent sections, we delve into the technological, pedagogical, content development, assessment, instructor training, student engagement, equity, and access challenges in online education and virtual laboratories. Through this

exploration, we aim to shed light on the multifaceted nature of these challenges and pave the way for future research and innovation in the field of online education.

2. TECHNOLOGICAL CHALLENGES

In the realm of online education and virtual laboratories, technological challenges are ubiquitous and multifaceted. These challenges span from infrastructure requirements to accessibility concerns and compatibility issues across various devices and platforms. Addressing these technological hurdles is crucial for ensuring seamless delivery of educational content and fostering an inclusive learning environment.

- **Infrastructure Requirements:** One of the primary technological challenges in online education is the need for robust infrastructure, including reliable internet connectivity and access to necessary hardware such as computers, tablets, or smartphones. However, disparities in infrastructure exist, particularly in rural or underserved areas where access to high-speed internet may be limited or non-existent. Bridging this digital divide is essential to ensure equitable access to online educational resources for all students.
- **Connectivity Issues:** Even in areas with adequate internet infrastructure, connectivity issues such as bandwidth limitations, network congestion, and intermittent outages can disrupt online learning experiences. These connectivity challenges not only hinder students' ability to access course materials and participate in live sessions but also impact the delivery of multimedia content, including videos, simulations, and virtual laboratories.
- **Accessibility Concerns for Students with Disabilities:** Ensuring accessibility is another critical technological challenge in online education. Platforms and content must be designed to accommodate students with diverse needs, including those with visual, auditory, motor, or cognitive impairments. This involves implementing features such as screen readers, captioning, alternative text for images, keyboard navigation, and compatibility with assistive technologies to facilitate an inclusive learning experience for all students.
- **Compatibility Across Devices and Platforms:** Online education platforms and virtual laboratories must be compatible across a wide range of devices and operating systems to accommodate students using different devices, including computers, tablets, and smartphones, with various operating systems such as Windows, macOS, iOS, and Android. Ensuring cross-platform compatibility enhances accessibility and flexibility, allowing students to access educational content seamlessly regardless of their preferred device or platform.

3 PEDAGOGICAL CHALLENGES

In addition to technological obstacles, online education and virtual laboratories present a range of pedagogical challenges that educators must navigate to ensure effective learning outcomes. These challenges revolve around designing engaging and interactive content, maintaining student motivation and engagement, adapting

teaching methods to an online environment, and providing meaningful feedback and support.

- **Designing Engaging and Interactive Content:** Creating engaging and interactive content is essential for keeping students actively involved and motivated in the online learning process. However, translating traditional classroom activities into an online format requires careful consideration of instructional design principles, multimedia integration, and interactivity. Educators must leverage a variety of tools and techniques, such as multimedia presentations, simulations, virtual labs, gamification elements, and collaborative activities, to enhance student engagement and facilitate meaningful learning experiences.
- **Maintaining Student Motivation and Engagement:** Sustaining student motivation and engagement over an extended period presents a significant challenge in online education. Without the physical presence of an instructor and peers, students may feel isolated or disengaged, leading to decreased participation and learning outcomes. To address this challenge, educators must employ strategies to foster a sense of community, establish clear expectations, provide opportunities for interaction and collaboration, and offer personalized support to keep students motivated and engaged throughout the online learning journey.
- **Adapting Teaching Methods to an Online Environment:** The transition from traditional face-to-face instruction to online teaching requires educators to adapt their teaching methods and instructional strategies to suit the digital learning environment. This adaptation involves rethinking pedagogical approaches, leveraging technology effectively, and designing learning experiences that align with the unique affordances of online platforms. Educators may need to explore new teaching modalities, such as asynchronous discussions, synchronous webinars, flipped classrooms, and blended learning models, to accommodate diverse learning preferences and optimize learning outcomes in an online context.
- **Providing Effective Feedback and Support:** Offering timely and constructive feedback is crucial for facilitating student learning and growth in online education. However, providing feedback in a virtual setting poses challenges such as limited opportunities for face-to-face interaction, difficulty in gauging students' understanding, and managing workload constraints. Educators must explore innovative feedback mechanisms, such as online quizzes, peer review assignments, automated grading systems, and video/audio feedback, to provide personalized, timely, and actionable feedback to students. Additionally, offering accessible support channels, such as discussion forums, virtual office hours, and online tutorials, can help students address questions and challenges effectively.

4 CONTENT DEVELOPMENT AND QUALITY ASSURANCE

In the realm of online education and virtual laboratories, content development and quality assurance play a pivotal role in ensuring the effectiveness, relevance, and credibility of educational materials. Challenges in this domain encompass ensuring the accuracy and authenticity of content, updating materials to reflect advancements in

the field, and implementing robust quality assurance processes for virtual laboratories.

- **Ensuring Accuracy and Authenticity of Content:** One of the foremost challenges in content development for online education is ensuring the accuracy and authenticity of educational materials. This involves verifying the credibility of sources, fact-checking information, and aligning content with established standards and best practices in the field. Educators and content developers must critically evaluate resources, cite reputable sources, and provide proper attribution to avoid disseminating misinformation or biased content.
- **Updating Content to Reflect Advancements in the Field:** Another challenge is keeping educational content relevant and up-to-date in rapidly evolving fields such as science, technology, engineering, and mathematics (STEM). Online courses and virtual laboratories must reflect the latest developments, discoveries, and best practices in their respective disciplines to provide students with current and relevant learning experiences. This requires continuous monitoring of industry trends, curriculum updates, and advancements in pedagogy, as well as regular review and revision of course materials to incorporate new knowledge and insights.
- **Quality Assurance Processes for Virtual Laboratories:** Ensuring the quality and effectiveness of virtual laboratories poses specific challenges due to their interactive and hands-on nature. Virtual laboratories must accurately simulate real-world experiments, provide meaningful learning experiences, and offer opportunities for students to develop practical skills and critical thinking abilities. Implementing robust quality assurance processes is essential to evaluate the functionality, usability, and educational efficacy of virtual laboratory simulations. This may involve conducting usability testing, peer reviews, expert evaluations, and student feedback surveys to identify areas for improvement and refine the design and functionality of virtual laboratories.

Addressing these content development and quality assurance challenges requires collaboration among educators, subject matter experts, instructional designers, and technology developers. By prioritizing accuracy, relevance, and educational effectiveness in content development, and implementing rigorous quality assurance processes for virtual laboratories, educators can create high-quality online learning experiences that empower students to succeed academically and professionally in their chosen fields. Additionally, fostering a culture of continuous improvement and innovation can help institutions stay at the forefront of online education and meet the evolving needs of learners in the digital age.

5. ASSESSMENT AND EVALUATION

Assessment and evaluation are integral components of online education and virtual laboratories, enabling educators to gauge students' learning progress, measure their achievement of learning objectives, and provide feedback for improvement. However, conducting assessments in an online environment presents unique challenges,

including ensuring the fairness and reliability of assessment methods, preventing cheating and plagiarism, and evaluating practical skills in virtual laboratories.

- **Implementing Fair and Reliable Assessment Methods:** One of the primary challenges in online education is designing assessment methods that are fair, reliable, and valid measures of students' knowledge and skills. Traditional assessment formats, such as multiple-choice quizzes and essay exams, may need to be adapted or supplemented with alternative assessment strategies to accommodate the online learning environment. Educators must explore diverse assessment methods, including authentic assessments, performance-based tasks, project-based assessments, and peer evaluations, to accurately evaluate students' learning outcomes and promote deeper learning.
- **Preventing Cheating and Plagiarism in Online Assessments:** Maintaining academic integrity is a critical concern in online education, as the remote nature of online assessments may increase the risk of cheating and plagiarism. Educators must implement proactive measures to deter academic dishonesty, such as using plagiarism detection software, designing secure assessment environments, implementing proctoring solutions, and promoting ethical behavior through clear communication of academic integrity policies and consequences for violations. Additionally, incorporating collaborative and open-ended assessment tasks can encourage original thinking and discourage rote memorization and regurgitation of information.
- **Evaluating Practical Skills in Virtual Laboratories:** Assessing practical skills and hands-on competencies in virtual laboratories presents unique challenges compared to traditional laboratory settings. While virtual laboratories offer opportunities for students to engage in simulated experiments and data analysis activities, assessing students' proficiency in performing laboratory procedures and interpreting results requires careful consideration. Educators may need to develop performance rubrics, design authentic assessment tasks, and provide opportunities for students to demonstrate their practical skills through virtual experimentation, data collection, analysis, and reporting.

6. INSTRUCTOR TRAINING AND SUPPORT

The successful implementation of online education and virtual laboratories hinges not only on technological infrastructure and pedagogical strategies but also on the preparedness and proficiency of educators in navigating the digital learning landscape. Providing comprehensive training and ongoing support for instructors is essential to equip them with the knowledge, skills, and resources necessary to effectively facilitate online learning experiences and engage students in virtual environments. However, ensuring adequate instructor training and support poses several challenges, including the need to address technological proficiency, pedagogical competence, and workload management.

- **Providing Training for Educators to Effectively Use Online Platforms:** Many educators may have limited experience or familiarity with online teaching

platforms and tools, making it essential to provide comprehensive training programs to enhance their technological proficiency. Training initiatives should cover topics such as navigating learning management systems, creating and delivering online content, facilitating synchronous and asynchronous interactions, and utilizing multimedia resources effectively. Additionally, educators may benefit from training in instructional design principles, accessibility guidelines, and best practices for online pedagogy to optimize learning outcomes in virtual environments.

- **Supporting Instructors in Transitioning to Online Teaching:** Transitioning from traditional classroom instruction to online teaching requires educators to adapt their teaching methods, instructional strategies, and assessment practices to suit the digital learning environment. Providing ongoing support and mentorship to instructors during this transition period is crucial for building confidence, addressing challenges, and fostering a culture of continuous improvement. Peer-to-peer collaboration, coaching sessions, and professional development opportunities can help educators navigate the nuances of online teaching, troubleshoot technical issues, and exchange best practices with colleagues.
- **Addressing Concerns Related to Workload and Burnout:** The increased demands associated with online teaching, including course development, content delivery, student support, and assessment, can place significant strain on educators and contribute to feelings of burnout and overwhelm. It is essential to recognize and address these concerns by implementing strategies to promote work-life balance, streamline administrative tasks, and provide adequate support for instructors' well-being. This may involve workload management strategies, such as course design templates, automated grading tools, and teaching assistants, to alleviate the burden on educators and enable them to focus on facilitating engaging and meaningful learning experiences for students.

7. STUDENT ENGAGEMENT AND SUPPORT

In online education and virtual laboratories, fostering student engagement and providing comprehensive support services are crucial for facilitating meaningful learning experiences and promoting academic success. However, achieving high levels of student engagement and ensuring effective support pose significant challenges in the digital learning environment. These challenges encompass promoting collaboration and peer interaction, providing technical support, and ensuring access to resources and materials for all students.

- **Promoting Collaboration and Peer Interaction in Virtual Classrooms:** One of the key challenges in online education is replicating the collaborative and interactive nature of traditional classrooms in virtual settings. Without face-to-face interactions, students may feel isolated and disconnected from their peers, hindering their engagement and motivation to participate actively in the learning process. Educators must implement strategies to promote collaboration,

communication, and peer interaction in virtual classrooms, such as group projects, discussion forums, virtual study groups, and collaborative activities. Additionally, fostering a sense of community and belonging through icebreaker activities, team-building exercises, and social events can enhance student engagement and cultivate a supportive learning environment.

- **Providing Technical Support for Students Encountering Difficulties:** Technical issues such as connectivity problems, software glitches, and compatibility issues can impede students' access to online learning resources and hinder their progress in virtual laboratories. Offering timely and responsive technical support services is essential for addressing these challenges and ensuring students have access to the tools and resources they need to succeed. Establishing help desks, providing troubleshooting guides, offering live chat support, and organizing technical workshops can help students resolve issues quickly and minimize disruptions to their learning experiences.
- **Ensuring Access to Resources and Materials for All Students:** Equitable access to educational resources and materials is paramount in online education, particularly for students from diverse backgrounds or those facing socio-economic challenges. Ensuring that course materials are accessible, inclusive, and available in multiple formats can help accommodate students with varying learning needs and preferences. Providing alternative formats for content, such as text transcripts for videos, accessible PDFs, and screen-reader-friendly materials, can enhance accessibility for students with disabilities. Additionally, offering financial assistance programs, loaner devices, and internet subsidies can help bridge the digital divide and ensure that all students have access to the technology necessary for participating in online learning activities.

8. FUTURE DIRECTIONS AND RECOMMENDATIONS

As online education and virtual laboratories continue to evolve, it is imperative to anticipate future trends, challenges, and opportunities to enhance the quality and effectiveness of digital learning experiences. Embracing innovative technologies, fostering collaboration among stakeholders, and prioritizing student-centered approaches are key strategies for shaping the future of online education. Here are some future directions and recommendations for advancing the field:

- **Investing in Research and Development for Online Education Tools:** Continued investment in research and development is essential for driving innovation and advancing the capabilities of online education tools and platforms. This includes developing new technologies, such as artificial intelligence, virtual reality, and augmented reality, to enhance interactivity, engagement, and personalized learning experiences in virtual environments. Additionally, conducting empirical research on the effectiveness of online pedagogical strategies, assessment methods, and support services can inform evidence-based practices and drive continuous improvement in online education.

- **Promoting Collaboration Among Stakeholders:** Collaboration among educators, instructional designers, technology developers, policymakers, and stakeholders is essential for addressing complex challenges and driving meaningful change in online education. Establishing interdisciplinary teams and communities of practice can facilitate knowledge sharing, resource sharing, and collaboration on innovative projects and initiatives. Additionally, fostering partnerships between educational institutions, industry partners, and government agencies can help align online education programs with workforce needs and emerging trends in the job market.
- **Prioritizing Accessibility and Inclusivity:** Ensuring accessibility and inclusivity should be a central focus in the design and delivery of online education and virtual laboratories. This includes adopting universal design principles, incorporating accessibility features into digital platforms and content, and providing accommodations for students with disabilities. Educators and instructional designers should undergo training on accessibility guidelines and best practices to create accessible learning experiences for all students. Furthermore, promoting cultural diversity, equity, and inclusion in online education can help address systemic barriers and promote social justice in education.
- **Emphasizing Lifelong Learning and Professional Development:** Online education has the potential to democratize access to lifelong learning opportunities and support individuals in acquiring new skills and competencies throughout their lives. Educational institutions and employers should collaborate to develop flexible, competency-based learning pathways that align with industry needs and support career advancement. Additionally, investing in professional development programs for educators to enhance their digital literacy, teaching skills, and cultural competence can improve the quality of online education and empower educators to meet the diverse needs of learners in the digital age.

9. CONCLUSION

In conclusion, online education and virtual laboratories offer tremendous potential for expanding access to high-quality learning experiences, fostering innovation in teaching and learning, and preparing individuals for success in a rapidly evolving digital world. However, realizing this potential requires addressing a myriad of challenges, ranging from technological limitations and pedagogical considerations to equity concerns and support services.

Throughout this paper, we have explored the multifaceted challenges faced in online education and virtual laboratories, including technological infrastructure requirements, pedagogical adaptations, content development complexities, assessment strategies, instructor training needs, student engagement initiatives, and future directions for advancement. These challenges underscore the complexities of transitioning to and optimizing digital learning environments and highlight the importance of collaborative efforts among educators, policymakers, technology developers, and stakeholders.

Despite these challenges, the opportunities presented by online education and virtual laboratories are vast. By leveraging innovative technologies, fostering collaboration among stakeholders, prioritizing accessibility and inclusivity, and emphasizing lifelong learning and professional development, we can create a more equitable, inclusive, and effective digital learning ecosystem that empowers learners of all backgrounds to thrive and succeed.

As we navigate the evolving landscape of online education, it is essential to remain agile, adaptable, and forward-thinking, continuously seeking new strategies, approaches, and solutions to address emerging challenges and capitalize on emerging opportunities. By embracing innovation, fostering collaboration, and prioritizing the needs of learners, we can shape a future where online education and virtual laboratories serve as catalysts for positive change, empowering individuals to reach their full potential and contribute meaningfully to society.

In closing, let us remain committed to the pursuit of excellence in online education, guided by principles of equity, accessibility, and lifelong learning, as we strive to create a brighter future for learners around the globe.

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COMPONENTS OF EHEALTH PENETRATING HEALTHCARE DOMAIN:A CONCEPTUAL REVIEW

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Abstract - Our life have been made easy by technology in various way. Ehealth, M-health and telemedicine has come up as a transformational technology. Health related information can disseminated amongst health care professionals. Ehealth, m-health and telemedicine is in integrated. The communication for the patients has become much more faster due to wireless connection equipped with a mobile or digital equipment. Remote monitoring of patients have been intervened by remote clinics with the help of mobile technology. The vital signs of a person can be detected earlier to avoid emergency situation. New devices and applications used for clinical practices have been innovated by research and innovations. The patient safety and disease outcomes are monitored by ehealth outcome. The aim of this abstract is to briefly discuss the components e-Health technology penetrating health care domain.

1 INTRODUCTION

TELEMEDICINE: Use of information, communication and technology for delivery of health care services to remote patients for diagnosis, treatment and prevention of disease and injuries, continuing education and research of health care providers and for health of community and individuals.

TELEHEALTH: The medical care, patient education, health information services self digital care with the help of ICT is delivered to patients in a faster pace which is called telehealth.

Healthcare Access and Affordability is enabled by telemedicine. Many benefits are there for telemedicine. Many service which are not available generally are provided by telemedicine with a faster pace and timely manner to properly intervene and the access to service increased. In the large geographical distribution of India, personalised health care is challengeing. The rural patients don't have to travel long distance if they avail telehealth facility near their home and their cost is saved. Not only their time and cost is saved also they get an optimal solution to their problem. It would also reduce financial costs associated with travel. The family and caregivers have also freed from in convineince. Routine check ups can be easily monitored by telemedicine where offline meeting with medical practitioner is not necessary. Secondary hospitals can be freed from public load because of telemedicine. **The advice of healthcare professionals are documented hence lesser risk of missing out in telemedicine service.** In Teleconsultation, the advice of doctors has been documented which protects the legal right of both doctors and patients. In contagious diseases, teleconsultation ensures both pateints and health workers safety. The patient helped by the telemedicine technology in managing the medicine regimen and disease symptoms. The vital parameters of patients can be informed by digital medical devices

such as blood pressure, blood glucose etc. Telemedicine helps majorly in disaster and pandemics providing healthcare which is very challenging. Medical practitioners can use telemedicine for managing patients in many scenarios though it may not be helpful in all situations. The screening of patients can be done remotely which avoids the unnecessary exposure of patients to the doctors in contagious situations. The medical practitioners may be rapidly accessed with the help of telemedicine those who can not be available in person. The equal access to health care is a commitment by Govt and health system is transformed by digital health. Thus the Govt. has taken many initiatives to mainstream telemedicine to minimize inequity and to alleviate the barriers to healthcare. The Govt. formulating digital health policy which is used nationwide for using digital tools which again improves efficiency and outcome of healthcare system. The practice of telemedicine is still a concern as far as the guidelines are taken into account. The registered practitioners who are registered for telemedicine practice are significantly confused and handling ambiguity because of unclear guidelines. The Hon'ble High Court of Bombay had given a judgement in 2018 which questioned about the framework available for telemedicine regarding its place of use and legitimacy. The telemedicine platform such as video, chat, phone and internet based platforms are not regularized by any legislation or guideline. The practice of medicine and information technology are governed by existing provisions under the Indian Medical Council Act, 1956, the Indian Medical Council (Professional Conduct, Etiquette and Ethics Regulation 2002), Drugs & Cosmetics Act, 1940 and Rules 1945, Clinical Establishment (Registration and Regulation) Act, 2010, Information Technology Act, 2000 and the Information Technology (Reasonable Security Practices and Procedures and Sensitive Personal Data or Information) Rules 2011. The unclear legislation and uncertain rules confuse both doctors and patients. Telemedicine is practised by legislation in some countries whereas in some other countries it is guided by guidelines. The medical practitioners follow the guidelines as professional norms. The practice guidelines are key to growth of telemedicine. Many health practitioners are adopting the telemedicine to enrich healthcare practices.

Telemedicine Practice Guidelines: Enabling Registered Medical Practitioners to Provide Healthcare Using Telemedicine
<https://www.mohfw.gov.in/pdf/Telemedicine.pdf>

Technology Used & Mode of Communications: Telemedicine are delivered by multiple technologies. Video, Audio, Text (chat, messaging, email, fax) are 3 primary modes. The modes have their own limitations while providing the diagnosis. That's why it's very important to know their strength and weakness. However the RMP gets benefit from this distant mode technologies in contagious situation. The distant technologies however cannot replace the palpation, percussion and auscultation which may be replaced by newer technology in newer features.

1. The context of telemedicine should be appropriate and sufficient.
2. The patient and RMP should be identified.

3. The telemedicine mode should be identified.
4. The patient should be evaluated by exchanging the information.
5. The first consultation and follow up consultation should be clarified and documented.
6. The health education, counseling & medication should be provided.

Category of Telemedicine: The telemedicine applications are divided into four groups, include:

1. Tele-consultation can be done through telephone, videoconferencing and various other means.
2. Tele-education is the mode where all scientific programmes can be learnt.
3. Medical emergency and assistance to victims can be provided to the victims in critical and disaster situations.
4. Tele-surgery reduce costs, reduce waiting time, reduce travelling, improve consulting, etc and give social and economic benefit.

2 LITERATURE REVIEW

Eysenbach (2001) in his paper “what is e-health?” elaborates that e-health is a science of intersection medical informatics, public health and business which is a emerging field now. E-health represents delivering qualitative service, empowering clients, maintaining a professional relationship between doctors and patients, training to doctors and patients for improving their knowledge, improving scope of healthcare, standardizing ehealth in exchanging information and communication, practising ehealth ethically and equitably.

Akerkar and Bichile (2004) in the paper “Health Information on the Internet: Patient Empowerment or Patient Deceit?” explained that majority of world use internet as the biggest library of world and get the information they need. Even the information are added in the search engine by many people which is a popular activity amongst all the activity. They add on that health information is the third most popular activity on the search engine of internet. Many persons who search in the search engine get many informations in the internet but many of them are confused that information is showing them right path or wrong one. That's why the information from internet can be authenticated by a health expert by teleconsultation. The health expert suggest that there should be a prescription from reliable sites and quality check up should be for this information sites.

Dixon (2007) in the paper “A Roadmap for the Adoption of e-Health” elaborates EHR, telemedicine and clinical decision support tools help in the delivery of healthcare which is defined as ehealth care. The healthcare improvised in terms of quality, safety and cost by E-health modality. The sustainable resource of ehealth for patients, Ehealth work force and best practices of ehealth constructs the road map for growth of ehealth which are the initiators of growth. For widespread adoption Ehealth as healthcare tool, the Govt. academic and private industry has to work together.

Eysenbach (2001) in his paper "what is e-health?" lines that significance of e-health as some distance as a growing discipline in the crossing point of medical informatics, popular well-being and enterprise, alluding to well-being administrations and statistics conveyed or progressed via the net and related advancements. Further the author characterized that e-health does not simply mean electronic instead it speaks to the productivity, upgrading nature of care, evidence based e-well being administrations, strengthening of buyers and patients, support of connection between a consultant and affected person, training of medical doctors and consumers additionally, empowering records trade and correspondence in a normalized way, increasing the extent of medicinal offerings, morals at the same time as rehearsing e-well-being and to make social insurance progressively unbiased.

Akerkar and Bichile (2004) within the paper "Wellbeing Information on the Internet: Patient Empowerment or Patient Deceit?" clarified that internet is the greatest scientific library on earth in which numerous individuals discover the statistics what they searching out. They add on that wellness information is the 0.33 maximum well-known movement at the web search tool of net. Further in this they indicated that after an character quests anything on web associated health the internet index display numerous results on the display. So now the inquiry emerges this is such kind of framework taking the man or woman the suitable manner or in an inappropriate one. Since the individual who is looking for some statistics with reference to scientific issues do not have the foggiest concept approximately the facts gave by using the internet is confirmed or now not.

Further in such manner they suggest that there need to be a treatment of strong locations what's more this a first classappraisal tool ought to be there for customary pay attention of these locales for the protected and sound eventual fate of the us of a.

Dixon (2007) inside the paper "A Roadmap for the Adoption of e-Health" characterised e-well being because the conveyance of medicinal offerings with assist from exclusive information and correspondence innovations like digital health facts, telemedicine and scientific preference assist. E-Health is taken into consideration as an important technique for improving excellent, protection and fees related with the conveyance of human offerings. Further he expounds the courses for the development E-Health in which he carries supportable assets for those trying to obtain E-Health, strong E-Health workforce and ramifications of satisfactory practices in EHealth. In carrying out lines he advocates that those guides are handiest the initiators. On the off hazard that we need to broaden this as medicinal offerings device, at that point authorities, scholastic and private enterprise pioneers need to cooperate to accomplish the objective of throughout the board selection of E-Health.

Srivastava, Agarwal and Agarwal (2013) within the paper "Verifying Indian E-Health System Through 'Aadhaar' A Unique Identification" look into that usage of information and correspondence innovation supply new statures to the medicinal services benefits but to offer relaxed and stable wellness information is a sizable fear in the gift state of affairs within the entire global. In this placing it is the tremendous problem for India to very well don't forget it seeing that India is a chief state with

quantity of states and association areas. To tackle such problem they proposed a showed version dependent on Aadhaar a twelve digit one among a kind distinguishing evidence quantity for e-well-being administrations in the nation. As indicated by them each associate check in themself on the Indian entrance with the one of a kind recognizable evidence variety who're associated with e-wellness administrations; regardless of whether or not the customer is a widespread medical doctor, attendant, seasoned or a affected person. All in all they said that it's far a protected and solid model to give e-wellness administrations to the Indian open.

Jaroslawski and Saberwal (2014) in their paper "In e-Health in India nowadays, the concept of labor, the difficulties and the accounts: a meeting primarily based research" portrays that e-health has an capability to enhance the nature of social coverage and are available to the unreached. They have directed an investigation to find out the concerns related with e-well being in India in present setting. They talked with 30 folks that speak to 28 associations engaged with the idea and choice e-well being in India. They discovered that India is managing inside the cause of care, statistics collection and reconnaissance, remedy consistence and a ways off scientific schooling on the name of e-wellbeing administrations. The difficulties before the achievement of e-wellbeing are: cash is a prime issue the identical range of projects are gain purpose and that is the reason beyond the compass of normal man, insufficient basis to provide forms of assistance productively and substitution of paper file into e-document is likewise a take a look at. Later in the final touch line they endorse some arrangements like: restore ostensible cost for the administrations and getting ready gadget to improve the personnel for productive and powerful acts of e-well being.

Kumar and Ahmad (2015) in the paper "A Review on use of Telemedicine and e-Health benefits in Public Health" characterized Telemedicine because the act of medicine and social insurance administrations a long way off utilising digital correspondence and statistics innovation. Telemedicine utilizes remote devices, for instance, telephones and man or woman automatic assist to change data. In this paper they've tested Telemedicine insetting of India, considering that India using Telemedicine because mid 2000 to present medicinal offerings in far off territories. Further they clarified the Indian sports within the discipline of Telemedicine through authorities and non-authorities association. In the consummation lines they summarize through pronouncing that Telemedicine is the want of Indian lifestyle to make the e-wellness program fruitful as India is a major kingdom with huge populace. Srivastava and Agrawal (2016) in their paper "Portable Health for Elderly in India" delineates that the usage of records and correspondence innovation in the health element is one of the speedy growing sector for social insurance. Further they compose that Department of Information Technology, Indian Space Research Organization, Apollo Hospitals, Asia Heart Foundation and State Governments supporting the E-Health program. Their investigation middle around giving agreeable wellness administrations to the antique people. It is the need in India to pay attention at the power of senior people. In this placing versatile spot a extensive activity to

alternate records and voice from one spot every other with out stressed institutions thru microwaves.

They supply a few functions at the back of huge acknowledgment of portable administrations just like the maximum reduced cost correspondence medium, extremely simple to use by means of all age gatherings, it doesn't require any urgent basis and it tends to be utilize every time to present clinical attention at any separation. To finish up they stated that to stretch out higher wellbeing administrations to the vintage populace versatile medicinal offerings framework is the maximum best method to coordinate their desires.

Sharma, Shivaram and Sharma (2016) within the paper "A Methodical Review of E-Health Systems Developed for Indian Healthcare Sector" utilized nineteen investigations for instance to find out difficulties and holes related with E-Health in India. They applied the substance primarily based techniques to interrupt down the EHealth Systems. They observed of their investigation that the Remote Consultancy, Teaching and Learning, Hospital and Record Management are providing kinds of assistance to the residents yet Mother and Child Care has a incredible hollow it need greater regard for create it in as worthy model. All in all they said that E-Health rose as a significant tool with the factor of improving the general public health. Malik (2016) within the paper "Effect of Telemedicine on Rural Women's Health" characterized that Telehealth modifications the correspondence station among clinicians and patients to limit geographic boundaries and upgrade conveyance of management. She concentrated her investigation on girls via along with a declaration of Nehru that the fame of ladies characterizes the fame of a state. Further she depicts the issues ladies have in India in medicinal services like pool of statistics, low nature of care, much less group of workers and so on. In this examination she observed that the usage of Telewellness overcomes any barrier amongst rustic and concrete mainly in putting of the girls of most people. It expels all the barriers like correspondence hole, mindfulness and separation.

Singh, Arora and Others (2017) within the paper "Extent of E-Healthcare Services in Uttar Pradesh: A Case Study of Lucknow Urban Areas" presented E-Health as Electronic Health and fate of social coverage advantages in India. They compose the sports of Uttar Pradesh in E-Health are: Uttar Pradesh HMIS, Hospital Information System, ASHA Mobile Application, M-Sehat, National Digital Literacy Mission and Pyarbitiya –PC and ANDT Website. They pointed out the extent of E-Health in Lucknow wherein they clarified approximately the institutions and institutions offering the varieties of help in social insurance division electronically, some clinics are utilising E-Health care administrations. Further they named some big players within the discipline like CDAC, Wipro, and TCS in the area of E-Health. In the consummation lines they composed that the essential focal factor of government to present social coverage is to accumulate the E-Health conveyance arrangement of medicinal offerings.

Sima Ajami, Parisa Lamoochi¹ During a disaster, hospitals may be overwhelmed and have an insufficient number of paediatric specialists available to care for injured

children.[9] Natural, technological, and human-generated disasters have always been a fact of life as major causes of premature death, impaired quality of life, and altered health status. Of all the problems experienced during disaster events, one of the most serious centers on communication, specifically, the lack of appropriate means to efficiently collect, process, and transmit important information in the midst of a disaster. If accurate and timely information can be made available, needless morbidity and mortality might be prevented. Thus, establishing rapid and reliable telecommunications systems specifically directed toward the disaster medical field is one of the most important challenges. During a disaster communication may be congested or misused. In addition, the local administration may be too heavily damaged or illequipped to make contact with neighbouring areas to ask for help. Therefore, emergency communications systems (including contingency systems) should have the ability of being quickly prepared and installed in areas where terrestrial communications lines or systems are unreliable, damaged, or non existent. In a disaster, communications are essential prerequisites to establish contact with the outside world. This contact could be as simple as a voice lifeline, or it could be as advanced as an Internet link or broadcast-quality video/ audio transmission. Scenarios may include any location, whether it is a desolate desert, on board an ocean vessel, or a zone of national emergency where terrestrial communications have been cut. Ideally, systems should be compact, reliably powered, easy to use, easy to repair, lightweight, rugged, and highly mobile or transportable.[10] Telemedicine describes the use of medical information exchanged from one site to another via electronic

3 OBJECTIVE OF STUDY

Analysing the concept of ehealth in saving patients.

3.1 Telemedicine Should be Appropriate and Sufficient As Per Context

3.1.1 The Registered Medical Practitioners should exercise their professional judgment to decide whether a telemedicine consultation is appropriate in a given situation or an in-person consultation is needed in the interest of the patient. They should consider the mode/technologies available and their adequacy for a diagnosis before choosing to proceed with any health education or counseling or medication. They should be reasonably comfortable that telemedicine is in the patient's interest after taking a holistic view of the given situation.

3.1.2 Complexity of Patient's health condition Every patient/case/medical condition may be different, for example, a new patient may present with a simple complaint such as headache while a known patient of Diabetes may consult for a followup with emergencies such as Diabetic Ketoacidosis. The RMP shall uphold the same standard of care as in an in-person consultation but within the intrinsic limits of telemedicine.

3.2 Identification of the Registered Medical Practitioner and the Patient is Required

3.2.1 Telemedicine consultation is should not be anonymous: both patient and the RMP need to know each other's identity.

3.2.2 An RMP should verify and confirm patient's identity by name, age, address, email ID, phone number, registered ID or any other identification as may be deemed to be appropriate. The RMP should ensure that there is a mechanism for a patient to verify the credentials and contact details of the RMP.

3.2.3 For issuing a prescription, the RMP needs to explicitly ask the age of the patient, and if there is any doubt, seek age proof. Where the patient is a minor, after confirming the age, tele consultation would be allowed only if the minor is consulting along-with an adult whose identity needs to be ascertained.

3.2.4 An RMP should begin the consultation by informing the patient about his/her name and qualifications.

3.2.5 Every RMP shall display the registration number accorded to him/her by the State Medical Council/MCI, on prescriptions, website, electronic communication (WhatsApp/ email etc.) and receipts etc. given to his/her patients

3.3 Mode of Telemedicine

3.3.1 Multiple technologies can be used to deliver telemedicine consultations. All these technology systems have their respective strengths, weaknesses and contexts in which they may be appropriate or inadequate in order to deliver proper care.

3.3.2 Primarily there are 3 modes: Video, Audio or Text (chat, images, messaging, email, fax etc.). Their strengths, limitations and appropriateness as detailed in Section 2 need to be considered by the RMP.

3.3.3 There may be situations where in order to reach a diagnosis and to understand the context better; a real-time consultation may be preferable over an asynchronous exchange of information. Similarly, there would be conditions where an RMP could require hearing the patient speak, therefore, a voice interaction may be preferred than an email or text for a diagnosis. There are also situations where the RMP needs to visually examine the patient and make a diagnosis. In such a case, the RMP could recommend a video consultation. Considering the situation, using his/her best judgment, an RMP may decide the best technology to use to diagnose and treat.

3.4 Patient Consent

Patient consent is necessary for any telemedicine consultation. The consent can be Implied or explicit depending on the following situations:

3.4.1 If, the patient initiates the telemedicine consultation, then the consent is implied².

3.4.2 An Explicit patient consent is needed if: A Health worker, RMP or a Caregiver initiates a Telemedicine consultation. 2 Implied Consent: In an in-person consultation, it is assumed the patient has consented to the consult by his/her actions. When the patient walks in an OPD, the consent for the consultation is taken as implied.

Like an in-person consultation, for most of the tele-consultations the consent can be assumed to be implied because the patient has initiated the consultation.

3.4.3 An Explicit consent can be recorded in any form. Patient can send an email, text or audio/video message. Patient can state his/her intent on phone/video to the RMP (e.g. “Yes, I consent to avail consultation via telemedicine” or any such communication in simple words). The RMP must record this in his patient records.

3.5 Exchange of Information for Patient Evaluation

RMPs must make all efforts to gather sufficient medical information about the patient’s condition before making any professional judgment.

3.5.1 Patient’s Information –

An RMP would use his/her professional discretion to gather the type and extent of patient information (history/examination findings/Investigation reports/past records etc.) required to be able to exercise proper clinical judgement. - This information can be supplemented through conversation with a healthcare worker/provider and by any information supported by technology-based tools. - If the RMP feels that the information received is inadequate, then he/she can request for additional information from the patient. This information may be shared in real time or shared later via email/text, as per the nature of such information. For example, an RMP may advise some laboratory or/and radiological tests to the patient. In such instances, the consult may be considered paused and can be resumed at the rescheduled time. An RMP may provide health education as appropriate at any time. - Telemedicine has its own set of limitations for adequate examination. If a physical examination is critical information for consultation, RMP should not proceed until a physical examination can be arranged through an in-person consult. Wherever necessary, depending on professional judgement of the RMP, he/she shall recommend: - Video consultation - Examination by another RMP/ Health Worker ; - In-person consultation - The information required may vary from one RMP to another based on his/her professional experience and discretion and for different medical conditions based on the defined clinical standards and standard treatment guidelines. - RMP shall maintain all patient records including case history, investigation reports, images, etc. as appropriate.

3.6 Types of Consultation: First Consult/Follow-Up Consult

There are two types of patient consultations, namely, first consult and the follow-up consult. An RMP may have only a limited understanding of the patient seeking teleconsultation for the first time, when there have been no prior in-person consultation. However, if the first consult happens to be via video, RMP can make a much better judgment and hence can provide much better advice including additional medicines, if indicated. On the other hand, if a patient has been seen in-person earlier by the RMP, then it is possible to be more comprehensive in managing the patient.

3.6.1 First Consult means - The patient is consulting with the RMP for the first time; or The patient has consulted with the RMP earlier, but more than 6 months have lapsed• since the previous consultation; or The patient has consulted with the RMP earlier, but for a different health condition•

3.6.2 Follow-Up Consult(s) means The patient is consulting with the same RMP within 6 months of his/her previous inperson consultation and this is for continuation of care of the same health condition.• However, it will not be considered a follow up if: There are new symptoms that are not in the spectrum of the same health condition;• and/or RMP does not recall the context of previous treatment and advice•

3.7 Patient Management: Health Education, Counseling & Medication

3.7.1 If the condition can be appropriately managed via telemedicine, based on the type of consultation, then the RMP may proceed with a professional judgement to: o Provide Health Education as appropriate in the case; and/or o Provide Counseling related to specific clinical condition; and/or o Prescribe Medicines

3.7.2 Health Education: An RMP may impart health promotion and disease prevention messages. These could be related to diet, physical activity, cessation of smoking, contagious infections and so on. Likewise, he/ she may give advice on immunizations, exercises, hygiene practices, mosquito control etc

3.7.3 Counseling: This is specific advice given to patients and it may, for instance, include food restrictions, do's and don't's for a patient on anticancer drugs, proper use of a hearing aid, home physiotherapy, etc to mitigate the underlying condition. This may also include advice for new investigations that need to be carried out before the next consult.

3.7.4 Prescribing Medicines Prescribing medications, via telemedicine consultation is at the professional discretion of the RMP. It entails the same professional accountability as in the traditional in-person consult. If a medical condition requires a particular protocol to diagnose and prescribe as in a case of in-person consult then same prevailing principle will be applicable to a telemedicine consult. RMP may prescribe medicines via telemedicine ONLY when RMP is satisfied that he/ she has gathered adequate and relevant information about the patient's medical condition and prescribed medicines are in the best interest of the patient. Prescribing Medicines without an appropriate diagnosis/provisional diagnosis will amount to a professional misconduct

Specific Restrictions There are certain limitations on prescribing medicines on consult via telemedicine depending upon the type of consultation and mode of consultation. The categories of medicines that can be prescribed via teleconsultation will be as notified in consultation with the Central Government from time to time. The categories of medicines that can be prescribed are listed below:

List 0: It will comprise those medicines which are safe to be prescribed through any mode of • tele-consultation. In essence they would comprise of o Medicines which are used for common conditions and are often available 'over the counter'. For instance,

these medicines would include, paracetamol, ORS solutions, cough lozenges etc. Medicines that may be deemed necessary during public health emergencies.

List A: These medications are those which can be prescribed during the first consult which is a video consultation and are being re-prescribed for re-fill, in case of follow-up. o This would be an inclusion list, containing relatively safe medicines with low potential for abuse Is a list of medication which RMP can prescribe in a patient who is undergoing follow-up consult, as a refill.

List B: Is a list of medication which RMP can prescribe in a patient who is undergoing follow-up consultation in addition to those which have been prescribed during in-person consult for the same medical condition.

Prohibited List: An RMP providing consultation via telemedicine cannot prescribe medicines in this list. These medicine have a high potential of abuse and could harm the patient or the society at large if used improperly.

Medicines listed in Schedule X of Drug and Cosmetic Act and Rules or any Narcotic and Psychotropic substance listed in the Narcotic Drugs and Psychotropic Substances, Act, 1985 The drugs in the above mentioned list is summarized in Annexure 1

3.6.4.2 Issue a Prescription and Transmit o If the RMP has prescribed medicines, RMP shall issue a prescription as per the Indian Medical Council (Professional Conduct, Etiquette and Ethics) Regulations and shall not contravene the provisions of the Drugs and Cosmetics Act and Rules. A sample format is suggested in Annexure 2

RMP shall provide photo, scan, digital copy of a signed prescription or e-Prescription to the patient via email or any messaging platform . In case the RMP is transmitting the prescription directly to a pharmacy, he/ she must ensure explicit consent of the patient that entitles him/her to get the medicines dispensed from any pharmacy of his/ her choice.

Table: Matrix of the permissible drug lists based on the type and mode of consultation
List Group Mode of Consultation [Video/Audio/Text]

Nature of Consultation [First-consultation/ Follow-up]

List of Medicines O Any List

O1 A Video First Consultation Follow-up, for continuation of medications

List A2 Any Follow-up List

B3 Prohibited Not to be prescribed Not to be prescribed Schedule X of Drug and Cosmetic Act and Rules or any Narcotic and Psychotropic substance listed in the Narcotic Drugs and Psychotropic Substances, Act, 1985 1. This list included commonly used 'over-the-counter' medications such as Paracetamol, Oral Rehydration Solution (ORS) packets, Antacids etc. This list also includes medicines that may be deemed necessary during emergencies and would be notified from time to time.

2. This list includes usually prescribed medications for which diagnosis is possible only by video consultation such as antifungal medications for Tinea Cruris, Ciprofloxacin eye drops for Conjunctivitis etc. and Re-fill medications for chronic

diseases such as Diabetes, Hypertension, Asthma etc 3. This list includes 'add-on' medications which are used to optimize an existing condition. For instance, if the patient is already on Atenolol for hypertension and the blood pressure is not controlled, an ACE inhibitor such as Enalapril

4. For instance, Anti-Cancer drugs; Narcotics such as Morphine, Codeine etc 23

3.7 Duties and Responsibilities of a Rmp In General . .

3.7.1 Medical Ethics, Data Privacy & Confidentiality³

3.7.1.1 Principles of medical ethics, including professional norms for protecting patient privacy and confidentiality as per IMC Act shall be binding and must be upheld and practiced.

3.7.1.2 Registered Medical Practitioner would be required to fully abide by Indian Medical Council (Professional conduct, Etiquette and Ethics) Regulations, 2002 and with the relevant provisions of the IT Act, Data protection and privacy laws or any applicable rules notified from time to time for protecting patient privacy and confidentiality and regarding the handling and transfer of such personal information regarding the patient. This shall be binding and must be upheld and practiced.

3.7.1.3 Registered Medical Practitioners will not be held responsible for breach of confidentiality if there is a reasonable evidence to believe that patient's privacy and confidentiality has been compromised by a technology breach or by a person other than RMP. The RMPs should ensure that reasonable degree of care undertaken during hiring such services.

3.7.1.4 Misconduct It is specifically noted that in addition to all general requirements under the MCI Act for professional conduct, ethics etc, while using telemedicine all actions that wilfully compromise patient care or privacy and confidentiality, or violate any prevailing law are explicitly not permissible. Some examples of actions that are not permissible: RMPs insisting on Telemedicine, when the patient is willing to travel to a facility and/or requests an in-person consultation RMPs misusing patient images and data, especially private and sensitive in nature (e.g.RMP uploads an explicit picture of patient on social media etc) RMPs who use telemedicine to prescribe medicines from the specific restricted list. RMPs are not permitted to solicit patients for telemedicine through any advertisements or inducements 3.7.1.5 Penalties: As per IMC Act, ethics and other prevailing laws.

3 It is the responsibility of the RMP to be cognizant of the current Data Protection and Privacy laws. RMP shall not breach the patient's confidentiality akin to an in-person consultation. For example: If the RMP is planning to create virtual support group for disseminating health education for patients suffering from a particular disease condition then he/she shall be wary of the patient's willingness and not violate patient's privacy and confidentiality by adding them to the group without their consent.

3.7.2 Maintain Digital Trail/ Documentation of Consultation It is incumbent on RMP to maintain the following records/ documents for the period as prescribed from time to time:

3.7.2.1 Log or record of Telemedicine interaction (e.g. Phone logs, email records, chat/text record, video interaction logs etc.).

3.7.2.2 Patient records, reports, documents, images, diagnostics, data etc. (Digital or non-Digital) utilized in the telemedicine consultation should be retained by the RMP.

3.7.2.3 Specifically, in case a prescription is shared with the patient, the RMP is required to maintain the prescription records as required for in-person consultations.

3.7.3 Fee for Telemedicine Consultation

3.7.3.1 Telemedicine consultations should be treated the same way as in-person consultations from a fee perspective: RMP may charge an appropriate fee for the Telemedicine consultation provided.

3.7.3.2 An RMP should also give a receipt/invoice for the fee charged for providing telemedicinebased consultation.

4. Framework for Telemedicine This section lays out the framework for practicing telemedicine in 5 scenarios:

1. Patient to Registered Medical Practitioner
2. Caregiver to Registered Medical Practitioner
3. Health Worker to Registered Medical Practitioner
4. Registered Medical Practitioner to Registered Medical Practitioner
5. Emergency Situations Essential Principles: -

The professional judgement of a Registered Medical Practitioner should be the guiding principle: an RMP is well positioned to decide whether a technology-based consultation is sufficient, or an in-person review is needed. Practitioner shall exercise proper discretion and not compromise on the quality of care - Same principles apply irrespective of the mode (video, audio, text) used for a telemedicine consultation. However, the patient management and treatment can be different depending on the mode of communication used. - RMP should exercise his/her professional discretion for the mode of communication depending on the type of medical condition. If a case requires a video consultation for examination, RMP should explicitly ask for it - The RMP can choose not to proceed with the consultation at any time. At any step, the RMP may refer or request for an in-person consultation - At any stage, the patient has the right to choose to discontinue the teleconsultation

4.1 Consultation Between Patient and Registered Medical Practitioner

Specifically, this section details with the key elements of the process of teleconsultation to be used in the First consults and Follow up consults when a patient consults with an RMP. In these 2 situations, the patient initiates telemedicine consultation and thereby consent is implied

4.1.1 First Consult: Patient to Registered Medical Practitioner

4.1.1.1 First Consult means

1. The patient is consulting with the RMP for the first time; or 2. The patient has consulted with the RMP earlier, but more than 6 months have lapsed since the

previous consultation; or 3. The patient has consulted with the RMP earlier, but for a different health condition

4.1.1.2 Tele-Consultation Process

The flow of the process is summarized in the Figure 1 and the steps are detailed below.

1. Start of a Telemedicine Consultation for First Consult
 - o The telemedicine consultation is initiated by the patient (For example, a patient may do an audio or video call with a RMP or send an email or text with a health query).

RMP accepts to undertake the consultation

1. Patient identification and consent
 - o RMP should confirm patient identity to his/her satisfaction by asking patient's name, age, address, email ID, phone number or any other identification that may be reasonable .
2. Telemedicine consultation should be initiated by the patient and thereby consent is implied
3. **Quick assessment:** The patient's condition needs to be quickly assessed by the RMP based on available inputs and RMP uses his professional discretion if emergency care is needed, to decide if emergency care is needed. If the condition of the patient merits emergency intervention, then advice for first aid/ immediate relief is provided and guidance is provided for referral, as appropriate. If the condition does not merit an emergency intervention, the following steps are undertaken:
4. Exchange of Information for Patient Evaluation
 - o The RMP may ask the patient to provide relevant information (complaints, information about any other consults for the same problem, available investigation and medication details, if any). The patient shall be responsible for accuracy of information shared by him/her with the RMP.
 - o If the RMP feels that the information provided at this stage is inadequate, then he/she shall request for additional information from the patient. This information may be shared in real time or shared later via email/text, as per the nature of such information. The consultation may be resumed at a rescheduled time after receipt of the additional information (this may include some laboratory or radiological tests). In the meantime, the RMP may provide health advice as appropriate.
 - o If the RMP is satisfied that he/she has adequate patient information for offering a professional opinion, then he/she shall exercise one's professional judgment for its suitability for management via telemedicine. If the situation is NOT appropriate for further telemedicine consultation, then the RMP should provide Health advice/ Education as appropriate; and/or refer for in-person consultation.
5. Patient Management
 - o If the condition can be appropriately managed via telemedicine, then the RMP may take a professional judgement to either:
 - o Provide Health Education as appropriate in the case; and/or
 - o Provide Counseling related to specific clinical condition, including advice related to new investigations that need to be carried out before next consult; and/or
 - o Provide specific treatment by prescribing medicines as in List O (which are over the counter drugs or others as notified). Additional medicines (as per List A) can also be prescribed if the ongoing tele-consultation is on video.

4.1.2 Follow-up Consult: Patient to Registered Medical Practitioner In a follow-up consultation, since the RMP-patient interaction has already taken place for the specific medical condition under follow-up, there is already an understanding of the context, with availability of previous records. This allows a more definitive and secure interaction between the RMP and the patient.

4.1.2.1 Follow-Up Consult means The patient is consulting with the RMP within 6 months of his/her previous in-person, and this consultation is for continuation of care of the same health condition. Follow-up can be in situations of a chronic disease or a treatment (e.g. renewal or change in medications) when a face-to-face consultation is not necessary. Examples of such chronic diseases are: asthma, diabetes, hypertension and epilepsy etc

4.1.2.2 Tele-Consultation Process The flow of the process is summarized in Figure 2 and the steps are detailed below: 1. Start of a Telemedicine Consultation for Follow Up
o Patient may initiate a follow up consult with a RMP for continuation of his/her ongoing treatment or for a new complaint or complication arising during the course of the ongoing treatment using any mode of communication. For e.g., the patient may do an audio or video call with a RMP or send him/her an email or text message with a specific health query
o RMP accepts to undertake the consultation
2. Patient identification and consent .

RMP should be reasonably convinced that he/she is communicating with the known patient, for e.g. if the patient is communicating with RMP through the registered phone number or registered email id
o If there is any doubt RMP can request the patient to reinitiate the conversation from a registered phone number or email id or should confirm patient identity to his/her satisfaction by asking patient's name, age, address, email ID or phone number. [Details in the section 3.2]

Patient initiates the Telemedicine consultation and thereby consent is implied

Quick Assessment for Emergency Condition

If the patient presents with a complaint which the RMP identifies as an emergency condition necessitating urgent care, the RMP would then advice for first aid to provide immediate relief and guide for referral of the patient, as deemed necessary.

In case of routine follow-up consultation, the following would be undertaken: If the RMP has access to previous records of the patient, he/ she may proceed with continuation of care. RMP shall apply his/her professional discretion for type of consultation based on the adequacy of patient information (history/examination findings/Investigation reports/past records). If the RMP needs additional information, he/ she should seek the information before proceeding and resume tele-consultation for later point in time.

Patient Management -If RMP is satisfied that he/she has access to adequate patient information and if the condition can be appropriately managed by tele-consultation, he/she would go ahead with the tele-management of the patient. If the follow-up is for continuation of care, then the RMP may take a professional judgement to either:
o Provide health education as appropriate in the case; or
o Provide counseling related to specific clinical condition including advice related to new investigations that need to

be carried out before next consult; And/or Prescribe Medications. The medications could be either of the below: If the follow up is for continuation of care for the same medical condition, the RMP would re-prescribe original set of medications for a refill (List A of medications, which has been previously prescribed for the patient). 29 If the RMP considers addition of a new drug, as an 'add-on' medication to optimize the underlying medical condition, then the RMP can prescribe medications listed under List B. If the follow-up consult is for a new minor ailment necessitating only 'over the counter' medications or those notified for this purpose, medications under List O can be prescribed. If the follow-up consult reveals new symptom pertaining to a different spectrum of disease, then the RMP would proceed with the condition as enunciated in the scenario for a first-time consultation (4.1.1)

5 DISCUSSING DIFFERENT MODALITIES OF EHEALTH AVAILABLE IN WORLD

1. Concept of ehealth

1.a **Satellite Communication:** Satellite correspondence utilizes counterfeit satellites for giving correspondence connects between distinct makes a speciality of Earth. With the help of transponder (a coordinated collector and transmitter of radio signals) a satellite tv for pc receives and retransmits the symptoms lower back. Satellites are assuming an expanding task in the help of wellbeing and authorities help on Earth. Clinical help through satellite is being taken into consideration as a financially savvy and an open association in particular in the growing international locations where populaces come up short on even critical stages of medicinal offerings due to remoteness, neediness, and lack of accessibility of well-being experts. Figure 1 clarifies the operating of telemedicine focuses supplying medical types of assistance thru satellite tv for pc. Following are the connections and the name of a few telemedicine focuses in India giving clinical workplaces through satellite:

(i) Apollo Hospital

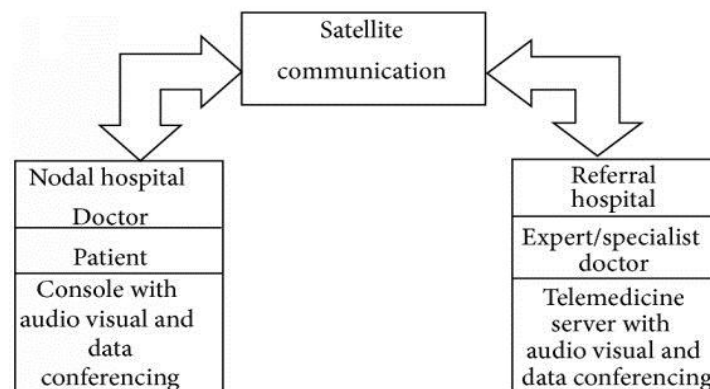
<http://www.apollotelehealth.com:9013/ATNF/aboutATNF.jsp>

(ii) Sri Ramchandra Medical Center

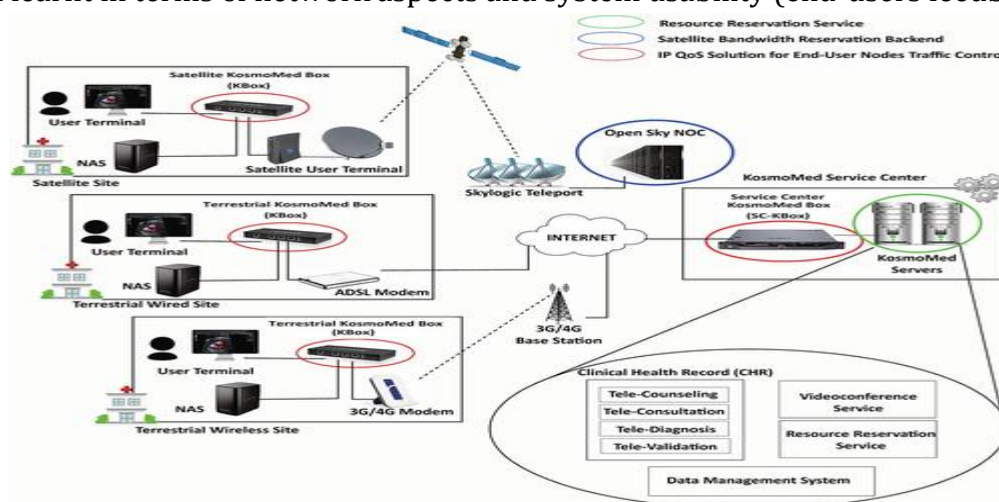
<http://www.sriramachandra.edu.in/medical/telemedicine.htm>

(iii) AIIMS Hospital

<http://www.aiims.edu/aiims/telemedicine/telepage.html>



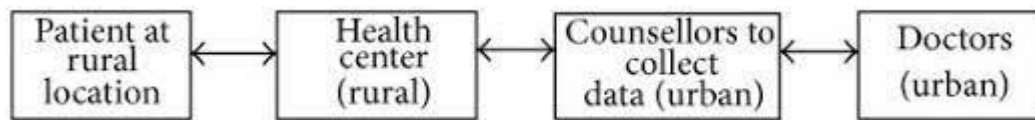
Satellite ehealth-Most of the above mentioned projects have the common objective of providing a reliable system or technology able to guarantee the quality level required for a specific telemedicine practice, mainly exploiting the features of satellite technology in terms of coverage; however, a proper functioning of the proposed systems relies on the presence of adequate network bandwidth resources, which may lack. Starting from this observation and from the analysis of the end-users needs in terms of quality of experience requirements for e-health services, a more complete and robust system based on a dynamic network resources management has been conceived, to cope with the unpredictable network resources availability, also due to a non-controlled usage of them. A high degree of integration among satellite resource management, applications and traffic engineering has led to a scalable, affordable and powerful medical platform for the provisioning of e-health services. The proposed system has been developed in the framework of Kosmo Med project [9], funded by the European Space Agency. The aim of the project was the design, development, deployment and validation of an ICT Professional Medical Platform, which delivers innovative medical applications operated on an integrated satellite terrestrial network. The deployed system enables clinical data sharing and real-time audio/video interactions among specialists, healthcare operators and patients, assuring an adequate QoE to final users [10]. Satellite communications provide unique features to medical applications, but the provision of adequate transmission quality with the limited available satellite bandwidth represents a challenge. Kosmo Med has implemented a smart solution integrating bandwidth reservation and IP QoS provisioning methods. The objective of this paper is to describe this technical solution and highlight the obtained results in terms of quality of experience. Since such a system has been fully implemented for the delivery of professional medical services and an experimental campaign has been carried out, both the system architecture and the obtained results are presented, highlighting the lesson learnt in terms of network aspects and system usability (end-users feedback)



Satellite integrated heterogeneous architecture for professional health services ISSN 1751-8628 Received on 16th March 2017 Revised 11th May 2017 Accepted on 1st June 2017 - First on 7th December 2017 doi: 10.1049/iet-

com.2017.0283www.ietdl.orgLuca Simone Ronga¹, Sara Jayousi¹, Cesare Aragno², Marco Bagni², Luca Carniato³, FedericaFongher³1National Inter-University Consortium for Telecommunications (CNIT), Florence, Italy2Kell Software Solutions, Via E.Q. Visconti, 8, Rome, Italy

Internet Communication. Interconnected networks of computers which make use of Internet protocol suite (TCP/IP) to link the devices located worldwide. The network can be private, public, academic, business and government and can be linked by a broad array of electronic, wireless, and optical networking technologies. The Internet users not only can seek health information, but also can get connected to the specialist doctor for the proper consultation. For example, in India an NGO named World Health Partners is providing health services in the rural areas through Internet [<http://worldhealthpartners.org/>]. Figure 2 shows the working of WHP.



Internet of Things for healthcare application.-. In this paper, while proposing an architecture similar to those mentioned above, we propose the Internet of Things paradigm as the unifying glue among the plethora of different hardware and software technologies populating the health personal network universe and the Internet. Fig. 1 shows a graphical representation of our reference model, which will be further detailed in the following sections. The main actors in this model are monitored patients, physicians and distributed information databases. Health relevant information and events are sent via Wireless Body Area Network (WBAN) to the individual HCR in the distributed database through Wireless / Local Area Networks (W/LAN) and the Internet; HCRs can be accessed from anywhere and at anytime by physicians, patients and other users that are allowed to consult them.



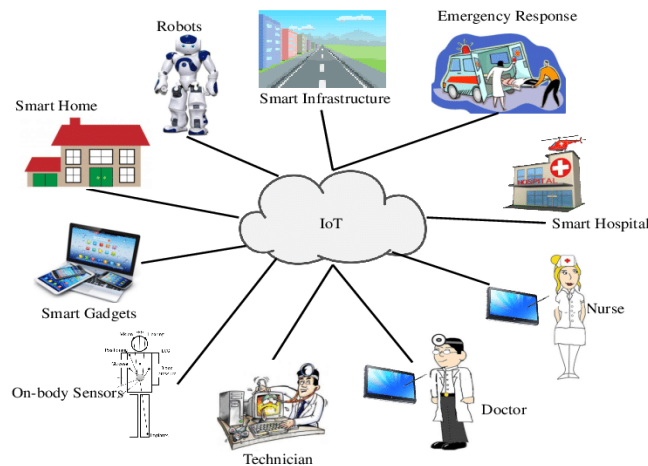
Internet of Things in ehealth system model

- Health care applications: A solution based on the Internet of Things Nicola Bui, Michele Zorzi IoT for media communication-

Healthcare represents one of the most attractive application areas for the IoT, as depicted in Fig. 1 [2]. To provide timely real-time patient information to health

support staff, which may reside in separate offices, hospitals or across several hospitals in the same city or at different cities, a smart hospital may employ cloud computing and big data analytics in conjunction with ICTs and smartphone apps. Similarly, telemedicine uses ICTs to deliver healthcare screening and even a diagnosis in remote and underserved areas, usually rural, as well as in developing countries whereby specialized expertise is not readily available. The IoT infrastructure relies on fast communication among the many different types of sensors, devices, and applications; on network security; and on the integrity of the software, middleware, and firmware algorithms that make the interconnected systems smart [3]. A useful implementation of the IoT in general, and of smart healthcare in particular, poses several challenges, including energy efficiency of the components connected to the system; security of communications; unique identification of users that guarantees the privacy of the users information; computational performance, reliability, and flexibility of the system; efficient analysis of large datasets in real time; and processing and storing enormous amounts of data for follow-up studies and for knowledge discovery in meta-analysis stages [4]. These very important requirements of such systems impose significant challenges on the hardware design of electronic circuits and systems in terms of reliability and security. A secure framework should allow the unique identification of the originating site of data, guarantee the integrity of the data, safeguard against corruption, and should also set access privileges automatically to the rightful owners of the data for further offline analysis and patient follow ups.

One of the important requirements of SHC is to develop the capability for automated analyses of biomedical images and secure communication, with user authentication, of the results of those analyses and related metadata over an IoT infrastructure. This article addresses some of these challenges related to the fulfillment of this requirement. In this context, this research focuses on exploration of algorithms and architectures for Better Portable Graphics (BPG) [5], for energy efficient, low-bitrate, and secure biomedical information exchange within the framework of SHC, and the realization of a Secure BPG (SBPG). More specifically, in this research watermarking methods are explored for use in architectures for trusted biomedical information exchange that is an integral part of an IoT. Additionally, we extend our initial work on BPG [6] and develop advanced energy-efficient real-time architectures using BPG. Medical images can be adapted to validate the security-integrated BPG methods, so that medical data can be securely stored and their integrity can be verified as they are transmitted over insecure Internet connections. Similar approaches can be considered with future expansion to nonimage biomedical data.



SBPG: Secure Better Portable Graphics for Trustworthy Media Communications in the IoT, Saraju P. Mohanty, Elias Kougianos

IoMT can enable Remote Patient Monitoring

With internet broadband penetrating even the most remote areas of developed countries, and the availability of cheap internet-connected devices & internet plans, the remote monitoring of the patients can be a reality soon.

The data collected from the IoT devices having sensors that can detect/measure changes in temperature, pressure, etc. are stored on the cloud. This data can then be used to develop Electronic Health Record (EHR) systems that have a detailed history of vital signs of the patient, treatments/prescriptions, diseases diagnosed, etc. These EHR systems can help in predicting and hence, preventing the future medical conditions which may harm the patient.

Remote patient monitoring is beneficial for the human cause, but it is equally advantageous to the healthcare service providers. With remote patient monitoring, they can provide services to so many more patients and are not restricted by the physical capacity of an institute like a hospital.

The largest healthcare technology company based in Germany uses an iPad app for remote monitoring of Ultrasound machines.



18. <https://insights.daffodilsw.com/blog/3-key-areas-where-iomt-internet-of-medical-things-can-augment-healthcare-services>

2. Smart Hospitals

Hospitals today are like small cities, spreading across hundreds of acres of land. Locating a person or a machine in such a big area can be challenging sometimes. And what if there is a scenario in which availability of a person or a machine is urgent for saving the life of a patient? This is where IoMT comes into the picture. It can help in locating various things and people across a medical campus. By utilizing this data, a lot of administrative tasks and inventory management can be done more efficiently, cutting down the cost for healthcare service providers.

We have suggested areas where medical practice owners can maximize their existing investments to expand their patient base.

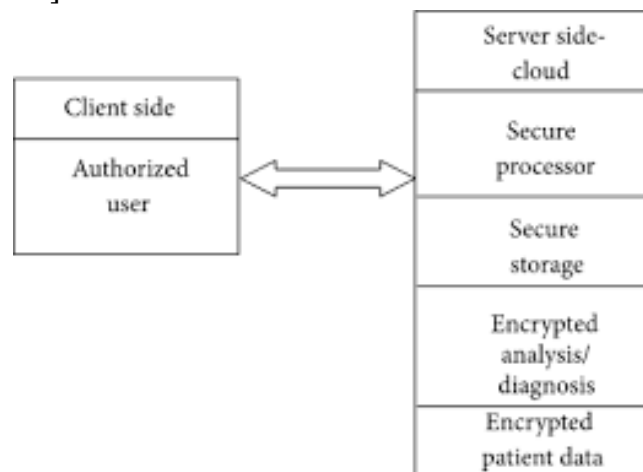
3. Collection of Clinical Data

Apart from Electronic Health Records, there is a lot of clinical data that is stored in silos. It includes administrative data, health insurance claims, disease registries, health surveys, clinical trial data, etc. IoT devices make collection and integration of this data seamless and autonomous, saving a lot of time and cost for the healthcare service providers.

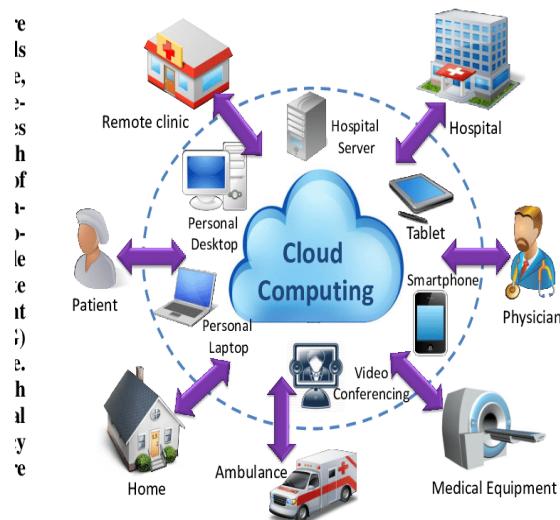
Apart from the benefits mentioned above, with the different types of sensory devices such as ingestible pills, heartbeat monitors, IoMT can even help in monitoring data from Intensive Care Units (ICU), ECG, detecting abnormalities in Kidneys, treatment of diseases like cancer, and more.

A UK-based leading healthcare centre streamlined and automated medical practices for clinical staff, general practitioners (GPs), and consultants with a multi-clinic Practice Management System (PMS) for their network of clinics.

Cloud Communication. Cloud computing relies on sharing computing resources to handle the applications. It is a type of Internet-based computing, where different services like servers, storage, and applications are shared which results in the effective and optimized use of software and hardware resources (Figure 4). For example, in India eHealth centers (eHC) are providing cloud enabled healthcare centers [<http://www8.hp.com/hpnext/posts/cloud-enabled-e-health-centers-bringing-quality-healthcare-rural-areas>].



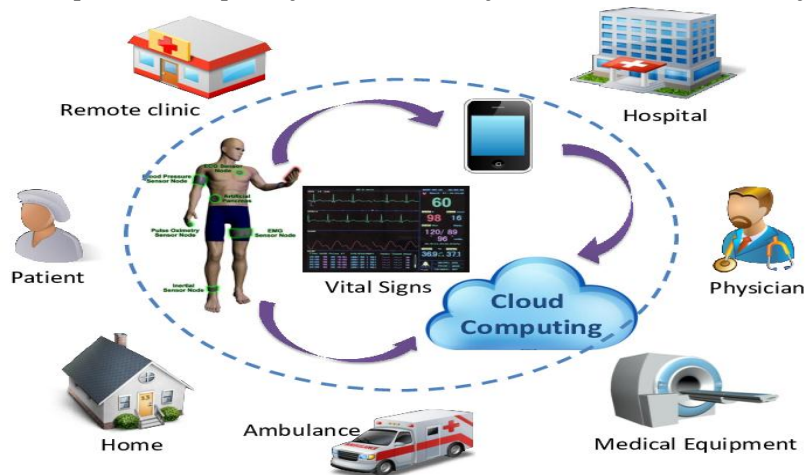
Mobile Cloud Approach- The severe challenges of the skyrocketing healthcare expenditure and the fast aging population highlight the needs for innovative solutions supporting more accurate, affordable, flexible, and personalized medical diagnosis and treatment. Recent advances of mobile technologies have made mobile devices a promising tool to manage patients' own health status through services like telemedicine. However, the inherent limitations of mobile devices make them less effective in computation- or dataintensive tasks such as medical monitoring. In this study, we propose a new hybrid mobile-cloud computational solution to enable more effective personalized medical monitoring. To demonstrate the efficacy and efficiency of the proposed approach, we present a case study of mobile-cloud based electrocardiograph (ECG) monitoring and analysis and develop a mobile-cloud prototype. The experimental results show that the proposed approach can significantly enhance the conventional mobile-based medical monitoring in terms of diagnostic accuracy, execution efficiency and energy efficiency, and holds the potential in addressing future large-scale data analysis in personalized healthcare.



Enabling Smart Personalized Healthcare: A Hybrid Mobile-Cloud Approach for ECG Telemonitoring, Xiaoliang Wang , Qiong Gui, Bingwei Liu, Zhanpeng Jin

Mobile Cloud Communication- Telemedicine based on Mobile Cloud Medical Monitoring- Fast growing mobile technologies have enabled and promoted the use of mobile-based health monitoring and alert systems (usually referred as “mHealth”), aiming at providing real-time feedback about an individuals health condition to either the user or to a medical center, while alerting in case of possibly imminent health-threatening conditions. Over the past decade, mobile phones have become ubiquitous in people’s daily lives. Recently, many mobile-based medical monitoring devices have been developed with the capability of processing certain types of physiological signals [1][2]. However, the limited computational power and battery life of existing mobile devices, significantly limit their ability to execute resource-intensive applications. Emerging cloud computing provides an alternative to renovate and promote future use of mobile devices in healthcare. As shown in Figure 1, mobile devices can be used

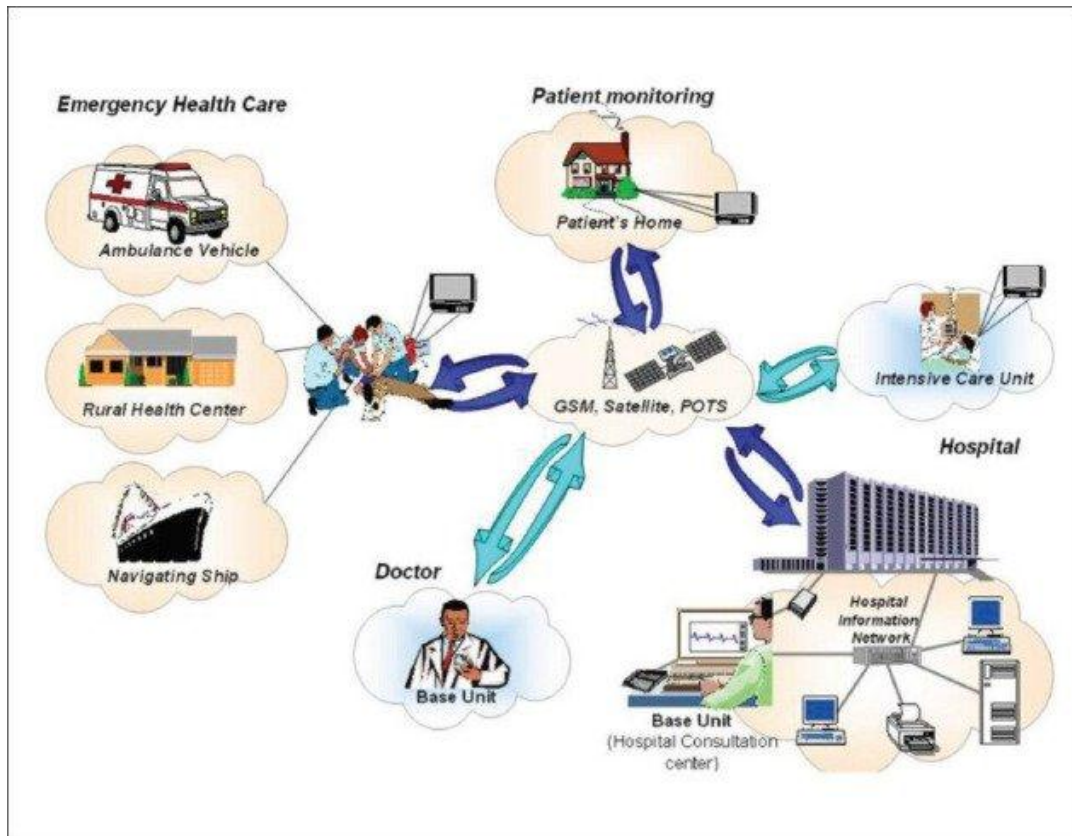
to acquire various physiological signals from a set of ambient/body sensors. To alleviate intensive computations and extend the battery life of mobile devices, the acquired physiological signals will be transferred to a cloud service environment to perform desired, computation-intensive algorithmic signal processing. The processed results, recognized abnormalities, or diagnostic alarms will be automatically archived in the cloud or sent to the mobile devices owned by patients, physicians, or emergency teams. This application mode can be of particular significance to patients whose physiological signals need to be monitored continuously. For instance, Hsieh and Hsu [3] presented a telemedicine cloud service enabling ubiquitous delivery of inter-hospital ECG records. Shen et al. [4] proposed a cloud-based EEG signal analysis system to detect brain disorder diseases, where the computation-intensive functions of feature extraction, feature selection and support vector machine (SVM) classifier are implemented and deployed using cloud services. In order to explore optimal application model that synergistically leverages the mobile cloud for telemedicine, in this paper, we report our preliminary study results that characterize the performance, energy, and complexity attributes of both mobile- and cloud-based solutions for medical monitoring. Our findings are encouraging and we hope it can inspire the further investigation and development of novel mobile cloud telemedicine architectures to improve the quality and efficiency of health care delivery.



Leveraging Mobile Cloud for Telemedicine: A Performance Study in Medical Monitoring Xiaoliang Wang¹, Qiong Gui¹, Bingwei Liu¹, Yu Chen¹, and Zhanpeng Jin^{1,2} ¹Department of Electrical and Computer Engineering, ²Department of Bioengineering Binghamton University, State University of New York, Binghamton, NY, United States E-mail: {xwang90, qgui1, bliu11, ychen, [zjin](mailto:zjin@binghamton.edu)}@binghamton.edu Telemedicine system architecture [13]

Figure 2 describes the overall system architecture. In each different application the telemedicine unit is located at the patient's site, whereas the base unit (or doctor's unit) is located at the place where the signals and images of the patient are sent and monitored. The telemedicine device is responsible to collect data (bio-signals and images) from the patient and automatically transmit them to the base unit. The base unit is comprised of a set of user-friendly software modules, which can receive data

from the Telemedicine device, transmit information back to it and store important data in a local database. The system has several different applications (with small changes each time), according to the current healthcare provision nature and needs. Before the system's technical implementation, an overview of the current trends and the needs of the aforementioned Telemedicine applications was made, so that the different requirements are taken into account during design and development, thus ensuring maximum applicability and usability of the final system in distinct environments and situations. As mentioned above, the system consists of two separate modules [Figure 2]: (a) the unit located at the patient's site called "telemedicine unit" and (b) the unit located at doctor's site called "Base unit". The Doctor might be using the system either in an emergency case or when monitoring a patient from a remote place. The design and implementation of the system were based on a detailed user requirements analysis, as well as the corresponding system functional specifications.[13]



Sima Ajami, Parisa Lamoochi1 Use of telemedicine in disaster and remote places
Telemedicine unit

According to Kyriacou et al. the Telemedicine unit mainly consists of four modules, the bio-signal acquisition module, which is responsible for bio-signals acquisition, a digital camera responsible for image capturing, a processing unit, which is basically a Personal Computer, and a communication module (Global System for Mobile: GSM, Satellite or Plain Old Telephone System: POTS modem) The bio-signal acquisition module was designed to operate with some of the most common portable bio-signal monitors used in emergency cases or in Intensive care Units. The bio-signals

collected by the patient (and then transmitted to the Base Unit) are: 1. Electrocardiogram up to 12 lead, depending on the monitor used in each case; 2. Oxygen Saturation (SpO₂); 3. Heart Rate (HR); 4. Noninvasive Blood Pressure (NIBP); 5. Invasive blood Pressure (IP); 6. Temperature (Temp); 7. Respiration (Resp). The Personal Computer (PC) used depends on the type of the Telemedicine application (role of the Telemedicine unit). As mentioned before, data interchange is done using the transmission control protocol/internet protocol network protocol, which allows operation over several communication means. The PC is equipped with the proper modem for each case, i.e., GSM, Satellite or POTS. The design was done in standard Hayes modems. The system supports ETSI- AT (European Telecommunications Standards Institute- AT) command set for GSM modem, for Satellite modems and for Standard POTS modems. Several modems types were used for testing: (a) a NOKIA card phone 2.0 GSM 900/1800 modem pcmcia card and an Option FirstFone GSM 900 modem pcmcia card were used for GSM communication; (b) a Micronet pcmcia POTS modem 56 K and a US-Robotics 33.6 K external modem were used for POTS communication; (c) a mini m terminal for ships "Thrane and Thrane TT-3064A Inmarsat Maritime Phone" was used for satellite communication. The Telemedicine unit is also responsible for the collection and transmission of images of the patient to the base unit. In order to implement a hardware independent system, this module was designed to operate using Microsoft video for WINDOWS. Several cameras were used while testing the system: (a) ZOOM digital camera connected to the PC's parallel port model 1585; (b) ZOOM digital camera connected to the PC's USB port model 1595; (c) Logitech quick cam express digital USB port camera; (d) Connectix quick cam VC (visual C++) parallel port; (e) Creative camera connected to USB port. The control of the Telemedicine unit is fully automatic. The only thing the telemedicine unit user has to do is connect the bio-signal monitor to the patient and turn on the PC. The PC then performs the connection to the base unit automatically. Although, the base unit basically controls the overall system operation, the Telemedicine unit user can also execute a number of commands. This option is useful when the system is used in a distance health center or in a ship and a conversation between the two sites takes place.[13]

Sima Ajami, Parisa Lamoochi¹

Base unit (or Doctor's unit)

Kyriacou et al. mentioned that the base unit mainly consists of a dedicated PC equipped with a modem, which is responsible for data interchange. In addition, the base unit PC is responsible for displaying incoming signals from the Telemedicine unit. When an expert doctor uses the base unit located outside the hospital area like in the intensive care room application — Figure 1, a portable PC equipped with a GSM modem or a desktop PC equipped with a POTS modem is used. When the base unit is located in the hospital, a desktop PC connected to the Hospital Information Network equipped with a POTS modem can additionally be used; the expert doctor uses it as a processing terminal.[13] The telemedicine can be used for decision making and collaborative arrangements for the real-time management of patients at a distance.

The use of telecommunications and information technologies in providing health services is determined.[14,15] The purpose of this study was to identify telemedicine applications in disaster, and propose the use of this technology in areas where the shortage of specialists in remote areas during disasters.

Sima Ajami, Parisa Lamoochi¹

6 CONCLUSION

One of the methods, especially those living in remote areas or have crashed and does not have access to specialists is telemedicine. Telemedicine describes the use of medical information exchanged from one site to another via electronic communications to improve patients' health status and care. Travel and wait times between the initial consultations with the patient's own general practitioner and referral to specialist can be reduced and specialists have successfully provided remote triage and treatment consults of victims via the robot. The robot proved to be a useful means to extend resources and provide expert consulting if specialists were unable to physically be at the site. In fact, the telemedicine system is providing health care services for individuals who are not available because of geographical and environmental conditions. The aim of this study was to identify telemedicine applications in disaster, and proposed use of this technology in areas where the shortage of specialists in remote areas in disasters. This study was un-systematic (narrative) review.

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21. Leveraging Mobile Cloud for Telemedicine: A Performance Study in Medical Monitoring Xiaoliang Wang¹, Qiong Gui¹, Bingwei Liu¹, Yu Chen¹, and Zhanpeng Jin^{1,2} ¹Department of Electrical and Computer Engineering, ²Department of Bioengineering Binghamton University, State University of New York, Binghamton, NY, United States E-mail: {xwang90, qgui1, bliu11, ychen, zjin}@binghamton.edu
22. Enabling Smart Personalized Healthcare: A Hybrid Mobile-Cloud Approach for ECG Telemonitoring, Xiaoliang Wang, Qiong Gui, Bingwei Liu, Zhanpeng Jin
23. The Technological Growth in eHealth Services: Shilpa Srivastava,¹ Millie Pant,² Ajith Abraham,³ and Namrata Agrawal
24. Satellite integrated heterogeneous architecture for professional health services ISSN 1751-8628 Received on 16th March 2017 Revised 11th May 2017 Accepted on 1st June 2017 E-First on 7th December 2017 doi: 10.1049/iet-com.2017.0283 www.ietdl.org Luca Simone Ronga¹, Sara Jayousi¹, Cesare Aragno², Marco Bagni², Luca Carniato³, Federica Fongher³ ¹National Inter-University Consortium for Telecommunications (CNIT), Florence, Italy ²Kell Software Solutions, Via E.Q. Visconti, 8, Rome, Italy

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REINFORCEMENT LEARNING IN ROBOTICS: A PATHWAY TO AUTONOMOUS SYSTEMS

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Abstract - This paper explores the role of reinforcement learning (RL) in robotics, highlighting its application in developing autonomous systems capable of learning complex tasks through trial and error. RL provides a framework that allows robotic systems to adapt to dynamic environments, learn optimal behaviors, and improve performance over time without explicit programming. This paper reviews foundational RL algorithms, explores various RL applications in robotics, and discusses challenges in real-world implementation, including sample efficiency, safety, and the transferability of policies. It also outlines recent advancements in deep reinforcement learning and model-based RL techniques, along with the future prospects of RL in achieving fully autonomous robotic systems.

1. INTRODUCTION

Autonomous robotic systems are essential in a wide range of applications, from manufacturing to healthcare and space exploration. Reinforcement Learning (RL), a type of machine learning where agents learn optimal actions by interacting with their environment, has emerged as a powerful method for training robots to perform complex tasks autonomously. This paper provides an overview of RL's potential to advance robotic autonomy, examining its key methods, applications, and challenges.

2. FOUNDATIONS OF REINFORCEMENT LEARNING

2.1 Basic Principles of RL

RL is based on agents learning through interactions with their environment, receiving rewards for desirable actions and penalties for undesirable ones. Key elements include the agent, environment, policy, reward function, and value function. The agent's goal is to maximize cumulative rewards, thereby finding an optimal policy.

2.2 Key RL Algorithms in Robotics

- **Q-Learning:** A value-based method where agents learn the value of action-state pairs, useful in discrete environments but limited in complex or continuous tasks.
- **Policy Gradient Methods:** Learn a policy directly, suitable for complex, high-dimensional tasks. Algorithms like REINFORCE and Actor-Critic are prominent examples.
- **Deep Q-Networks (DQNs):** Combine Q-learning with neural networks, allowing agents to process high-dimensional inputs such as images.

- **Proximal Policy Optimization (PPO) and Trust Region Policy Optimization (TRPO):** Algorithms designed to improve stability and efficiency in RL, particularly in continuous action spaces common in robotics.

3. APPLICATIONS OF REINFORCEMENT LEARNING IN ROBOTICS

3.1 Autonomous Navigation

RL enables robots to navigate dynamic and uncertain environments autonomously. RL-trained robots can map surroundings, avoid obstacles, and find optimal paths to targets, making it useful in applications like drone navigation, warehouse automation, and autonomous vehicles.

3.2 Manipulation and Grasping

RL is widely used to train robotic arms for object manipulation tasks, such as picking, placing, and sorting. Robotic arms learn by trial and error, adapting their grip and movements to handle objects of various shapes and sizes, essential in industrial and household robotics.

3.3 Human-Robot Interaction

RL can help robots learn safe and effective interaction strategies, enhancing human-robot collaboration in healthcare, customer service, and assistive technologies. Robots learn to recognize and respond to human cues, making interactions smoother and more intuitive.

3.4 Multi-Agent Systems

In scenarios with multiple robots, RL enables cooperation and coordination. Applications include swarm robotics, where multiple robots work together to achieve a common goal, such as search-and-rescue missions, exploration, or environmental monitoring.

3.5 Self-Learning and Adaptation

Reinforcement Learning allows robots to adapt to changing conditions and self-learn new behaviors. For instance, a robotic vacuum could learn to navigate a new room layout, while factory robots could adjust to new types of objects in assembly lines.

4. ADVANCEMENTS IN REINFORCEMENT LEARNING FOR ROBOTICS

4.1 Deep Reinforcement Learning (DRL)

Deep Reinforcement Learning combines RL with deep learning, enabling agents to handle high-dimensional sensory inputs, such as images. DQNs, PPO, and SAC (Soft Actor-Critic) are notable algorithms that use neural networks to approximate optimal policies, improving performance in complex tasks like object recognition and scene understanding.

4.2 Model-Based RL

Model-based RL introduces a predictive model of the environment, allowing the agent to simulate actions before executing them, which is beneficial in robotics where real-world trials are expensive or unsafe. Techniques like MuZero and Model Predictive Control (MPC) represent key model-based RL approaches, helping in improving sample efficiency and safety.

4.3 Transfer Learning and Sim2Real

Transfer learning and simulation-to-reality (Sim2Real) methods enable RL models trained in simulations to transfer learned policies to real-world environments. Domain adaptation techniques and domain randomization are used to bridge the gap between simulation and real-world variability, addressing the challenge of transferring learned behaviors from simulated environments to physical robots.

5. CHALLENGES IN IMPLEMENTING RL FOR AUTONOMOUS ROBOTICS

5.1 Sample Efficiency

RL algorithms typically require extensive trial-and-error learning, which is resource-intensive. Improving sample efficiency is crucial, especially in robotics, where each trial can be costly and time-consuming.

5.2 Safety and Risk Management

In real-world applications, ensuring safety during the learning process is vital. Robots can potentially cause harm to themselves or their surroundings if not managed carefully. Safe RL techniques, like reward shaping and constraint-based learning, are essential in mitigating risks.

5.3 Computational Complexity and Real-Time Processing

RL algorithms can be computationally intensive, posing challenges for robots that require real-time decision-making. Balancing computational demands with hardware limitations is an ongoing challenge in autonomous robotics.

5.4 Interpretability and Explainability

RL policies, particularly in deep learning, often function as black boxes, making it challenging to interpret decisions. For trustworthy and ethical AI in robotics, explainable RL methods are crucial to understanding why and how decisions are made.

6. FUTURE PROSPECTS OF RL IN AUTONOMOUS ROBOTICS

6.1 Hybrid Approaches in RL

Combining RL with other techniques, such as supervised learning or symbolic reasoning, may improve performance in complex tasks. Hybrid methods can potentially yield more robust and adaptable autonomous systems by leveraging the strengths of multiple learning approaches.

6.2 RL and Ethical Considerations in Autonomous Systems

As RL-driven robots become more prevalent, ethical considerations around safety, accountability, and human-centric design will become increasingly important. Developing ethical RL frameworks will be essential to ensure responsible use in domains like healthcare, law enforcement, and consumer robotics.

6.3 Integration with IoT and Edge Computing

The integration of RL with Internet of Things (IoT) and edge computing can support real-time processing, allowing robots to make quick decisions using data from connected devices. This synergy could expand RL applications in smart environments, such as smart homes and cities.

6.4 Towards Generalizable Autonomous Agents

Future research aims to develop RL agents capable of generalizing across multiple tasks and environments, moving towards general-purpose autonomous systems. Achieving this level of autonomy will involve advances in unsupervised learning, multi-task RL, and meta-learning.

7. CONCLUSION

Reinforcement Learning is paving the way for the development of autonomous robotic systems capable of performing complex tasks with minimal human intervention. Through continuous learning and adaptation, RL equips robots with the flexibility needed to operate in dynamic environments, making it an ideal tool for achieving robotic autonomy. However, challenges related to sample efficiency, safety, and real-world implementation persist. Addressing these issues, along with ethical considerations, will be crucial for future advancements in the field. With ongoing research and innovation, RL holds the promise of enabling fully autonomous systems that can benefit various industries and improve human lives.

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