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**Proceedings of  
National Conference  
On  
Green Technology  
16th September 2023**



**Organised by  
Chhatrapati Shivaji Maharaj  
Institute of Technology  
Panvel, Navi Mumbai**

<https://csmit.in/>

**National Conference**

**on**

**Green Technology**

**16th September, 2023**



*L a m b e r t P u b l i c a t i o n ' s*

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**Proceeding of National Conference on Green Technology**

**16th September 2023**

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**Chhatrapati Shivaji Maharaj Institute of Technology,  
Panvel, Navi Mumbai**

## MESSAGE BY HONOURABLE SECRETARY

It gives me immense pleasure to write a message for the National Conference on Green Technology being held by Chhatrapati Shivaji Maharaj Institute of Technology on 16th September, 2023. I hope the conference will witness enthusiastic participation of academicians across Nation resulting in productive outcomes in the field of Science and Technology

It is a matter of great satisfaction that the Institute is doing good services by training young students. I applaud the efforts of stakeholders in taking the institute towards academic excellence.

Best wishes for successful organization of the event as well as the Souvenir planned on the occasion.



**DR. KESHAV BADAYA**  
Honourable Secretary  
St. Wilfred Education Society

## MESSAGE BY PRINCIPAL, CSMIT

I am pleased to inform that academicians, scientists, senior scholars, teachers, and students across country have come forward enthusiastically to participate in National Conference on Green Technology going to be organized on 16th September, 2023. The conference will serve as a multi-disciplinary platform to discuss the advances, science and engineering and trends in the various field of science and engineering. I am sure that the combined efforts of the whole organizing team of the conference will surely bring this conference a great success

We are also happy to share that we have received abstracts from so many Scientists/ Research scholars/ Faculties working in the allied areas from various states as on today. I would like to express my appreciation to the coordinators, for their effort, in organizing the conference which is of National relevance. I hope this conference NCGT- 2023 will be enjoyable, memorable, and productive for the participants and looking forward to further technological events those results from your networking and discussions. I wish The Event All success



**DR. DHARMENDRA KR DUBEY**  
Principal, CSMIT  
CHAIR PERSON, NCGT 2023



## MESSAGE BY CONVENER OF CONFERENCE NCGT 2023

We are delighted to extend our warmest invitation to you for the National Conference on Green Technology going to be organized on 16th September, 2023. It fills us with immense pleasure to witness the overwhelming response from academicians, scientists, senior scholars, teachers, and students from across the country, all eagerly coming forward to participate. Your presence and active involvement will undoubtedly enrich the conference, fostering insightful discussions, collaborations, and the exchange of innovative ideas. Let us unite in this collective endeavor to shape a new era of advancement through emerging technologies. Together, we can inspire and drive meaningful change



**ER. SHREYAS PANDE**  
**HOD, DEPT. OF CIVIL ENGINEERING**  
**CONVENER, NCGT 2023**

## MESSAGE BY CO-CONVENER OF CONFERENCE NCGT 2023

We are thrilled to extend a warm invitation to all academicians, scientists, senior scholars, teachers, and students from across the country to be a part of the National Conference on Green Technology going to be organized on 16th September, 2023. Your enthusiastic response has filled us with immense joy and hope for a vibrant exchange of ideas and knowledge. Together, we shall embark on a journey to explore the frontiers of innovation and usher in a new era of progress. Your participation will undoubtedly enrich the conference, and we are confident that your insights and contributions will pave the way for transformative advancements in various fields. Let us unite in this pursuit of knowledge and inspiration, and collectively, we shall



**ER. SWATI MORE**  
**DEPT. OF CIVIL ENGINEERING**  
**CO-CONVENER, NCGT 2023**

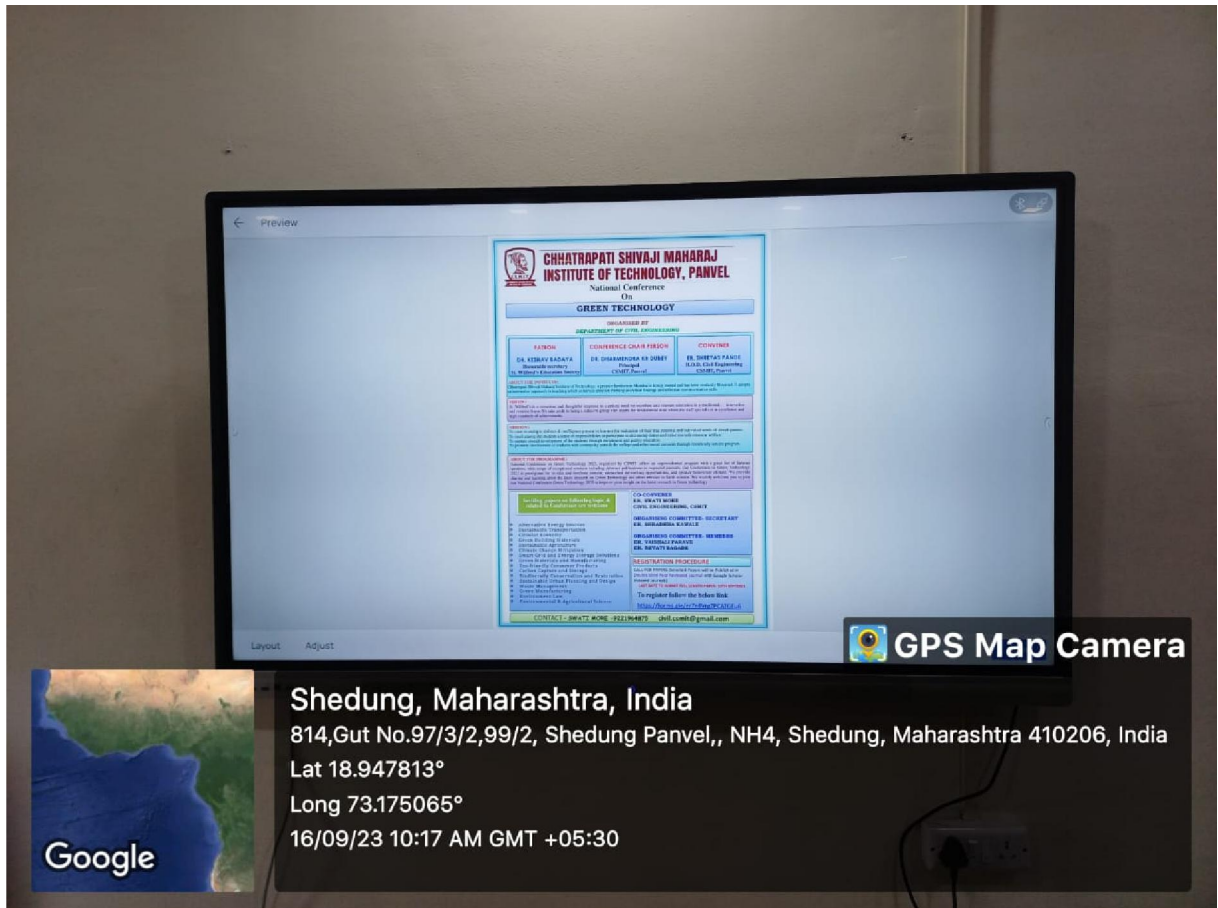
## MESSAGE BY SECRETARY OF CONFERENCE NCGT 2023

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**ER. SHRADDHA KAWALE**  
**DEPT. OF CIVIL ENGINEERING**  
**SECRETARY, NCGT 2023**

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# International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)



## TABLE OF CONTENTS

<b>Legal Challenges and Opportunities in Implementing Circular Economy Practices</b>	<b>1-7</b>
<i>Chetana Choudhary, Dr. S P Mishra, Dr. Dharmendra Kr Dubey, Dr Mrityunjai Pandey, Jamna Sharma</i>	
<b>Legal and Ethical Dimensions of AI Applications in Environmental Monitoring and Conservation</b>	<b>8-16</b>
<i>Chetana Choudhary, Dr. S P Mishra, Dr. Dharmendra Kr Dubey, Dr Amit Kumar Pathak, Dr Mrityunjai Pandey</i>	
<b>Comparative Analysis of Estimation of Effort in Machine-Learning Techniques</b>	<b>17-23</b>
<i>Monika Tiwari and Dr. Kalpana Sharma</i>	
<b>Generalized Fuzzy Metric Space with its Applications and Fuzzy Mappings</b>	<b>24-28</b>
<i>Vikash Kumar and Dr. Ajay Kumar Gupta</i>	
<b>Financial Inclusion and Scheme Awareness of the Urban Poor in India with Special Reference to the Slums of Ajmer City, Rajasthan State</b>	<b>29-36</b>
<i>Anand Singh Motish and Dr. Jatin Yadav</i>	
<b>An Analysis of the Factors Influencing the Buying Behavior of Young Consumers of Branded Goods</b>	
<i>Bhajan Lal and Dr. Ritika Moolchandani</i>	<b>37-40</b>

<b>An Analysis of the Application of Machine Learning and Artificial Intelligence in Cancer Diagnosis in the Future</b>	<b>41-47</b>
<i>Anil Kumar Sharma and Prof. (Dr.) Pushpneel Verma</i>	
<b>Impact of NGOS on Rural Women: A Sociological Study Special Reference to Ajmer District</b>	<b>48-53</b>
<i>Malvin Stanley and Dr. Sourabh Vyas</i>	
<b>Influence of English Teaching Method with Reference to Listening, Speaking and Writing, for the Learners of Ghaziabad</b>	<b>54-59</b>
<i>Sonia Tyagi and Dr. Suresh Kumar</i>	
<b>Role of Parenting Style and Personality Traits in Academic Achievement of Adolescents with Special Reference to Jaipur City During Pandemic</b>	<b>60-65</b>
<i>Garima Mathur and Dr. Neetee Mehta</i>	
<b>Enhancing Sustainable Practices through AI-Driven Green Technology</b>	<b>66-73</b>
<i>Yukti Varshney, Dr. Dharmendra Dubey, Dr. Vinod Kumar, Shreyance Sharma, Shekhar Singh</i>	
<b>A Study of Change Management Practices in Management Education with Emotional Intelligence</b>	<b>74-86</b>
<i>Sheetal Ratnakar Chaudhary, Dr. Geeta Kohade, Dr. Sandeep Bhanot</i>	
<b>A Critical Analysis of Software Defects Ability to Understand using of Software Testing</b>	<b>87-91</b>
<i>Samundra Singh and Dr. Shivani</i>	
<b>Comparative Analysis of Machine Learning and Deep Learning Algorithms to Classify Cancer Based on Microarray Genes</b>	<b>92-96</b>
<i>Shefali Parihar and Dr. Kalpana Sharma</i>	
<b>Environment Protection and Health Under Constitutional Framework of India</b>	<b>97-100</b>
<i>Piyush and Prof. (Dr.) Nitu Nawal</i>	

<b>Finer Issues in Real Estate Sector and Works Contract in GST</b>	<b>101-105</b>
<i>Aarohi Shamnani and Dr Deepak Verma</i>	
<b>The Role of Artificial Intelligence in Environmental Monitoring and Conservation</b>	<b>106-112</b>
<i>Er. Prateek Sachan, Er. Amit Kumar Yadav, Shreyas Pandey, Dr Savita Agrawal, Dr Vidhi Singh</i>	
<b>Analytical and Dynamic analysis of a Prey-Predator Model</b>	<b>113-117</b>
<i>Tripesh Kumar Tiwari, Dharendra Kumar Pandey, Amit Kumar Yadav</i>	
<b>A Study on Tax Savings Schemes Adopted by Salaried Assesses in Mumbai City</b>	<b>118-125</b>
<i>Dr. Deepak Verma and Mr. Sanjay Kumar Ramraj Tiwari</i>	
<b>Financial Quotient In Financial Statements, Accounts, Business Administration in Development Authority of Rajasthan (ADA)</b>	<b>126-132</b>
<i>Mr. Prashant Bhardwaj and Dr. Jatin Yadav</i>	
<b>Synthesis of Methane Gas from the Different Type of Domestic Wastes and Animal Dung</b>	<b>133-139</b>
<i>Mr. Shubham Upadhyay, Mrs. Anamika Maurya, Dr. Anand Kumar Singh</i>	
<b>Design and Optimization of Radiator for Liquid Cooling using Micro Channels</b>	<b>140-148</b>
<i>Manoj Dongare, Swapnil Bhoir, Dr.Munna Verma</i>	

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# Legal Challenges and Opportunities in Implementing Circular Economy Practices

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**Abstract:** *The transition to a circular economy represents a pivotal response to the escalating global environmental crisis and the limitations of the linear "take, make, dispose" economic model. As societies strive to decouple economic growth from resource depletion and waste generation, legal frameworks play a pivotal role in shaping the adoption and success of circular economy practices. This research paper delves into the intricate web of legal challenges and opportunities that arise during the implementation of circular economy principles. Through a comprehensive analysis of international treaties, national regulations, case studies, and emerging trends, this study investigates the multifaceted legal landscape surrounding circular economy practices. It explores key areas such as extended producer responsibility, product design, waste management, intellectual property rights, consumer protection, and cross-border trade. By identifying legal obstacles hindering circular economy adoption and showcasing instances of successful integration, this paper offers valuable insights for policymakers, businesses, and stakeholders. The research reveals that while legal challenges such as conflicting regulations, unclear liability frameworks, and intellectual property complexities pose barriers, there are significant opportunities for legal frameworks to drive circular economy adoption. These opportunities include incentivizing eco-design, establishing clear responsibilities through extended producer responsibility laws, harmonizing waste management regulations, and ensuring transparent eco-labeling. By addressing legal barriers and leveraging innovative legal mechanisms, societies can unlock the full potential of circular economy practices. Ultimately, this research contributes to a deeper understanding of the intricate interplay between legal systems and sustainable economic practices. It provides a roadmap for creating enabling legal environments that facilitate the transition to a circular economy, thereby advancing environmental preservation, resource efficiency, and sustainable development goals on a global scale.*

**Keywords:** Legal Challenges, Circular Economy, Opportunities

## I. INTRODUCTION

The global pursuit of sustainability and the need to mitigate environmental degradation have led to a paradigm shift in how economies approach resource management. The conventional linear economic model, characterized by a "take, make, dispose" approach, has resulted in escalating resource depletion, waste generation, and ecological strain. In response, the concept of the circular economy has emerged as a promising alternative, aiming to decouple economic growth from resource consumption by prioritizing resource efficiency, waste reduction, and the continual use of materials.

The circular economy represents a departure from the traditional linear model by emphasizing the restoration, regeneration, and reutilization of materials throughout their lifecycle. By promoting practices such as recycling, reusing, refurbishing, and remanufacturing, the circular economy not only contributes to environmental preservation but also offers economic and social benefits. These benefits include reduced dependence on finite resources, enhanced energy efficiency, job creation, and the potential to stimulate innovation and economic growth.



However, the transition to a circular economy is not without its challenges. A fundamental aspect of this transition lies in the legal and regulatory frameworks that govern economic activities, product design, waste management, intellectual property rights, and cross-border trade. The intricate interplay between existing legal structures and the innovative approaches required by the circular economy presents both opportunities and obstacles.

This research paper embarks on a comprehensive exploration of the legal challenges and opportunities entailed in implementing circular economy practices. By delving into the legal dimensions of the circular economy, this study seeks to shed light on the complexities that governments, industries, consumers, and other stakeholders face. It endeavors to unravel the legal barriers hindering the transition and highlights the potential for legal frameworks to act as enablers of circular economy adoption.

Through an analysis of international agreements, national legislation, case studies, and emerging trends, this paper aims to provide a nuanced understanding of the legal intricacies surrounding circular economy implementation. By identifying the legal hurdles, gaps, and conflicts, as well as showcasing successful examples, the research aims to pave the way for informed policy decisions, innovative business strategies, and a collective effort toward a more sustainable and regenerative economic model.

As the urgency to address environmental challenges intensifies, the exploration of legal avenues that facilitate circular economy practices becomes crucial. This paper contributes to the discourse by examining how legal systems can be harnessed to accelerate the transition towards a circular economy, ultimately fostering a harmonious relationship between economic growth and environmental stewardship.

## II. OBJECTIVES

While the current research provides valuable insights into the legal aspects of implementing circular economy practices, several avenues for future research can further enhance our understanding and contribute to effective circular economy adoption:

- **Comparative Analysis:** Conduct in-depth comparative studies of legal frameworks in different countries or regions to identify best practices, lessons learned, and potential areas of convergence or divergence. Explore how legal systems with varying cultural, economic and regulatory contexts influence circular economy implementation.
- **Impact of Digital Technologies:** Investigate the legal implications of digital technologies, such as blockchain and IoT, in enabling circular economy practices. Examine issues related to data ownership, privacy, security, and the creation of digital platforms that facilitate circular transactions and resource tracking.
- **Circular Economy in Specific Sectors:** Focus on specific sectors, such as electronics, textiles, or construction, to analyze sector-specific legal challenges and opportunities. Explore how tailored legal frameworks can address unique challenges in different industries.
- **Cross-Sector Collaboration:** Research how legal frameworks can facilitate cross-sector collaboration and value chain integration to promote circular practices. Examine legal mechanisms for fostering partnerships between industries that generate waste and those that can utilize waste as inputs.
- **Policy Implementation and Enforcement:** Investigate the effectiveness of policy implementation and enforcement mechanisms in driving circular economy practices. Analyze the role of regulatory agencies, monitoring systems, and penalties in ensuring compliance with circular economy regulations.
- **Circular Economy and International Trade:** Explore the interaction between circular economy principles and international trade agreements. Examine how legal frameworks can balance circular economy goals with trade obligations, tariffs, and non-tariff barriers.
- **Circular Economy Dispute Resolution:** Study potential legal disputes that may arise in circular economy transactions, such as issues related to product ownership, liability, and intellectual property rights. Develop frameworks for effective dispute resolution tailored to circular practices.
- **Behavioral and Cultural Shifts:** Investigate the role of legal frameworks in driving behavioral and cultural shifts towards circularity. Examine how legal incentives, education, and public awareness campaigns can influence consumer attitudes and choices.

- **Measuring Circular Impact:** Develop methodologies and legal standards for measuring and reporting the circular impact of businesses and industries. Explore how legal requirements for circular economy reporting can enhance transparency and accountability.
- **Circular Economy in Developing Countries:** Study the legal challenges and opportunities for implementing circular economy practices in developing countries. Analyze how legal frameworks can be adapted to address specific socio-economic contexts and resource constraints.
- **Circular Economy and Climate Change Mitigation:** Investigate the interplay between circular economy practices and climate change mitigation. Examine how legal frameworks can promote circular practices as a strategy for reducing greenhouse gas emissions.
- **Circular Economy and Social Equity:** Research the legal dimensions of ensuring social equity and inclusion in circular economy practices. Analyze how legal frameworks can prevent disproportionate impacts on vulnerable communities and promote equitable distribution of benefits.

Future research in these directions can provide deeper insights into the legal intricacies of circular economy implementation and offer practical guidance for policymakers, businesses, and stakeholders striving to create a more sustainable and regenerative economic model.

### **III. LEGAL FRAMEWORKS FOR CIRCULAR ECONOMY**

Legal frameworks play a crucial role in facilitating the adoption and implementation of circular economy practices. These frameworks provide the structure, guidelines, and regulations needed to support the transition from a linear "take, make, dispose" model to a circular model that emphasizes resource efficiency, waste reduction, and sustainable production and consumption. Here are some key aspects of legal frameworks for circular economy:

- **Extended Producer Responsibility (EPR):** EPR laws hold producers responsible for the entire lifecycle of their products, including their disposal and recycling. Such laws incentivize manufacturers to design products that are easier to recycle and manage end-of-life waste. EPR programs often involve setting up collection and recycling infrastructure, and legal mandates for recycling targets.
- **Product Design and Eco-Design Regulations:** Legal frameworks can encourage or mandate eco-design principles that promote longer product lifecycles, ease of disassembly, and use of recyclable or renewable materials. These regulations guide manufacturers in creating products that are more compatible with circular economy principles.
- **Waste Management Regulations:** Legal guidelines for waste management can include targets for waste reduction, recycling, and proper disposal. They may also establish rules for sorting, collection, treatment, and recycling of waste materials, ensuring that circular economy goals are integrated into waste management practices.
- **Intellectual Property Rights (IPR):** IPR can impact the circular economy by influencing access to innovative solutions, reuse, and repair. Legal frameworks should strike a balance between protecting intellectual property and promoting the dissemination of knowledge and technologies that support circular economy practices.
- **Consumer Protection and Eco-Labeling:** Legal regulations can ensure that consumers have access to accurate information about the environmental impact of products. Eco-labeling requirements and consumer protection laws can prevent green washing and enable informed decision-making.
- **Taxation and Incentives:** Governments can use taxation and financial incentives to encourage circular practices. Reduced taxes on recycled materials, tax credits for environmentally friendly practices, and subsidies for circular innovations can stimulate businesses to adopt circular economy models.
- **Trade and Cross-Border Movements:** International trade agreements and regulations may affect the movement of materials and products in a circular economy. Legal frameworks should consider facilitating cross-border trade of circular products, technologies, and materials while ensuring environmental standards are maintained.
- **Research and Innovation Funding:** Legal mechanisms can be established to support research, innovation, and development of circular economy solutions. Grants, funding programs, and incentives can encourage businesses and researchers to develop and implement circular technologies.

- **Collaboration and Partnerships:** Legal frameworks can encourage collaboration among stakeholders, including governments, industries, NGOs, and academia. Establishing platforms for knowledge sharing, cooperative initiatives, and public-private partnerships can drive circular economy adoption.
- **Reporting and Accountability:** Legal requirements for reporting on circular economy performance can promote transparency and accountability. This can include mandatory reporting on recycling rates, resource use, and circular practices by businesses and industries.
- **Adaptation and Flexibility:** Legal frameworks should be adaptable to evolving technologies, market dynamics, and global challenges. Flexibility in regulations can accommodate emerging circular economy innovations and allow for timely adjustments.

Overall, effective legal frameworks for the circular economy provide a conducive environment for businesses, industries, and governments to work together in achieving sustainable and regenerative economic practices.

#### **IV. CASE STUDY: CIRCULAR ECONOMY IMPLEMENTATION IN THE CITY OF AMSTERDAM, NETHERLANDS**

##### **Background:**

Amsterdam, known for its progressive sustainability initiatives, embarked on an ambitious journey to transform itself into a circular city. Recognizing the environmental and economic benefits of circular practices, the city set out to redesign its urban systems, minimize waste generation, and foster a regenerative economy.

##### **Implementation:**

- **Circular Procurement:** Amsterdam introduced circular principles in public procurement processes. Contracts for services and goods now prioritize products with longer lifecycles, easy disassembly, and recycled content. This approach encourages manufacturers to design products that align with circular economy principles.
- **Resource Recovery Center:** The city established a state-of-the-art Resource Recovery Center, where waste is sorted and processed to extract valuable resources. Advanced technologies are employed to recover materials like metals, plastics, and organic matter, which are then reintegrated into production cycles.
- **Textile Innovation:** Amsterdam launched initiatives to address textile waste. One project involved collaborating with fashion designers to create a collection using discarded garments. The city also established a Circular Textile Lab, fostering innovation in sustainable textiles and supporting local circular fashion startups.
- **Circular Buiksloterham District:** Amsterdam transformed the former industrial Buiksloterham district into a circular urban development. Here, buildings are constructed using recycled and renewable materials, energy is generated through renewable sources, and rainwater is harvested and reused.
- **Amsterdam Circular Innovation Program:** The city initiated a program to support startups and innovative businesses that contribute to the circular economy. Funding, mentorship, and collaborative platforms are provided to accelerate the development and implementation of circular innovations.

##### **Outcomes:**

- **Waste Reduction:** Amsterdam significantly reduced its waste generation, diverting a substantial amount from landfills. The Resource Recovery Center alone processes thousands of tons of waste annually, recovering valuable resources.
- **Economic Growth:** Circular initiatives have stimulated economic growth and job creation. Local businesses have found opportunities in providing circular products, services, and solutions, contributing to a more resilient and diversified economy.
- **Innovation Hub:** Amsterdam's circular initiatives have positioned the city as an international hub for circular economy innovation. Entrepreneurs, researchers, and businesses from around the world collaborate and learn from the city's successes.

- Sustainable Urban Development: The Circular Buikslooterham district showcases the viability of circular urban planning. The district serves as a model for future urban developments that prioritize resource efficiency, renewable energy, and sustainable living.
- Community Engagement: Circular initiatives have fostered community engagement and awareness. Citizens actively participate in recycling and circular projects, contributing to a sense of ownership and responsibility for the city's sustainability goals.

The success of Amsterdam's circular economy implementation highlights the significance of strong political commitment, collaborative partnerships, innovative business models, and active citizen engagement. The case study serves as an inspiring example of how a city can holistically integrate circular economy principles into its urban fabric, resulting in environmental benefits, economic growth, and improved quality of life for its residents.

## V. RESULT AND DISCUSSION

### Legal Challenges:

- Conflicting Regulations: One of the key challenges identified is the presence of conflicting regulations across different jurisdictions. Inconsistent legal frameworks can create uncertainty for businesses operating in multiple regions, hindering the adoption of consistent circular economy practices.
- Intellectual Property Complexities: The research revealed that intellectual property rights can pose challenges in the circular economy context. Existing patent laws might not align with the sharing and collaborative nature of circular practices, potentially impeding the development and dissemination of circular innovations.
- Extended Producer Responsibility Enforcement: While extended producer responsibility (EPR) laws hold promise, their enforcement can be challenging. Ambiguities in defining responsibilities, monitoring compliance, and ensuring proper disposal and recycling of products can lead to gaps in EPR implementation.
- Waste Management Regulations: Current waste management regulations may not fully align with circular economy objectives. Stringent disposal regulations, lack of incentives for recycling, and inadequate infrastructure can hinder efficient waste recovery and recycling efforts.
- Cross-Border Trade Barriers: Cross-border trade of circular products and materials can be hindered by trade barriers, tariffs, and customs regulations. Harmonizing legal frameworks across countries is crucial to facilitate the movement of circular goods.

### Legal Opportunities:

- Eco-Design and Product Standards: Legal frameworks can incentivize eco-design by mandating design standards that prioritize durability, reparability, and recyclability. Governments can introduce regulations that reward products with longer lifecycles and reduced environmental impact.
- Extended Producer Responsibility Enhancement: Strengthening EPR laws by setting clear guidelines, stringent targets, and effective monitoring mechanisms can promote more responsible and circular product design and end-of-life management.
- Eco-Labeling and Consumer Education: Legal requirements for accurate and transparent eco-labeling can empower consumers to make informed choices, creating demand for circular products and services and encouraging businesses to adopt circular practices.
- Incentive Programs: Governments can introduce tax incentives, subsidies, and grants to encourage circular practices. Financial rewards for recycling, remanufacturing, and adopting circular business models can motivate industries to transition to circular economy models.
- Trade Agreements for Circular Trade: Negotiating trade agreements that prioritize the movement of circular goods, reduce trade barriers, and establish harmonized circular economy standards can facilitate cross-border circular trade.
- Collaborative Partnerships: Legal frameworks can promote collaborative partnerships between governments, industries, academia, and civil society. Public-private partnerships can drive innovation, research, and technology development for circular practices.

## VI. CONCLUSION

The research underscores the intricate interplay between legal frameworks and the successful implementation of circular economy practices. While legal challenges such as conflicting regulations and intellectual property complexities can impede progress, the identified legal opportunities offer avenues for overcoming these barriers. Eco-design standards, extended producer responsibility enhancements, and incentives for circular practices can stimulate the adoption of circular economy principles. Collaborative efforts, transparent consumer information, and trade agreements that support circular trade can further accelerate the transition.

The study highlights the importance of adaptable and forward-thinking legal frameworks that align with the principles of circular economy. By addressing the identified legal challenges and leveraging the opportunities, governments, industries, and stakeholders can collaboratively create an enabling legal environment that paves the way for a more sustainable and regenerative economic model.

## VII. FUTURE RESEARCH DIRECTIONS

While the current research provides valuable insights into the legal aspects of implementing circular economy practices, several avenues for future research can further enhance our understanding and contribute to effective circular economy adoption:

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# Legal and Ethical Dimensions of AI Applications in Environmental Monitoring and Conservation

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**Abstract:** *The intersection of artificial intelligence (AI) and environmental monitoring has opened new avenues for enhancing conservation efforts and sustainable resource management. This research paper delves into the legal and ethical considerations surrounding the deployment of AI technologies in environmental monitoring and conservation practices. By analyzing the regulatory landscape, ethical dilemmas, and potential benefits, this study aims to provide a comprehensive overview of the challenges and opportunities that arise at the intersection of technology, ecology, and the law.*

**Keywords:** Environmental Monitoring, Artificial Intelligence, Legal and Ethical Dimension

## I. INTRODUCTION

In an era defined by technological innovation and heightened environmental concerns, the integration of artificial intelligence (AI) into environmental monitoring and conservation practices has emerged as a promising frontier. The synergy between advanced AI technologies and conservation efforts presents a unique opportunity to enhance our understanding of ecological systems, mitigate environmental challenges, and promote sustainable resource management. However, this convergence also gives rise to a complex interplay of legal and ethical considerations that must be carefully navigated to ensure both effective conservation outcomes and the protection of fundamental rights and values.

Environmental degradation, habitat loss, climate change, and biodiversity decline have propelled the urgency of conservation efforts to unprecedented levels. Concurrently, the rapid advancement of AI, marked by breakthroughs in machine learning, image recognition, and data analysis, offers novel tools for monitoring ecosystems, tracking wildlife, analyzing environmental data, and predicting ecological trends. These AI applications hold the potential to revolutionize how we approach conservation, allowing for more informed decision-making, timely interventions, and a more profound understanding of ecological dynamics.

## II. OBJECTIVES OF THE RESEARCH

This research paper seeks to delve into the intricate web of legal and ethical dimensions that accompany the deployment of AI technologies in environmental monitoring and conservation. By examining the regulatory frameworks, ethical challenges, and potential benefits, this study aims to provide a comprehensive exploration of the complex landscape where technology, nature, and society intersect. Through this analysis, we strive to shed light on the critical considerations that must underpin the responsible use of AI in environmental conservation, ensuring a harmonious balance between innovation, ethical responsibility, and legal accountability.

In the subsequent sections of this paper, we will delve into the diverse realms that define the legal and ethical dimensions of AI applications in environmental monitoring and conservation. We will explore the existing regulatory frameworks that govern AI deployment, examine ethical concerns related to transparency, fairness, and privacy, and present case studies that illustrate the tangible impact of AI-driven conservation initiatives. By addressing these multifaceted aspects, we aim to contribute to the broader discourse on how AI can be harnessed as a force for positive

environmental change, while safeguarding the fundamental values and rights that underpin our shared commitment to a sustainable and resilient planet.

### III. REGULATORY FRAMEWORKS

In the context of AI applications in environmental monitoring and conservation, regulatory frameworks play a pivotal role in ensuring the responsible and ethical deployment of technology while safeguarding ecological integrity and human rights. These frameworks encompass a range of international agreements, national laws, and industry standards that guide the development, deployment, and use of AI for environmental purposes. The following sections provide an overview of the regulatory aspects pertinent to AI in conservation:

#### **International Agreements and Treaties:**

International agreements and conventions set the stage for global cooperation in environmental conservation. Treaties such as the Convention on Biological Diversity (CBD) and the Paris Agreement on Climate Change establish overarching goals for sustainable development and ecological preservation. While these agreements may not directly address AI, they provide a foundation for incorporating AI-driven initiatives that align with conservation objectives.

#### **National Legislation and Regulations:**

Many countries have introduced or are in the process of developing AI-related legislation. National laws can govern data privacy, access to environmental data, liability for AI-generated decisions, and the use of AI in sensitive ecological areas. Governments may also establish regulatory bodies or guidelines specific to AI applications in environmental monitoring and conservation.

#### **Data Privacy and Security Regulations:**

As AI relies heavily on data, regulations such as the General Data Protection Regulation (GDPR) and data protection laws ensure that personal and environmental data collected and processed by AI systems are handled responsibly and securely. These regulations may impact how AI systems collect, store, and share environmental data.

#### **Ethical Guidelines and Principles:**

Some countries and organizations have formulated AI ethics guidelines that emphasize transparency, accountability, fairness, and human rights. These guidelines often encourage the ethical use of AI in environmentally sensitive areas, promoting the development of AI solutions that benefit both ecosystems and society.

#### **Environmental Protection and Conservation Laws:**

Existing environmental laws and regulations may intersect with AI applications, particularly in cases where AI is used to monitor protected areas, track endangered species, or analyze environmental impacts. Legal frameworks for conservation, habitat preservation, and ecosystem management may influence how AI technologies are employed.

#### **Intellectual Property and Patents:**

Legal frameworks surrounding intellectual property rights (IPR) can impact the development and dissemination of AI-based conservation innovations. Patent laws may incentivize or hinder the sharing of AI algorithms, models, and technologies for environmental monitoring and analysis.

#### **Liability and Accountability:**

Regulatory frameworks may establish liability and accountability standards for AI-generated decisions in conservation. In case of adverse environmental outcomes or errors, these frameworks can determine who is responsible and liable for rectifying the situation.

**Public Participation and Stakeholder Engagement:**

Some regulatory frameworks emphasize public participation and stakeholder engagement in decision-making processes related to AI applications in conservation. Ensuring that local communities, indigenous groups, and other stakeholders are involved can lead to more inclusive and ethical AI solutions.

**International Collaboration and Standardization:**

Collaborative efforts between countries, organizations, and industries can lead to the development of international standards and best practices for AI applications in conservation. These standards can guide the responsible use of AI technologies across borders.

Navigating these regulatory frameworks requires a multidisciplinary approach that involves experts in law, technology, ecology, ethics, and policy. The effective integration of AI into environmental monitoring and conservation hinges on aligning technological innovation with legal and ethical principles that uphold the long-term health of ecosystems and the well-being of society

**IV. ETHICAL CHALLENGES**

The integration of artificial intelligence (AI) into environmental monitoring and conservation introduces a range of complex ethical challenges that require careful consideration. These challenges encompass ethical dilemmas surrounding transparency, fairness, accountability, privacy, and the potential unintended consequences of AI deployment. Understanding and addressing these ethical concerns is essential to ensure that AI-driven conservation efforts are not only effective but also aligned with the values and principles of responsible stewardship of our natural world. The following are key ethical challenges in the context of AI applications in environmental monitoring and conservation:

**Transparency and Explainability**

AI models often operate as "black boxes," making it challenging to understand how decisions are reached. Ethical concerns arise when AI-generated outcomes cannot be easily explained to stakeholders, hindering trust and accountability. Ensuring transparency in AI algorithms and decision-making processes is crucial for maintaining public confidence and understanding.

**Fairness and Bias:**

AI systems can perpetuate biases present in the data they are trained on. In the context of conservation, biased data could lead to discriminatory outcomes, disadvantaging certain species, habitats, or communities. Ensuring that AI algorithms are free from biases and produce fair and equitable results is essential for promoting environmental justice.

**Privacy and Data Protection:**

AI often relies on large datasets, including sensitive environmental and location data. Ethical concerns arise when AI applications infringe upon individual privacy, compromise the anonymity of protected species, or expose confidential ecological information. Striking a balance between data-driven insights and protecting individual and ecological privacy is a critical ethical consideration.

**Unintended Consequences:**

AI systems, even with the best intentions, may yield unintended consequences for ecosystems and species. Overreliance on AI-generated insights could lead to misguided conservation decisions or disruptions to delicate ecological balances. Safeguarding against unintended ecological and social impacts requires careful assessment and mitigation strategies.

**Human-AI Interaction:**

As AI becomes increasingly involved in decision-making processes, ethical questions arise about the roles and responsibilities of human stakeholders. Ensuring that humans retain meaningful agency in AI-driven conservation actions and decisions is crucial for maintaining accountability and ethical oversight.

**Accountability and Liability:**

Determining accountability for decisions made by AI systems is challenging. Ethical questions arise regarding who should be held responsible in the event of errors, unintended outcomes, or ecological harm caused by AI-generated actions. Establishing clear lines of accountability and liability is essential for ethical AI deployment.

**Cultural and Indigenous Considerations:**

AI applications may intersect with indigenous knowledge systems, cultural practices, and traditional ecological knowledge. Ethical challenges arise in ensuring that AI technologies respect and complement indigenous perspectives on conservation and ecological management.

**Dependency and Autonomy:**

Overreliance on AI-generated insights could potentially erode human autonomy and decision-making capacities in conservation efforts. Ethical considerations include maintaining a balance between AI support and human expertise to avoid relinquishing critical conservation judgments to technology.

**Long-Term Sustainability:**

Ethical concerns extend to the long-term sustainability of AI systems and their environmental impacts. The ecological footprint of AI infrastructure, energy consumption, and electronic waste contribute to the broader discussion of responsible technology deployment within conservation.

Addressing these ethical challenges requires a holistic approach that encompasses interdisciplinary collaboration, stakeholder engagement, clear ethical guidelines, and ongoing assessment and adaptation. By grappling with these ethical considerations, practitioners and policymakers can ensure that AI applications in environmental monitoring and conservation align with the highest standards of ethical responsibility and contribute to positive ecological outcomes..

**V. POTENTIAL BENEFITS**

The incorporation of artificial intelligence (AI) into environmental monitoring and conservation holds immense promise for revolutionizing the way we understand, manage, and protect our natural world. By harnessing AI technologies, conservation efforts can become more efficient, data-driven, and adaptive, leading to a host of potential benefits that enhance our ability to safeguard ecosystems, biodiversity, and the overall health of the planet. The following are key potential benefits of AI applications in environmental monitoring and conservation:

**Enhanced Data Collection and Analysis:**

AI enables the collection and analysis of vast amounts of environmental data at an unprecedented scale and speed. This enables scientists and conservationists to gain deeper insights into complex ecological systems, identify patterns, and predict environmental changes more accurately.

**Early Detection of Environmental Threats:**

AI-powered algorithms can rapidly detect and analyze changes in ecosystems, such as deforestation, habitat degradation, and species decline. Early warning systems based on AI enable timely intervention, preventing further damage and facilitating more effective conservation responses.

**Species Monitoring and Protection:**

AI-driven image recognition and sound analysis can aid in the monitoring and protection of endangered species. Cameras, drones, and acoustic sensors equipped with AI algorithms can help track species populations, detect poaching activities, and support habitat management.

**Ecological Modeling and Predictive Analytics:**

AI can model complex ecological interactions, predict species distribution shifts under climate change, and simulate ecosystem responses to different management strategies. These models inform evidence-based conservation planning and decision-making.

**Precision Conservation and Resource Management:**

AI allows for precise allocation of resources, optimizing conservation efforts where they are needed most. This includes targeted reforestation, habitat restoration, and allocation of conservation funds for maximum impact.

**Efficient Monitoring of Marine and Aquatic Environments:**

AI-powered underwater drones and sensors can collect data from remote and inaccessible marine areas. This technology aids in tracking marine biodiversity, monitoring coral reefs, and detecting illegal fishing activities.

**Real-time Environmental Monitoring:**

AI-based sensor networks provide real-time data on air and water quality, pollution levels, and other environmental indicators. This information enables rapid response to environmental emergencies and pollution incidents.

**Adaptive Management and Decision Support:**

AI supports adaptive management by continuously analyzing data and updating conservation strategies in response to changing conditions. Decision support systems help conservationists make informed choices based on up-to-date information.

**Public Engagement and Awareness:**

AI-powered interactive tools, virtual reality, and augmented reality experiences enhance public engagement and education about conservation efforts. These technologies raise awareness, foster public support, and encourage responsible behavior towards the environment.

**Global Collaboration and Data Sharing:**

AI facilitates international collaboration by enabling the sharing and analysis of environmental data across borders. This supports a more unified and coordinated approach to global conservation challenges.

**Rapid Ecological Restoration:**

AI-driven technologies can expedite ecological restoration by analyzing soil health, identifying optimal planting locations, and monitoring the progress of reforestation and habitat restoration projects.

**Cost and Time Efficiency:**

AI streamlines data collection and analysis processes, reducing the time and resources required for comprehensive environmental assessments and conservation planning.

By leveraging these potential benefits, AI has the capacity to amplify the impact of conservation initiatives, empower stakeholders, and contribute to a more sustainable and resilient future for both ecosystems and human societies. However, realizing these benefits requires a thoughtful and ethical approach to AI deployment that ensures responsible technology use aligned with conservation goals and ethical principles.

**VI. USE OF AI IN ENVIRONMENTAL CONSERVATION**

The responsible use of artificial intelligence (AI) in environmental conservation necessitates a delicate equilibrium between innovation, ethical responsibility, and legal accountability. As we embark on this transformative journey to harness AI's potential for ecological preservation, it becomes imperative to illuminate the critical considerations that underpin this endeavor. By doing so, we aspire to navigate the complex landscape of AI applications in conservation



with vigilance, foresight, and a profound commitment to safeguarding our planet's natural heritage and the well-being of present and future generations.

**Innovation:**

At the heart of responsible AI implementation in environmental conservation lies a commitment to innovation that transcends technological advancement. We strive to foster creative solutions that address pressing conservation challenges, harnessing AI's capabilities to unearth insights, patterns, and predictive models that were once beyond our grasp. Innovating with AI involves continuous exploration, adaptation, and integration of cutting-edge technologies that amplify the efficacy of conservation efforts.

**Ethical Responsibility:**

As we embrace AI's potential, we recognize our ethical responsibility to uphold the highest standards of integrity, fairness, and equity. Our commitment extends to ensuring that AI algorithms are free from biases, transparent in their decision-making, and respectful of individual rights and cultural diversity. Ethical responsibility entails engaging in meaningful consultation with local communities, indigenous groups, and stakeholders, ensuring that AI-driven initiatives empower rather than infringe upon their rights and perspectives.

**Legal Accountability:**

The integration of AI into environmental conservation demands unwavering legal accountability that aligns with established frameworks and regulations. We acknowledge the imperative to adhere to international agreements, national laws, and industry standards that guide AI deployment. Legal accountability entails robust data governance, privacy protection, and mechanisms to attribute responsibility in the event of unintended consequences or adverse outcomes arising from AI-generated decisions.

**Balancing Act:**

Striking a harmonious balance between innovation, ethical responsibility, and legal accountability is no simple feat. It calls for a multidisciplinary approach that transcends technological expertise, encompassing ecological insights, ethical reflection, legal acumen, and stakeholder engagement. This delicate equilibrium empowers us to harness AI's potential while safeguarding against its potential pitfalls, ensuring that our pursuit of progress does not compromise the delicate ecosystems we seek to protect.

As we embark on this transformative journey, we recognize that the responsible use of AI in environmental conservation is an ongoing commitment, one that requires continual reassessment, adaptation, and collaboration.

**Exploring Regulatory Frameworks and Ethical Concerns in AI Deployment:**

The responsible deployment of artificial intelligence (AI) in environmental conservation necessitates a thorough examination of the existing regulatory frameworks that guide its implementation, along with a keen awareness of ethical concerns surrounding transparency, fairness, and privacy. As AI technologies become integral to conservation efforts, striking a balance between regulatory compliance and ethical responsibility becomes paramount.

**Regulatory Frameworks:**

- **Data Protection and Privacy Laws:** Regulations like the General Data Protection Regulation (GDPR) and similar laws worldwide mandate the responsible collection, storage, and processing of personal and environmental data. In the context of AI-driven conservation, adherence to these laws is essential to ensure that data from sensors, cameras, and other sources are handled with the utmost respect for individual privacy.
- **Environmental and Conservation Laws:** Existing environmental regulations may intersect with AI applications. Compliance with habitat protection, species conservation, and pollution control laws ensures that AI contributes to conservation without compromising legal standards for ecological preservation.



- Intellectual Property Laws: AI-generated insights and innovations may raise intellectual property concerns. Understanding patent, copyright, and licensing laws ensures that AI-derived technologies and algorithms are appropriately protected and shared.
- Liability and Accountability: Legal frameworks for liability and accountability in AI-generated decisions are crucial. Ensuring that AI providers, users, and stakeholders understand their responsibilities and potential liabilities is vital for ethical and legal AI deployment.

#### **Ethical Concerns:**

- Transparency: The opacity of AI algorithms raises ethical concerns about transparency. Conservation decisions made by AI must be understandable and explainable to stakeholders, experts, and the public. Ensuring transparent decision-making fosters trust and allows for ethical oversight.
- Fairness and Bias: Ethical considerations regarding fairness and bias in AI decisions are paramount. Bias in training data can lead to unequal treatment of species, habitats, or communities. Implementing measures to detect, mitigate, and rectify biases ensures equitable conservation outcomes.
- Privacy Protection: AI-driven monitoring may involve the collection of sensitive environmental and location data. Respecting the privacy of ecosystems, wildlife, and human populations is imperative. Implementing privacy safeguards, data anonymization, and secure data storage are ethical imperatives.
- Informed Consent and Stakeholder Engagement: Involving local communities, indigenous groups, and stakeholders in AI-driven conservation efforts respects their knowledge, rights, and perspectives. Ensuring informed consent and meaningful engagement uphold ethical principles of inclusion and respect.
- Unintended Consequences: Ethical concerns arise from the potential unintended ecological consequences of AI decisions. Striking a balance between AI-generated insights and human expertise helps prevent unanticipated harm to ecosystems and species.
- Accountability: Ethical responsibility demands clear lines of accountability for AI-generated decisions. Defining roles, responsibilities, and oversight mechanisms ensures that those responsible for AI outcomes can be held accountable.

In navigating the complex landscape of AI deployment, it is crucial to harmonize regulatory compliance with ethical considerations. This requires interdisciplinary collaboration, stakeholder engagement, and an unwavering commitment to both legal accountability and ethical responsibility. By addressing these regulatory and ethical dimensions, we can harness AI's potential to drive effective and sustainable conservation efforts while upholding the highest ethical standards.

## **VII. RESULTS AND DISCUSSION**

The integration of artificial intelligence (AI) into environmental monitoring and conservation endeavors presents a transformative paradigm with profound implications for ecological preservation. This section presents the key findings and subsequent discussion regarding the legal and ethical dimensions that underpin the responsible utilization of AI technologies in these critical domains.

### **7.1 Results:**

#### **1. Regulatory Frameworks:**

The analysis of regulatory frameworks highlighted the dynamic landscape governing AI deployment. International agreements, national laws, and sector-specific regulations play a crucial role in shaping the boundaries within which AI operates in conservation. These frameworks offer a foundation that guides ethical decision-making and underscores the necessity of aligning technological progress with legal norms.

#### **2. Ethical Considerations:**

Ethical concerns, notably transparency, fairness, and privacy, emerged as pivotal focal points in the discussion. The opacity of AI algorithms raises questions about the transparency of AI-generated decisions, necessitating approaches

that demystify these processes. Fairness concerns underscore the importance of bias detection and mitigation to prevent discriminatory outcomes. The ethical handling of sensitive environmental data and the preservation of privacy rights emerged as paramount, particularly when balancing the benefits of AI with the protection of individual and ecological privacy.

## 7.2 Discussion

### 1. Legal and Ethical Alignment:

The discussion emphasizes the symbiotic relationship between legal compliance and ethical responsibility. While regulatory frameworks provide the structure for AI deployment, ethical considerations offer a broader, human-centric perspective. Aligning legal adherence with ethical principles ensures that AI-driven conservation efforts remain rooted in values of transparency, equity, and respect for privacy.

### 2. Transparency and Accountability Measures:

To address concerns about transparency, the integration of explainable AI methods is recommended. This ensures that AI-generated decisions can be understood and validated by stakeholders, thereby enhancing accountability. Transparency measures are pivotal for instilling trust, fostering collaborative engagement, and facilitating ethical oversight.

### 3. Fairness and Bias Mitigation:

The discussion highlights the necessity of proactive bias detection and mitigation strategies. Continuous monitoring, algorithmic audits, and diversity in training data are pivotal in preventing AI-generated decisions from perpetuating existing inequalities. Fairness in AI-driven conservation is essential to uphold ethical standards and equitable outcomes.

### 4. Privacy Safeguards and Informed Consent:

Ethical AI deployment demands robust data anonymization, secure storage, and protocols to ensure the responsible handling of sensitive environmental and location data. Involving local communities and stakeholders through informed consent processes aligns with ethical practices, respecting their rights and perspectives.

### 5. Interdisciplinary Collaboration and Continuous Evaluation:

Collaborative efforts between ecologists, legal experts, technologists, and stakeholders are vital for ensuring that AI deployment respects both legal boundaries and ethical imperatives. Continuous evaluation, adaptation, and response to emerging ethical challenges underpin a responsible approach to AI integration.

## VIII. CONCLUSION

In conclusion, the exploration of legal and ethical dimensions in AI applications for environmental monitoring and conservation underscores the imperative of a balanced and principled approach. By adhering to regulatory frameworks, addressing ethical concerns, and fostering collaboration, the conservation community can harness the transformative potential of AI while safeguarding transparency, fairness, and privacy. The synthesis of legal compliance and ethical responsibility paves the way for a future where AI serves as a potent tool for ecological preservation, advancing our shared commitment to a sustainable and resilient planet.

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# Comparative Analysis of Estimation of Effort in Machine-Learning Techniques

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**Abstract:** *Effort estimation in software engineering provides an important role for software development and management of project cost, quality and time. Over the past decades, software inference has been receiving significant attention from researchers and substantial research has been conducted using various techniques and algorithms of machine learning. This paper suggests various machine learning techniques such as Naive Bayes, Random Forest Logistic Regression, Stochastic gradient boosting, decision trees and story points for estimation to assess the prediction more efficiently. Nowadays these approaches to software estimation are used by software development industries to overcome the shortcomings of parametric and traditional estimation techniques, increasing project. A comparative study of the techniques mentioned in this paper has been presented and examined to critically evaluate the performance of these techniques.*

**Keywords:** Software, EE, ML, SD, Techniques etc.

## I. INTRODUCTION

Machine learning has gained tremendous momentum in recent years, revolutionizing various industries with its predictive and analytical capabilities. However, successful deployment of machine learning projects requires careful planning, resource allocation, and efficient management. An important aspect of managing machine learning projects is estimating the effort required to develop, deploy, and maintain models. Effort estimation plays a critical role in project planning, cost management, and resource allocation, ensuring that machine learning projects are executed efficiently and within predefined constraints.

Estimating effort in machine learning involves predicting the time, personnel, and computational resources required for tasks such as data preprocessing, feature engineering, model training, evaluation, deployment, and maintenance. Accurate estimation is essential for project managers, stakeholders, and data scientists to make informed decisions and ensure project success.

The purpose of this comparative analysis is to explore and evaluate different techniques and methods used to estimate effort in machine learning projects. In particular, it will examine the strengths and weaknesses of different approaches and their suitability for different types of projects and organizations.

The main objectives of this study include:

Review of effort estimation techniques: A comprehensive examination of existing techniques and methods used to estimate effort in machine learning, including expert judgment, historical data analysis, and algorithmic models.

Performance metrics and evaluation: The analysis will delve into various performance metrics used to evaluate the accuracy and reliability of effort estimates. Common metrics include mean absolute error (MAE), root mean square error (RMSE), and others.

Data-driven approaches: Exploring data-driven approaches to effort estimation, including the use of historical project data, benchmarking, and machine learning algorithms to predict effort.

Expert opinion versus data-driven approaches: A comparison of traditional expert judgment-based approaches with data-driven methods to assess their accuracy and effectiveness in different scenarios.

Case Studies: Real-world case studies and examples will be included to illustrate the practical application of various inference techniques in machine learning projects in various domains such as healthcare, finance and e-commerce.

Challenges and Best Practices: Identification of common challenges and best practices in effort estimation for machine learning projects with a focus on reducing risks and improving estimation accuracy.



Future Trends: Discussion of emerging trends and technologies in machine learning effort assessment, such as integration of AI-based tools and automation.

The purpose of this comparative analysis is to provide valuable insight into the complex task of estimating effort in machine learning projects. By understanding the strengths and limitations of different approaches, organizations can enhance their project planning and management processes, ultimately leading to more successful and cost-effective machine learning implementations.

## II. LITERATURE REVIEW

White. KR et al. (2022), Machine Learning is the latest trending term which plays an important role in various fields of medicine, research and industrial application. It is difficult to weigh the real values or value of software. The best way to estimate software development cost, effort, size, and time is based on previous experience in software development. To measure the standard cost of software, as a unit of software value, machine-learning algorithms are used to increase the level of end user satisfaction through accurate and quick calculations of software cost and effort estimation. In this research work, an innovative cost assessment for software project management was developed using improved artificial neural network models. Two publicly available datasets with different machine learning algorithms are compared and the results show that the proposed model has high accuracy and low error rate in predicting the first phase of cost and effort evaluation.

Gauthaman et al (2021) stated that recently, frustration of programming project is increasing due to lack of planning and limitations of financial planning [2]. Deren et al (2020) applied expense evaluation to board development using an ANN model [3]. Fangwei Ning et al (2020) proposed a three-dimensional CNN for feasibility cost evaluation [4]. Eric Mattel et al (2019) recommended quotes allow project directors to assess the deliverability of activities and feasibly control costs [5]. Mahmood et al (2019) build a product cost evaluation model using AI approach [6]. Michael et al (2018) applied neural convolution computation to cost evolution [7]. Przemys et al (2017) proposed different AI calculations for exertion and time evaluation [8]. TMS Elhag et al (1998) proposed ANNs for the development of programming projects [9]. Richa Yadav et al (2016) opine that the achievement of any enterprise is further characterized by a well developed amount and cost valuation strategy that deals with the ideal utilization of assets [10]. Murat Gunaydin et al (2004) investigate the usefulness of neural organization systems to overcome cost evaluation issues in the early stages of building configuration processes [11].

### Machine learning techniques used

The following machine learning techniques are applied to various datasets that are considered to calculate the effort of a software product. The decision to choose machine learning techniques for the purpose of implementation in the proposed research is made on the basis of previous research studies conducted in the literature survey [12-15]. Many researchers have previously applied some of the following machine learning techniques for their research purpose. But none of these techniques were previously applied for inference using CP, UCP, Web, and SP datasets. Each proposed contribution also describes a detailed representation of the results obtained using these techniques for their respective datasets. Each contribution also shows a detailed comparison of these techniques with first results obtained from the literature to reach their performance.

### Inspiration

The motivation for this paper is to provide the estimation community with a new approach to the estimation problem, which can complement current practices.

- Ineffective results from algorithmic models
- Lack of appropriate techniques to assess software developed using an object-oriented approach
- Lack of applicable procedures to estimate the effort required to develop web-based applications.
- Non-availability of proper estimation techniques for software developed using Agile methodology.

### **Problem Description**

Previous research has shown that approximately one third of projects go over their budget and are delivered late. Two-thirds of the projects exceed their original estimates. It is an exceptionally troublesome task for a manager or system analyst to estimate with accuracy the effort required to develop software, when many external parameters such as vague project definition, technical uncertainty, implementation complexity, team experience, etc. play a significant role. [11] Role. Therefore, project managers are usually not able to determine how much time and manpower will be required for a successful project. However, during the initial phase of SDLC, a valid estimate of the software is necessary to help the organization develop a qualitative product within the planned period.

### **Combative Analysis**

It has been observed in the literature that analysts and practitioners have proposed many techniques for the purpose of software assessment. However, CP, UCP and SPA are among the definitive estimation models used due to their simplicity, rapidity and to some extent accuracy. Taking into account the experimental research work conducted, the research contributions, conclusive comments as well as the scope of future work are included in this thesis. The overall conclusion that can be drawn from the research work displayed in this thesis is that the various findings obtained are certainly beneficial to analysts, experts and product specialists, in light of the fact that CPA and UCP are fundamentally the object of -oriented software was used and adapted. By employing ML techniques to provide more accurate estimation results. To handle web-based applications, the ISBSG Release 12 dataset is employed and then optimized using various ML techniques to predict the outcomes more accurately. Similarly, SPA is an improved estimating model that can be applied to estimate the effort required to develop software using agile methodology. The obtained results have been optimized using various ML techniques to improve the accuracy of the estimated effort value. Of all the techniques used in various chapters, the SVR polynomial performs better in most cases. Each SVR kernel is based on some kernel function. Any operation for that kernel is performed with the help of their respective kernel functions. The RBF kernel uses the exponential function, while the sigmoid kernel uses the sigmoid function. Linear kernel is more preferable for linearly separable data. Therefore, by analyzing the results obtained, it is observed that different results (error and prediction accuracy values) are obtained using different kernels and the results obtained using SVR RBF kernel based effort estimation model are CPA. outperform the results obtained from other models for SPA as well as UCP for web applications. Calculations were performed for the above methods, and results were obtained using MATLAB.

All the models proposed for agile software estimation are developed assuming that an initial project velocity value is given. This value is derived from previous projects developed by the same team under similar working conditions. But when a team is new, the company may not have any track record of it. In that case, no clear assignment can be made to the initial project velocity. The dataset collected from [7] for the purpose of estimating agile software does not provide any information on the types of projects considered for this study. For the results obtained to be valid for the general software engineering paradigm, it is desired to be based on working data that includes all categories of software developed using various agile methodologies.

Comparative analysis shows parameter values obtained by employing all 8 different machine learning algorithms: SVM (on all 4 kernels: linear, polynomial, RBF and sigmoid), RF, SGB, DT, KNN, LR, NB and MLP from 12 More different datasets namely Albrecht, China, COCOMO81, Desharnais, Finnish, Kemmerer, Kitchenham, Maxwell, Miyazaki, NASA18, NASA93, Telecom. 2 details the number of observations used to apply the ML model, with some entries missing in the dataset, which are being ignored for correct results. Some other statistical details like mean, median effort, maximum and minimum efforts are shown in the table.

Table 1.1 provides a comparative study on the Albrecht dataset on applying the ML estimation model. The result shows, MLP gives higher pred accuracy, higher R-square value, minimum MAE then RF and NB. So from above analysis we can say, MLP is better ML algorithm when implemented with Albrecht table 1.2.

**Table 1.1:** Comparative analysis of performance of ML algorithms on ALBRECHT dataset.

Models	Pred (25)	Pred (50)	MAE	MMRE	MMER	MdMRE	R Square	MSE	RMSE
SVM	37.50%	50%	0.0461	0.7629	-1.5324	0.4703	0.8852	0.0040	0.0631
RF	62.50%	62.50%	0.0425	0.7119	0.2155	0.1570	0.9202	0.0028	0.0526
DT	25%	50%	0.1032	0.6764	0.2780	0.1989	0.1877	0.0282	0.1679
SBG	37.50%	37.50%	0.0667	1.7262	0.3734	0.4173	0.8168	0.0064	0.0798
NB	50%	62.50%	0.0464	1.0948	-2.9651	0.4302	0.9072	0.0032	0.0567
MLP	75%	75%	0.0405	0.8617	0.2728	0.1870	0.9284	0.0025	0.0498
LR	37.50%	37.50%	0.0632	1.4789	-0.1823	0.5429	0.8598	0.0049	0.0698
KNN	37.50%	50%	0.0958	0.7200	0.3871	0.2751	0.2892	0.0247	0.1571

Table 1.2 shows a comparison of applying ML models to the China dataset. As can be seen from the results, KNN has the highest prediction accuracy followed by MLP. When it comes to comparing R-squared values, RF comes out ahead, and it has the lowest absolute error. So from the above analysis, it can be concluded that RF performs better with two metrics.

**Table 1.2:** Comparative analysis of the performance of ML algorithms on the China dataset.

Models	Pred (25)	Pred (50)	MAE	MMRE	MMER	MdMRE	R Square	MSE	RMSE
SVM	20%	41.33%	0.0441	1.4281	0.1680	0.6108	0.6914	0.0056	0.0748
RF	10.67%	25.33%	0.0204	0.1367	0.1033	0.0531	0.7453	0.0046	0.0679
DT	22.66%	46.66%	0.0366	1.0713	0.5456	0.5011	0.6409	0.0065	0.0807
SGB	23.33%	46%	0.0436	1.9753	0.4937	0.5501	0.5297	0.0085	0.0923
NB	21.33%	47.33%	0.0415	0.9399	0.3359	0.4545	0.6239	0.0068	0.0826
MLP	27.33%	49.33%	0.0357	0.9481	0.3734	0.5025	0.7015	0.0054	0.0735
LR	26%	46.66%	0.0433	0.9087	0.2739	0.4753	0.4531	0.0099	0.0995
KNN	38.66%	70.66%	0.0332	0.3484	0.3264	0.2142	0.6541	0.0063	0.0792

Table 1.3 provides a comparative study on telecom datasets on applying ML estimation models. As the above result shows, NB and LR gives the highest prediction accuracy, highest R-squared value, lowest absolute error, followed by RF. So we can say that both NB and LR models perform best with telecom dataset.

**Table 1.3:** Comparative analysis of performance of ML algorithms on telecom dataset.

Models	Pred (25)	Pred (50)	MAE	MMRE	MMER	MdMRE	R Square	MSE	RMSE
SVM	16.66 %	33.33 %	0.0570	0.5530	0.2638	0.2353	0.5933	0.0047	0.0689
RF	33.33 %	33.33 %	0.0676	0.7271	0.2233	0.1334	0.4512	0.0064	0.0800
DT	33.33 %	33.33 %	0.0735	0.5899	0.2043	0.0811	0.2811	0.0084	0.0916
SGB	16.66 %	16.66 %	0.1218	1.3561	0.3350	0.3267	-0.5649	0.0182	0.1351
NB	100 %	100 %	0.0016	0.0174	0.0186	0.0055	0.9997	0.0000	0.0017
MLP	16.66 %	16.66 %	0.1904	1.9030	0.4637	0.8072	-3.1509	0.0484	0.2200

Models	Pred (25)	Pred (50)	MAE	MMRE	MMER	MdMRE	R Square	MSE	RMSE
LR	100 %	100 %	0.0016	0.0174	0.0186	0.0055	0.9997	0.0000	0.0017
KNN	16.66 %	33.33 %	0.0974	0.7965	0.3255	0.2324	-0.0452	0.0122	0.1104

There may be many valid arguments to support the appropriateness of models. Relative error measures such as MRE, MMRE and prediction accuracy are measures that are independent of the output value. While estimating the effort of small and large systems with competing relative error is more logical, the concept of relative error appears to be obvious to software academics and practitioners [8]. The use of PRED, which indicates that a higher PRED model has a higher proportion of accuracy, also meets this requirement. When using MMRE to choose between competing models, models with lower MMRE values are better. A low MMRE is taken to indicate minimal uncertainty or inaccuracy and is also used to provide a quantitative assessment of the uncertainty of a prediction [8]. Therefore further statistical analysis is based on the comparison of MMRE value obtained by different ML models and existing work.

Table 1.3 gives a statistical analysis based on the performance of existing estimation models and the proposed model when considering MMRE. In the papers taken into consideration various inference techniques are used such as genetic programming, particle swarm optimization, ensemble learning, deep learning and many others. According to the results, a lower MMRE value is preferred, which indicates minimal uncertainty. In most cases, machine learning models give lower MMRE values except in the case of the Albrecht dataset, which gives lower MMRE values when estimated using analogs. The results obtained show that the machine learning model measures generally reduce the relative error compared to existing models in almost all cases except Albrecht.

On considering prediction accuracy to compare algorithms on different datasets. Albrecht dataset predicts effort accurately with MLP algorithms, COCOMO81, China, Desharnais, Kemmerer and Miyazaki predicts effort accurately with KNNs. The Finnish and Maxwell prediction accuracy is higher when the random forest is applied. The datasets Kitchenham and NASA93 give higher prediction accuracy with DT and stochastic gradient boosting algorithms, respectively. Both NASA18 and Telecom, being two small datasets, provide 100% prediction accuracy with NB and LR.

### III. CONCLUSION

Comparative analysis of effort estimation in machine learning techniques involves assessing and comparing different methods and tools used to estimate the time, resources, and complexity involved in developing a machine learning model.

Effort estimation in machine learning is essential for project planning and resource allocation.

A combination of expert judgment, historical data analysis, and automated tools can provide more accurate and reliable estimates.

Continuous monitoring and adjustment of estimates throughout the project lifecycle is critical to success. To conclude, we believe that our analysis here has highlighted the consistency achieved by Random Forest in almost every case. Specifically, the metrics we used to compare, out of 36 cases for each metric, considering three cases for each dataset, MMRE, MMER, MDMRE; Random forest turnout is more stable after decision tree. On considering the prediction accuracy; Random Forest is more stable and provides accurate results after k nearest neighbors. In the case of R-Square; Naive Bayes, MLP appears to be more accurate, followed by Linear Regression and Random Forest. Overall we can specify that different algorithms have different approaches and nature, which vary with the results obtained.

### IV. FUTURE DIRECTIONS

Future research could focus on improving automated estimating tools, incorporating more advanced machine learning techniques for estimation, and developing standardized practices for the industry.

In summary, estimating effort in machine learning projects is a complex and important task that requires a combination of methods and tools. Each approach has its own advantages and limitations, and the choice of method should be tailored to the needs of the specific project and available data. Automation and data-driven estimation methods are likely to play an important role in improving accuracy and consistency in the future.



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# Generalized Fuzzy Metric Space with its Applications and Fuzzy Mappings

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**Abstract:** Fixed point theory itself is a magnificent combination of analysis (pure and applied), topology, and geometry. Over the last few decades, the theory of fixed points has become a very influential and important tool in the study of nonlinear analysis. In particular the use of fixed-point techniques has been increased enormously in such diverse fields as biology, chemistry, economics, engineering, dynamics, optimal control, game theory, and physics. In this paper, we extend the application of generalized fuzzy metric space and generalized locations with fuzzy mapping such as quasi-pseudo-metric spaces and cone metric spaces. Some assumptions are also acceptable for  $\alpha$ -commuting,  $\alpha$ -weakly consistent mapping,  $L$ -fuzzy mapping for  $L$ -fuzzy sets, and a pair of  $\beta FL - L$ -fuzzy mappings. Based on the above definitions, some interesting coincidence points, common fixed points, and fixed point results are obtained that generalize not only the applications and fuzzy mapping and several important results of generalized fuzzy metric space with multiplayer mapping in recent literature. They do, but also decrease. Some survival theory for the solution of a generalized class of nonlinear integral equations. Some practical examples have also been presented to increase the validity of this work.

**Keywords:** Software, EE, ML, SD, Techniques etc.

## I. INTRODUCTION

While utilizing the topological methods in the theory of differential equations, French mathematician Poincaré initiated the idea of fixed point theory. In 1904, Bohl proved a result about the non-retraction which was preceded by Brouwer and Hadamard in the form of a very famous Brouwer fixed point theorems in 1910. Although this theorem attained a lot of importance and recognition among the existence principles in mathematics it never provided any practical approach towards the calculation of a fixed point. Banach resolved this issue in 1922 by presenting a revolutionary contraction principle (namely called Banach contraction principle) in which the Picard iteration process was used for the evaluation of a fixed point. Since the theorem and its many equivalent formulations or extensions are powerful tools in showing the existence of solutions for many problems in pure and applied mathematics.

Fixed point theory itself is a magnificent combination of analysis (pure and applied), topology, and geometry. Over the last few decades, the theory of fixed points has become a very influential and important tool in the study of nonlinear analysis. In particular the use of fixed-point techniques has been increased enormously in such diverse fields as biology, chemistry, economics, engineering, dynamics, optimal control, game theory, and physics.

From the commencement of modern science until the start of twentieth century, uncertainty was mostly regarded as objectionable in science and the indication was to escape it. This approach progressively changed with the development of probability theory in the field of statistical mechanics. Probability theory effectively defined and categorized the phenomenon of uncertainty and was thought to be appropriate for dealing with all types of ambiguities. With the advent of fuzzy set theory in 1965, a tremendous modification was observed in the classical ideas of probability theory. Irrespective of the expectation of future events, fuzzy set theory is basically concerned with the concepts arising in the linguistic terms of natural languages, such as hot, very hot, warm, cold, educated, highly educated and so on.

Fuzzy set theory / Fuzzy logic comes under Artificial intelligence or soft computing. The other useful tools of soft computing or Artificial Intelligence (A.I) are Artificial Neural Network(A.N.N), Genetic Algorithm (G.A) , Support Vector Machine (S.V.M) , Probabilistic Reasoning etc.

The theory of fuzzy logic of soft computing is based on the notion of relative graded membership, as inspired by the processes of human perception and cognition. Lotfi A. Zadeh published his first famous research paper on fuzzy sets in 1965[1]. Fuzzy logic can deal with information arising from computational perception and cognition, that is, uncertain, imprecise, vague, partially true, or without sharp boundaries. Fuzzy logic allows for the inclusion of vague human assessments in computing problems. Also, it provides an effective means for conflict resolution of multiple criteria and better assessment of options. New computing methods based on fuzzy logic can be used in the development of intelligent systems for decision making, identification, pattern recognition, optimization, and control.

As an important consequence, some real problems can be solved most effectively by using hybrid systems what is increasing the interest on them. The rest and probably the most successful hybrid approach till now are the so-called neurofuzzy systems, although some other hybridations are being developed with great success as, for instance, the genetic fuzzy systems. Soft computing is an emerging collection of methodologies, which aim to exploit tolerance for imprecision, uncertainty, and partial truth to achieve robustness, tractability and total low cost.

### Review of the Work already done on the subject

The concept of fuzzy metric spaces has been studied by many authors in several ways. Kramosil and Michalek [2] introduced the concept of KM-fuzzy metric space as a generalization of probabilistic metric space given by Menger [3] and Schweizer and Sklar [4]. George and Veeramani [5] modified this concept to GV-fuzzy metric space and obtained a hausdorff topology for this kind of fuzzy metric spaces. Fuzzy set theory has applications in applied sciences such as mathematical programming, modeling theory, engineering sciences, image processing, control theory, and communication.

Sintunavarat and Kumam [11] introduced the notion of common limit range property (or (CLR) property) for a pair of maps as a generalization of (E.A) property and prove common fixed point theorems in fuzzy metric spaces. The concept of (CLRg) property for hybrid maps is an extending of single maps. There are some similar results in deferent ways such as [12–14].

Heilpern introduced the concept of fuzzy mapping and proved a fixed point theorem for fuzzy contraction mappings in metric linear space, which is a fuzzy extension of the Banach contraction principle. Subsequently several other authors have studied existence of fixed points of fuzzy mappings. Many authors have proved fixed and common fixed point theorems in metric and fuzzy metric spaces.

Mishra et al. [6] extended the notion of compatible maps under the name of asymptotically commuting maps in fuzzy metric spaces and prove common fixed point theorems using the continuity of one map and completeness of the involved maps. Singh and Jain [7] introduced the notion of weak and semicompatible maps in fuzzy metric spaces and showed that every pair of compatible maps is weakly compatible but the converse is not true in general. Pant [8] initiated the study of common fixed points of non-compatible maps in metric spaces. For a non-compatible maps, Aamri and El Moutawakil[9] introduced a new property named as (E.A) property,Pant [10] studied the common fixed points for non-compatible maps using (E.A) property in fuzzy metric spaces.

### Application

- The most common application of fuzzy controller is Washing Machine which most of us uses in daily life which have fuzzy Controller.
- In Aero plane there is a fuzzy controller.

### Work plan and implications

In this study, some fuzzy fixed point and fuzzy coincidence theorems are proved in various spaces to illustrate the utility of fuzzy fixed point theory. Some interesting notions are introduced in the context of expansion which is helpful in the generalizations of classical results. This study is distributed among seven chapters and each one of the research-oriented sections promotes the diversity of ideas in metric spaces. The intentions behind the first two chapters are to



give a brief introduction of fuzzy fixed point theory, research motivation and the illumination of the elementary concepts to be used in the entire study.

A fuzzy coincidence theorem for a pair of fuzzy mappings satisfying a generalized contraction in a metric space is established in chapter three, which also generalizes the Heilpern contraction theorem for fuzzy mappings. A coincidence theorem for multivalued contractions is obtained as an improvement of the Nadler fixed point theorem. For the existence of the solution of nonlinear integral equations an application of the above-mentioned fuzzy coincidence theorem is achieved, which involves the completeness property of the function space  $(C[a, b], \mathbb{R})$ .

In the same chapter we have also proved some fuzzy coincidence theorems by using MT-function. The last section of this chapter deals with the newly defined concepts of  $\alpha$ -commuting and  $\alpha$ -weakly compatible mapping. A fuzzy fixed point result for two  $\alpha$ -weakly compatible mappings in connection with MT-function is also obtained. Another very fascinating aspect of metric space is quasi-pseudospace. The concepts of K-Cauchy sequences and K-sequentially complete quasi-pseudo-metric spaces are the two forceful inspirations behind chapter four. In this chapter, some local versions of fixed point theorems satisfying Banach, Kannan, and Chatterjea type fuzzy contractive conditions in a left(respectively right) K-sequentially complete quasi-pseudo-metric space are obtained. Our analysis is based on the fact that fuzzy fixed point results can be obtained from the fixed point theorems of multivalued mappings with closed values. An interesting example is also generated for the clarification of results.

Another remarkable feature of fuzzy set theory is associated with the concept of L-fuzzy sets. For the purpose of extension and modification of classical ideas related to fuzzy sets, an innovative notion of L-fuzzy mappings is introduced in chapter five. Motivated by the concept of admissible mappings, an interesting idea of  $\beta_{FL}$ -admissible for a pair of L-fuzzy mappings is also established. On the basis of these definitions, a common L-fuzzy fixed point theorem is proved. The last section of this chapter establishes some new coincidence (and fixed-point) results in connection with a contractive relation (depending upon newly defined notions of  $D_{\alpha L}$  and  $d^{\infty}_L$  distances) on a sequence of L-fuzzy mappings and a single valued crisp mapping in a complete metric space. This result not only generalizes several important results of fuzzy mappings and multivalued mappings in the current literature but also discuss an existence theorem for the solution of a generalized class of nonlinear integral equations.

Cone metric spaces hold a very strong position amongst all the emerging branches of metric spaces, where the distances are considered in the form of vectors from an ordered Banach space. In [1], Jankovi'c et. al. prove that every fixed point result in cone metric spaces, for which the conjecture that the underlying cone is normal and solid holds, may be reduced to the corresponding result for metric spaces. But the situation is different for non-normal solid cones. In chapter six, some L-fuzzy fixed point results for local and global contractions in the context of cone metric spaces, by exempting the normality on cone, are achieved. A homotopy result is also obtained as an application.

Fuzzy set theory is generalization of the classical or crisp set. Let X be Universal set. The crisp set is defined in such a way as an element will be either a member or non member of a set and its characteristic function will be expressed as  $\chi_A : X \rightarrow \{0, 1\}$

The function can be generalized such that the values assigned to the elements of the universal set X fall within a specified range [0,1] and indicate the membership grade of the elements in the set. Larger values denote higher degrees of element membership. Such a function is called a membership function and is defined as

$$\mu_A : X \rightarrow [0, 1]$$

Thus a Fuzzy set  $\tilde{A}$  is defined  $\tilde{A} = \{(x, \mu_{\tilde{A}}(x)) : x \in X\}$

Where  $\mu_{\tilde{A}}(x)$  is the grade of membership of the element of X in A i.e  $x \in A$  where  $A \subseteq X$ .

There are various notations to denote fuzzy set of a set & its membership function. Here we used  $\tilde{A}$  as fuzzy set,  $\mu_{\tilde{A}}$  as membership function &  $\mu_{\tilde{A}}(x)$  as degree of membership for element of X.

The significance of Zadeh's contribution was that it challenged not only probability theory as a sole agent for uncertainty; but the very foundations upon which the probability theory is based, Aristotelian two-valued logic. For when A is a fuzzy set and x is a relevant object the proposition x is a member of A is not necessarily either true or false as required by two valued logic, but it may be true only to some degree the degree to which x is actually a member of A.

Fuzzy Theory not only helps in the representation of the measurement of uncertainties but also gives a meaningful representation of vague concepts in a simple natural language.

Let  $X$  be any metric linear space and  $d$  be any metric in  $X$  &  $\mu_{\tilde{A}}(x)$  is the grade of membership of the element of  $X$  in  $A$  i.e  $x \in A$  where  $A \subseteq X$ .

The Collection of all fuzzy sets in  $X$  is denoted by  $\text{Tau}(X)$ .

Let  $\tilde{A} \in \text{Tau}(x)$  and  $\alpha \in [0,1]$ . The  $\alpha$ -level set of  $\tilde{A}$  is defined by

$$\tilde{A}_{\alpha} = \{x: \mu_{\tilde{A}}(x) \geq \alpha\} \text{ if } \alpha \in [0,1]$$

$$\& \tilde{A}_0 = \{x: \mu_{\tilde{A}}(x) \geq 0\}$$

Now we distinguish from the collection  $\text{Tau}(X)$  a subcollection of approximate quantities denoted by  $W(X)$ .

Defination 5.4.1. A fuzzy set of  $X$  is an approximate quantity iff its  $\alpha$ -level set is a compact convex subset (non fuzzy) of  $X$  for each  $\alpha \in [0,1]$ , and  $\sup \mu_{\tilde{A}}(x) = 1$ .

When  $\tilde{A} \in W(x)$  and  $\mu_{\tilde{A}}(x_0) = 1$  for some  $x_0 \in X$ , we will identify  $\tilde{A}$  with an approximation of  $x_0$ .

## II. CONCLUSION

In this study, we prove some generalized coincidence points, common fixed points and fixed point theorems in various spaces, like metric spaces, quasi-pseudo-metric spaces and cone metric spaces by using different contractive conditions for fuzzy mappings. For the development of the theory some notions, namely  $\alpha$ -commuting,  $\alpha$ -weakly compatible mapping, L-fuzzy mappings for L-fuzzy sets,  $\beta$ FL -admissible for a pair of L-fuzzy mappings are also established. On the basis of the above definitions some interesting results are obtained, which not only generalize many important results of fuzzy mappings and multivalued mappings in the current literature, but also deduce few existence theorems for the solution of generalized class of nonlinear integral equations. With the inception of fuzzy theory it get importance due to his human behavior and in every field of mathematics e.g Analysis, topology, Matrix, algebra ,approximation and a lot of etc even in other field it get importance due to its practical human behavior. Many of the researchers are now working on Hybridization by using Fuzzy Theory with some other already established theory. Due to its humanitarian behavior & result it get be better used in medical Science, Engineering etc.

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# Financial Inclusion and Scheme Awareness of the Urban Poor in India with Special Reference to the Slums of Ajmer City, Rajasthan State

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**Abstract:** The term "financial inclusion" has gained importance since the early 2000s, a result of findings about financial exclusion and its direct link to poverty. The study of financial inclusion of slum dwellers in Ajmer city is of international importance. The importance of financial inclusion of poor people is being increasingly recognised. Much research has been done on financial inclusion of poor people, but not specifically on slum dwellers. Such research will highlight the awareness of slum dwellers regarding financial inclusion. Policy makers have now started giving importance to the financial inclusion of the poor people in India. In this study an attempt will be made to analyze the economic condition of the slum dwellers of Ajmer city. As a result, the awareness of slum dwellers about financial inclusion plays a very important role here. The objective of this research study is to understand the importance of delivery of financial services at an affordable cost to the underprivileged and low income section of the society.

**Keywords:** Poor, Urban, India, City, Awareness etc

## I. INTRODUCTION

The term "financial inclusion" has gained importance since the early 2000s, a result of findings about financial exclusion and its direct correlation to poverty. The Reserve Bank of India (RBI) set up the Khan Commission in 2004 to look into financial inclusion and the recommendations of the commission were incorporated into the mid-term review of the policy (2005–06). In the report RBI exhorted the banks with a view to achieving greater financial inclusion to make available a basic "no-frills" banking account. In India, financial inclusion first featured in 2005, when it was introduced by K.C. Chakraborty, the chairman of Indian Bank. Mangalam became the first village in India where all households were provided banking facilities. Norms were relaxed for people intending to open accounts with annual deposits of less than Rs. 50,000. General credit cards (GCCs) were issued to the poor and the disadvantaged with a view to help them access easy credit. In January 2006, the Reserve Bank permitted commercial banks to make use of the services of non-governmental organizations (NGOs/SHGs), micro-finance institutions, and other civil society organizations as intermediaries for providing financial and banking services. These intermediaries could be used as business facilitators or business correspondents by commercial banks. The bank asked the commercial banks in different regions to start a 100% financial inclusion campaign on a pilot basis. As a result of the campaign, states or union territories like Pondicherry, Himachal Pradesh and Kerala announced 100% financial inclusion in all their districts. Reserve Bank of India's vision for 2020 is to open nearly 600 million new customers' accounts and service them through a variety of channels by leveraging on IT. However, illiteracy and the low income savings and lack of bank branches in rural areas continue to be a roadblock to financial inclusion in many states and there is inadequate legal and financial structure. The government of India recently announced "Pradhan Mantri Jan Dhan Yojna" a national financial inclusion mission which aims to provide bank accounts to at least 75 million people by January 26, 2015.

## II. LITERATURE REVIEW

Srikanth .R, (2013) A Study on - Financial Inclusion - Role of Indian Banks in Reaching Out to the Unbanked and Backward Areas. This study concluded that Financial inclusion has, in reality, far reaching positive consequences



which can help resource poor people to access the formal financial services in order to pull themselves out of abject poverty. The focus on the common man is particularly imperative in India as he is the more often ignored one in the process of economic development. Indeed, with the process of financial inclusion, the attempt should be to lift the resource poor from poverty through coordinated action amongst the banks, the government and other related institutions in order to facilitate access to bank accounts and other related services.

K. Hema Divya, (2013), A Study On Impact Of Financial Inclusion With Reference To Daily Wage Earners. From the above study, it is concluded that there is more need to educate and create some new instruments for daily wage earners and also make them a part of financial inclusion.

Nilanjan Bhattacharjee, (2014), financial inclusion of the identified slum dwellers in Assam: Many slum dwellers are still not aware of various financial schemes and they are reluctant to take the advantages of formal financial sector. These people are usually go for borrowing a heavy amount of loans from the informal sectors for meeting their requirements. They habitually park their investable surplus funds to the unorganized sectors with the expectation to earn more profit within a shorter period, but it is very unfortunate to mention here that most of these unorganized sectors usually manipulate them and try to grab their investible surplus by providing various ponzi schemes. Therefore, financial literacy and financial awareness among these groups of people are very important and distance from the formal financial sectors is not a major factor of financial exclusion in urban areas. To create awareness and improve financial literacy level in the identified slum dwellers, Government of India and RBI should come forward to frame some effective policies and implement it through appropriate governance so that universal banking services can be extended to the un-served.

Deepak and Prakash (2014) identified various initiatives of the RBI in crafting & delivering financial schemes, oriented towards those groups who are financially excluded. On the other hand, the study also comprehends the policy schemes of the government considering factors such as poverty, illiteracy (financial illiteracy) and Human Development Index. It also outlines the fact that financial inclusion is contemplation unless inclusive growth is achieved.

The purpose of this study by Joseph and Deshmukh (2015) is to comprehensively understand the perception of bank employees towards Financial Inclusion Policy and study the impact of perceived organizational support and affective commitment on its better implementation. The authors did a descriptive research while analyzed the data gathered through primary sources and discussed their viewpoints and interpreted the results. The findings of the study are that there is a strong relationship between affective commitment and other variables. There is a strong positive correlation in perceived superiors support and perceived organizational support.

Shah (2016), the book published by the author highlights about the awareness of Financial Inclusion in India, various issues and challenges associated with it, the book by the author also speaks about how Financial Inclusion act as a roadmap for development of the country, Role of Co-operatives bank Financial Inclusion and inclusive growth, and beginning of PMJDY.

### **2.1 Inclusive Growth through Financial Inclusion**

India has seen rapid growth since the 1991 economic reforms. But in recent times the topic "inclusive growth" has gained importance in the developing economies of the world which has become the subject of intense discussion among policy administrators. The term "inclusive growth" can be explained as a fair distribution of wealth throughout society that creates opportunities for all and benefits all sections of society. The phenomenon of inclusive growth can be achieved when every member of the society participates in the economic development process without any prejudice, irrespective of their individual ability. "It lays emphasis on providing equal opportunities, empowering the community by providing education and skill development, especially to the poorer sections and to the maximum extent possible" (Planning Commission, 2007).

For achieving rapid and disciplined growth, timely entry of financial resources is a pre-requisite. The challenge for the administrators is to make it available equally to every part of the country. But, achieving inclusive growth requires resources and FIs are needed across the country to generate resources and operate it.

## 2.2 Concept of financial inclusion

Financial inclusion can be explained as “the process of ensuring access to financial services and timely and adequate credit, where available to vulnerable groups such as weaker sections and low-income groups, at an affordable cost” (Rangarajan Committee, 2008) is required. FI is essential to a more inclusive development process and mainstream financial service providers play a major role in promoting the inclusive development process.

FI helps in accelerating "economic growth and development" by creating job opportunities which ultimately affects the economic and social welfare of the people of the country. A comfortable and proper access to financial resources helps the marginalized people and owners to generate income for small enterprises, channelize their uneven cash inflows and outflows, spend into good business opportunities, shake manage the elasticity of poverty and come out of the vicious circle of poverty.

## 2.3 Supply and Demand Sides of Financial Inclusion

### 2.3.1 Demand side of financial inclusion

As already stated, an inclusive financial system should ensure access, quality and use of financial services and schemes by all concerned. The term FI can be understood by looking at its demand and supply side. From the demand side, there are individuals or customers for banking schemes and services, especially marginalized people who belong to the weaker section of the society. Their financial inclusion is based on a number of factors (identified from the literature review) which may include:

- Karthikeyan (2011) discusses the factors affecting the status of FIs in the country. On the part of the users of financial services culture, financial literacy, income and wealth, gender and distance of residence from financial institutions are the most prominent factors of financial exclusion.
- Chakraborty (2012) found lack of financial awareness, irregular income among individuals, lack of trust in formal financial system, demographic variables (gender, education qualification, cultural values etc.) are common demand side factors for financial exclusion.
- KanithaTambunlertchai (2017) concluded that insufficient income among individuals results in low savings which ultimately leads to low use of formal networks. Second, individuals working in the informal sector are less likely to have access to formal financial schemes regardless of the fact that they are self-employed or employed elsewhere. They also recognized that low education is another socio-economic factor that has a major impact on the use of financial schemes among individuals.

### 2.3.2 FI- supply side

A vast structured network of FFS has been created in the country to cater to the financial needs of various sections of the society. The Reserve Bank of India and the Government of India regulate the supply side of financial inclusion with an elaborate system of commercial banks in India. Apart from this, there is also a network of Regional Rural Banks, MFIs, Cooperative Banks, Self Help Groups, Insurance Corporations which regulates the process of FI in India. Despite the efforts made by GOI and RBI there are certain factors which slow down the course of FI in India. These are stated as follows:

- According to the report published by Forum IAS on Financial Inclusion Challenges (2019) Inappropriate financial schemes and services, attitude of employees, improper identity proof, high transaction cost are some of the barriers on the part of financial services providers that slow down the process in India In F.I.
- Akhil Damodaran (2016) in his research paper, "Financial Inclusion: Issues and Challenges" talks about the various ways to increase the reach of FIs in India. The government should increase the bank penetration in the rural and semi-urban counterparts of the country. Secondly, banks should develop schemes which are simple, reasonable and suit the wishes of all sections of the society. The role of MFIs and NGOs should be increased to provide monetary services in unreached areas. Third, banks and telecom service providers should come together to make accessible “mobile banking schemes” affordable. Lastly, special discount bank services should be provided in rural areas as compared to urban area. The ROI in rural areas may be kept lower than in urban areas or the interest paid on "Savings Bank Account" may be higher as compared to the savings bank account of urban people.

#### 2.4 Functions of Commercial Banks in the Process of Financial Inclusion

FI is the delivery of banking and other financial services to the underprivileged and underprivileged section of the society at a reasonable cost. This is the phenomenon through which the gap between the poor and the rich can be reduced. FI is one of the topmost priorities of Government of India and RBI and the network of CBs has successfully implemented government policies across the country through "Bank led model". Banking outreach has increased substantially in the last few decades. The total number of SCBs is increasing with each passing year including both rural and urban areas. Most of the policies of the Government of India towards financial inclusion are implemented through the banking system of India as it has a pan India reach and this fact can be proved as the number of scheduled commercial banks branches as of November 2018 stood at 2, 03,806.

The position of commercial banks towards achieving financial inclusion is:

- **Proliferation of FL:** It is a proven fact that one of the demand side barriers to financial inclusion is the lack of financial literacy among users of financial services. Financial literacy can be defined as the knowledge required to administer personal finances.
- **Credit Counselling:** It is a phenomenon which is concerned with educating the banking customers about how to avoid recurring bad loans. Credit counseling depends on the type of customers of the banks.
- **No Frill Accounts:** A no-frills account is a bank account that can be opened and maintained with zero balance, levies zero or insignificant fees and does away with unnecessary services or frills.
- **Opening of training centers for the employees:** To make the banking system more efficient to address the problems of the poor and marginal customers, training camps can be organized for the bank personnel so that more and more people can be connected to the banking system
- **Other Measures:** Several measures are taken by commercial banks for FI in the country. This includes deployment of Business Correspondents, KCC and GCC, relaxation of KYC norms, mobile banking, branch expansion etc.

#### 2.5 Committees on Financial Inclusion

##### Dr. C. Rangarajan Committee on FI

In 2006, the GOI constituted a task force to look into the matter of financial inclusion, headed by Dr. C. Rangarajan.

##### Raghuram Rajan Committee on Financial Sector Reforms

In 2007, GO constituted a working group under the chairmanship of Dr. Raghuram Rajan to propose the next generation of financial sector reforms in India. The committee presented its findings in a report titled "One Hundred Small Steps". The committee highlighted several concerns on the Indian banking system.

##### Deepak Mohanty Committee on the medium term path on Financial Inclusion

In 2015, the RBI constituted the committee to look into the current policies on financial inclusion and outline a "medium-term action plan" regarding credit, deposits, payments, insurance, pension and social benefit transfers.

##### Dr. K.C. Chakraborty-FI: Perspectives and Issues

RBI Deputy Governor Dr. K.C. Chakraborty in his lectures on "Financial Inclusion and Banks - Issues and Perspectives" (October, 2011), "Financial Inclusion - A Road India Needs to Travel" (September, 2011), "Financial Literacy and Consumer Protection" (April, 2011), 2012 and "Financial Inclusion in India - The journey so far and the way forward" (September, 2013), addressed the issue of financial inclusion.

#### 2.6 SLUMS

##### A CONCEPTUAL DISCUSSION

A slum is a heavily populated urban informal settlement characterized by substandard housing and squalor. A slum is generally seen as a blighted area, with deteriorated physical and social conditions of people and increasing tendency for culturally unwanted activities. A slum is a persistent feature of a developing city where the basic amenities of life are characteristically lacking or in short supply. (Singh 1972) While slums differ in size and other characteristics from country to country, most lack reliable sanitation services, supply of clean water, reliable electricity, timely law enforcement and other basic services. Slum residences vary from shanty houses to professionally-built dwellings that

because of poor-quality design or construction have deteriorated into slums. The term 'slum' is thus a typical outcome of the wider modern processes of industrialization and urbanization

**SLUM DWELLERS:** Slum dwellers are people living in badly built and dirty crowded houses with deteriorated physical conditions, extremely poor living standards and morals, poverty, unemployment, broken home picture and prevalence of chronic vices and notorious character.

**NO-FRILLS ACCOUNTS:** Basic banking no-frills account is with nil or very low minimum balance as well as charges that make such accounts accessible to vast sections of the population. Banks have been advised to provide small overdrafts in such accounts.

### 2.7 Need for Financial Inclusion in India

Despite witnessing significant progress and changes in the financial sector in India, almost half of the rural households certainly do not have access to any source of funds regulation, which is very disappointing. Barely one-fourth of the rural households are guided and helped by the banks. Consequently, the major task for the banks is to bring the excluded or neglected majority i.e. 75% of the rural households into the banking fold. This is going to be a difficult task as these rural households are either uneducated, poor or unorganized and moreover, they are widely spread. With the help of banks, NGOs and local development agencies, there should be introduction of new and increased economic activities which will only improve their standard of living. First step first, it is very important to get a decent and proper appreciation and knowledge about their profile. Also, there is a need to know their assessment and understanding about the bank and its services.

With this arise two needs: increasing financial literacy to be seen by the formal financial system and financial inclusion and concern among farmers to be addressed by financial advisors. As a part of Corporate Social Responsibility, Indian banks and financial market players are expected to undertake such programs with regard to creating awareness about the implications of loans, calculation of interest, and other information on overall features of banking for mindful decisions. The emphasis should be on support. Banks should organize a full day program for counseling their customers including small borrowers, especially farmers. Working in this field requires a lot of work and involvement.

### 2.8 Importance of Financial Inclusion in India

Despite the country's winning economic growth rate compared to most developed countries in recent years, a large proportion of India's population remains unbanked. In India, financial inclusion aims at changing the dynamics of the underprivileged by providing financial services at affordable prices and being aware of the fact that it is a relatively new socio-economic concept; The poor may otherwise not be aware and informed or may not be able to afford these services. Extension of financial services to all sections of the society is of utmost importance to achieve inclusive growth and development and this is clearly stated by the global trends. For every person who is involved in the intermediaries of banks/NBFCs, and the left out urban population; Financial inclusion is a win-win opportunity overall in urban as well as rural as well as economically backward areas.

### 2.9 Financial Inclusion Schemes in India

Government of India is introducing various special schemes to enhance financial inclusion. The objective of these schemes is to provide social security to the less fortunate sections of the society. After much planning and research by many financial experts and policy makers, the government launched schemes keeping in mind financial inclusion. These schemes have been launched in different years. Let us make a list of financial inclusion schemes in the country:

Pradhan Mantri Jan Dhan Yojana (PMJDY)

Atal Pension Yojana (APY)

Pradhan Mantri Vaya Vandana Yojana

Stand Up India Scheme

Pradhan Mantri Mudra Yojana

Pradhan Mantri Suraksha Bima Yojana (PMSBY)

Sukanya Samridhi Yojana

Jeevan Suraksha Bandhan Yojana

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Credit Enhancement Guarantee Scheme (CEGS) for Scheduled Castes (SC)  
Venture Capital Fund for Scheduled Castes under Social Sector Initiatives  
Senior Pension Insurance Scheme (VPBY)

### 2.10 Profile of Slums in Ajmer

Ajmer District is a district of the state of Rajasthan in western India. The city of Ajmer is the district headquarters. Ajmer District has an area of 8,481 km<sup>2</sup>, and a population of 2,583,052 (2011 census). There are 1,869,044 Hindus, 244,341 Muslims and 47,812 Jains. The district is situated in the center of Rajasthan, and is bounded by Nagaur district to the north, Jaipur and Tonk districts to the east, Bhilwara district to the south, and Pali district to the west.

Rajasthan State Slum Policy, 2012, defines slum as defined by Pronab Sen Committee Report i.e. "a slum is a compact settlement of at least 20 households with a collection of poorly built tenements, mostly of temporary nature, crowded together usually with inadequate sanitary and drinking water facilities in unhygienic conditions". Ajmer city has 67 notified slums<sup>1</sup> which are mostly located within the city centre. Some of the informal settlements are more than 30 years old. The slums in outer areas of Ajmer are formed by newly migrated settlers in the city. There are 43 non-notified informal settlements and 2 resettled informal settlements in the city. Along with proper Solid Waste Management, proper drainage facility is urgently required in the city. During monsoons Ajmer city is often flooded without any proper outlets for water. The drains are often clogged with solid waste which blocks the easy flow of sewage and waste water. Some of the drains which play important role in drainage pattern of the city are: Bandi river, Kazi ka nallah, Arihant colony drain, Anted chatriyोजना drain, Vaishali diversion channel, Anasagar escape channel, Brahmपुरi drain, Anderkotmadar gate drain. Indiscriminate discharge of solid waste from the nearby areas into these drains regularly results in unhygienic environment, which gives rise to many public health issues.

The process of mapping informal settlements started with gathering secondary data from different sources and studying the data for better understanding of the city. The secondary data included list of notified slums with names of heads of households from Ajmer Municipal Corporation, 2011 Census Reports, latest map showing the wards, Master Plan and City Development Plan of Ajmer and various other reports prepared under JNNURM. It also involved a number of interactions with various stakeholders in the city. The stakeholders included Ajmer Municipal Corporation officials and councillors, ex-councillors, ward development committees, and community leaders of Lohar, Sansi, Banjara, and Harijan Communities. PRIA team also interacted with organisations like Senior Citizen Council of Ajmer, media representatives working on smart city and sanitation issues and different NGOs working in the city. These stakeholder interactions and analysis of secondary data have helped us in understanding the city and identifying and locating the notified, non-notified, and resettled slum locations in the city. The consultation process also involved Rajiv Awas Yojana (RAY) officials who worked previously in the city. The process of consultations helped the team in identifying citizen leaders and taking further steps.

As data means raw information collected from various sources, there is a need to filter this raw information so that some important conclusions can be drawn from it. It has to go through a sequence of analysis and conclusions must be drawn accordingly before its meaning and interpretations can be understood. Various statistical tools are to be used for testing hypotheses and for drawing conclusions and inferences about the relationship between variables. In this research study Descriptive Statistics, Exploratory Factor Analysis, Mann-Whitney Test, Kruskal-Wallis H Test, Wilcoxon Signed Rank Test, Ranking method using SPSS 16 and MS Excel has been implemented to achieve the objectives.

### III. CONCLUSION

The need of the present study can be summarized in the following points:

- The literature on FI mainly deals with the discussion on the level of FI in rural counterparts of India. Thus, it is necessary to examine the issues and problems of the urban population so that a suitable action plan can be formulated to include the vulnerable section of the society.
- The main reason for the exclusion of people from the formal financial system is attributed to the supply side of the providers of formal financial services ie FIs. There is a missing link in the demand side literature, particularly with regard to the urban poor, that has to be filled.



- Even though there is empirical evidence to support the fact that a strong operational FS plays a major role in efficient distribution of resources resulting in inclusive growth in the country. But there are certain constraints and problems faced by financial service providers including large sections of the community covered under FFS. Thus, apart from looking at the macro aspect of financial exclusion, it is necessary to examine the problems faced by FIs by commercial banks which form a micro view of the concept of financial exclusion.
- Therefore, this study is a modest attempt to fill the existing gap and complete the missing literature link and study the nature of FI among the urban poor as well as the demand side factors affecting FI in the country. The problems in implementation of Government and RBI schemes faced by Scheduled Commercial Banks will also be examined. This would be a worthy study to help administrators and educationists to develop suitable schemes in achieving the goal of full FI in the country.

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# An Analysis of the Factors Influencing the Buying Behavior of Young Consumers of Branded Goods

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**Abstract:** India is the country with the largest youth population in the world. As we know that information or a potential customer database is essential to survive in the market and develop a competitive edge for the success of any business. The objective of this article is to explore the factors that influence the behavior of customers purchasing branded goods in the Indian market. This is a conceptual paper based on secondary data with the help of content analysis. The result reflects towards the factors that influence the purchasing behavior of young customers in making purchase decision of branded goods in India. Celebrity endorsement and brand image are some of the factors that influence Indian young customer purchasing behavior. The key findings of the research can help policy makers and managers design and implement strategies to encourage purchasing.

**Keywords:** Customers, Consumer Buying Behaviour, Branded Goods and Youth etc

## I. INTRODUCTION

There are many factors affecting consumer behaviour. All these factors jointly shape consumer behaviour. Due to the influence of various factors, consumers react or respond to marketing program in different ways. For the same product, price, promotion and distribution, their reactions vary greatly. The factors do not affect all buyers equally; They have different effects on their behavior. However, some factors are more dominant, while others have negligible influence on consumer behavior.

There can be several important factors to analyze the factors influencing the behavior of young customers to buy branded goods. Some of the following factors may be important in this process:

- Brand Value: Brand value is important for young customers. They prefer brands that have value and are compatible with them. They buy based on the value of the brand.
- Youth Clothing and Fashion: Young customers may be more critical of clothing and fashion products. They prefer products with innovative and modern designs.
- Values and Discounts: Values and discounts can be important to young customers. They can wait for discounts and sales opportunities.
- Social media influence: A brand's reputation and influence on social media can also be important. Young consumers can take a look at the brand's direction on social media and be a part of promoting the brand in their community.
- Product quality and performance: Product quality and attractive performance may also be important to younger customers. This can impact their buying process.
- Publicity and promotion: Good publicity and promotion can also be important for young customers. How they got to know the brand and what type of promotion they prefer can be important to keep in mind.

Social and mental maturity: The social and mental maturity of young customers can also influence their behavior. Understanding their social and psychological contexts may be important.

**Here are 5 major factors that influence consumer behavior:**

- psychological factors
- social situation

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- cultural factors
- personal factors
- economic factors

## II. BRAND AWARENESS

Brand awareness is the extent to which consumers are able to recall or recognize a brand in a variety of situations.[1] Brand awareness is one of two dimensions of brand knowledge, an associative network memory model.[2] Consumer behavior Brand awareness is an important consideration in advertising management and brand management. A consumer's ability to recognize or remember a brand is important in making purchasing decisions. A purchase cannot proceed unless the consumer first becomes aware of a product category and the brands in that category. Awareness does not mean that the consumer should be able to remember a specific brand name, but rather that they should be able to remember enough distinctive features to proceed with a purchase. Creating brand awareness is the main step in advertising a new product or bringing an old brand back into light.

Brand awareness consists of two components: brand recall and brand recognition.[2] Several studies have shown that these two components work in fundamentally different ways because brand recall is linked to memory retrieval, and brand Recognition involves object recognition. Both brand recall and brand recognition play important roles in consumers' purchase decision process and marketing communications. Brand awareness is closely related to concepts such as generating set and consideration set, which include the specific brands that a consumer considers in a purchasing decision. Consumers are believed to have three to seven brands in mind across a wide range of product categories. Consumers typically purchase one of the top three brands in their consideration set because consumers have shown to only purchase familiar, well-established brands. [3]

As brands compete in a highly globalized marketplace, brand awareness is a key indicator of a brand's competitive market performance.[4] Given the importance of brand awareness in consumer purchasing decisions, marketers have developed other measures of brand awareness and brand health. Have developed several metrics designed to measure. These metrics are collectively known as awareness, attitude, and usage (AAU) metrics.

To ensure market success of a product or brand, awareness levels must be managed throughout the product life-cycle – from product launch to market decline. Many marketers regularly monitor brand awareness levels, and if they fall below a predetermined threshold, advertising and promotion efforts are intensified until awareness returns to the desired level.

## III. LITERATURE REVIEW

Buying Analysis: There are mainly five stages in the consumer decision process (SS Anjana 2018), the brand plays an important role in creating a positive image among the customers. A brand name has the ability to create loyal customers as well as maintain the company's market share. Loyal customers always remain loyal or loyal to a brand, they repurchase it and through word of mouth they recommend it to others.

Loudon and Della Bitta (1988) state that customers obtain an idea or feeling about a brand image from a variety of sources.

Quality: Quality plays an important role in assessing product purchase intent. Product quality indicates the extent to which the product is performing its intended function and is considered as an important factor that influences brand choice. (Khan and Rohi, 2013) Quality can also be defined as the difference that the customer perceives in the actual level of performance compared to the perceived level of performance.

Brand: (Durani, Godil, Baig & Sajid, 2015) According to other researchers, it is proposed that brand image is the variable that can increase the level of business performance because better brand image always results in positive behavior of the customer towards the particular brand. Is. (Malik et al, 2013)

Price: Levy and Weitz (2012), states that loyal customers are willing to buy the product even if its price is high. The company always gives more attention and care to the loyal customers and takes necessary steps to retain them as they bring more profits to the firm.

### 3.1 Research Objective:

- To find out the factors influencing consumer purchasing behavior of branded goods.

## IV. RESEARCH METHODOLOGY

The research approach is qualitative based on exploratory research design, the tool used to analyze data collected from literature review based on content analysis. Secondary data was collected from various available sources through literature survey and desk research referring to e-libraries etc. The proposal is developed on the basis of literature:

Factors influencing the behavior of young consumers purchasing branded goods in India.

Review of literature and other available information from various published and unpublished reports. Magazines, books, newspapers etc. (including databases like EBSCO, Pro-Quest, Emerald, Google Scholar) that explore various customer factors that lead to buying a brand.

## V. DISCUSSION AND RESULTS

Statement 1: New styles of clothing appear in the market, which influence young customers who purchase branded goods.

Branding is an important marketing tool for manufacturers today (Motameni and Shahrokhi, 1998). The value of a brand and its perception govern the purchasing patterns of products and services (Kotler et al., 2001). Clothing is especially a way of communicating one's self-image to the environment. The apparel industry is a business where branding is a common way for companies to differentiate themselves from the competition and gain a competitive advantage. According to Baskin, (2003).

Statement 2: Famous branded clothes influence young customers who buy branded goods to impress people.

Brand loyalty is one of the key factors influencing consumers' brand preference. One of the most widely shared definitions of brand loyalty was that of Jacoby and Kiner, (1973). It was described as a biased behavioral response expressed over time by some decision-making entity with respect to one or more alternative brands from a set of such brands, it involves a psychological (decision making, evaluation) process. (Bozo et al. 2003).

Statement 3: Quality influences the behavior of young consumers in purchasing branded goods.

Quality plays an important role in assessing product purchase intention. Product quality indicates the extent to which the product is performing its desired function and is considered as an important factor that influences the choice of brand. (Khan and Rohi, 2013) Quality can also be defined as the difference that the customer perceives in the actual level of performance compared to the perceived level of performance.

Statement 4: Advertising influences the behavior of young consumers of branded goods.

Advertisements are the most important influential media for this generation. Any method through which information is given to the buyer to build a profile of the brand or its values is known as promotion, (McCarthy and Perreault, 1984). It includes various methods used for promotion such as advertising, sales promotion techniques, word-of-mouth referrals, etc.

It is observed that they usually remain neutral regarding wearing branded clothes to impress people. People are saying that they generally like or are neutral towards the price of branded clothes, for them the high price is not an issue. Most of the people show their consent that they wear branded clothes to look attractive. It has been found that people prefer to wear branded clothes in place of non-branded apparel, even though higher prices and advertisements influence the buying behavior of young customers of branded goods. Branded apparel influences the behavior of young customers to shop for branded goods just because you want to look more attractive. To be attractive and impress people. The cost of branded clothes is not a big issue for the people.

## VI. CONCLUSION

India is a vast country with a vast number of heterogeneous population spread across different regions of the country. Each of these regions has its own unique characteristics which are reflected on the consumption behaviour, attitudes, beliefs and values of the individual, it is almost like catering to different markets of the country. With the luxury market growing at a phenomenal rate, it is very important for international brands and markets to understand this, and build their marketing plans accordingly. Based on previous research, analysis of the current study and obtaining views from



expert luxury marketers, the researcher has made the following recommendations that will facilitate international marketers and brands to adapt marketing pitches to different segments of the youth population of India, and successfully tapping the potential booming market.

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# An Analysis of the Application of Machine Learning and Artificial Intelligence in Cancer Diagnosis in the Future

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**Abstract:** *If you are interested in the field of health and want to know about the use of computers in the field of health, then this article is only for you, because today in this article we will tell you in detail about the usefulness of computers in the field of health. Will tell Medical professionals use computers extensively to make better decisions about treating patients, Medical imaging is a method of visualizing body parts to make accurate predictions. Modern biomedical research has also become increasingly focused on bringing AI technology into clinics safely and ethically. AI-based assistance to pathologists and physicians is a major step towards predicting disease risk, diagnosis, prognosis and treatment. The clinical applications of AI and machine learning (ML) in cancer diagnosis and treatment are set to guide the future of medicine towards rapidly mapping a new treatment for each individual. Using AI base systems approach today can collaborate and digitally share knowledge to potentially heal millions of lives. In this paper, we look at combining biology with artificial intelligence as the game-changing future in clinics and how AI-based assistance can help oncologists to tailor precise treatments.*

**Keywords:** AI, ML, CS, Clinical, Digital etc

## I. INTRODUCTION

Research in the 1960s and 1970s produced the first problem-solving program or expert system, known as Dendral.[9] While it was created for applications in organic chemistry, it led to a later system Provided the basis for MYCIN, which is considered one of the most important early uses of artificial intelligence in medicine. MYCIN and other systems such as INTERNST-1 and CASNET have not gained routine use by physicians.

The 1980s and 1990s saw the proliferation of microcomputers and new levels of network connectivity. During this time, it was recognized by researchers and developers that AI systems in health care should be designed to accommodate the absence of accurate data and to build on the expertise of physicians. Approaches related to fuzzy set theory, Bayesian networks and artificial neural networks have been applied to intelligent computing systems in healthcare. Medical and technological advances that have occurred over this half-century period have enabled the development of healthcare applications of artificial intelligence:

- Improvements in computing power resulted in faster data collection and data processing
- Growth of genomic sequencing databases
- Widespread implementation of electronic health record systems
- Improving natural language processing and computer vision, enabling machines to replicate human perceptual processes
- Enhanced accuracy of robot-assisted surgery
- Improvements to dredging techniques and data logs in rare diseases

In the future, with the help of machine learning and artificial intelligence application in cancer diagnosis, different techniques are used such as MRI, Radiography, Ultrasound, X-ray etc. Computers are also used extensively for medical training, in today's time surgeons are not only dependent on actual practice in the operation theater to acquire skills.

Instead, simulation based surgical platforms with the help of machine learning and artificial intelligence techniques have emerged as a very effective tool for training and assessment, surgical simulation helps trainees to hone their surgical skills.

This gives them detailed feedback on their performance and also helps a lot in getting evaluations, so that they can better care and protect the patient before actually working on the patient. Skin cancer is usually difficult to detect early because its symptoms are similar to those of common skin diseases, but scientists have used machine learning and technology to effectively distinguish between cancerous skin lesions and noncancerous ones. Has taken the help of artificial intelligence. Machine learning and artificial intelligence are also used in the diagnosis of breast cancer, as technology is developing, machine learning and artificial intelligence can be used in the diagnosis of many other types of cancer in the future. The disease of COVID-19 had presented a huge challenge in the health related services all over the world, the whole world faced this disease together and machine learning and artificial intelligence can play a very important role in facing this challenge.

Computers have helped a lot in the treatment, control and prevention of COVID-19, research was done on the virus of this disease through computers and later different vaccines of COVID-19 were prepared. Artificial intelligence (AI) and machine learning (ML) are gradually gaining ground in everyday life and are expected to have a major impact in digital healthcare for disease diagnosis and treatment in the near future. Technological advancements in AI and ML have paved the way towards autonomous disease diagnosis tools using large data sets to meet future challenges for early stage human disease detection, especially in cancer. ML is the subset of AI, where neural network base algorithms are developed to allow machine to learn and solve problems like human brain [1, 2]. In turn, Deep Learning (DL) is used to process data to recognize images, objects, process languages, improve drug discovery, upgrade precision medicine, improve diagnosis, and help humans make decisions. is a subset of ML to mimic the human brain's ability to It can also work without human supervision and suggest outputs [3]. DL can process data including medical images by artificial neural network (ANN) to mimic human neural architecture and is composed of input, output and various hidden multi-layer networks to enhance the processing powers of machine learning. In medicine, the virtual and physical aid of technology through information management and robotics systems is the future. AI-based approaches in medicine are considered to solve complex biology puzzles, determine complex protein-protein interactions, and identify therapeutic targets. The review also discusses various trained deep-learning design models to aid in new drug discovery and robotic surgery. AI also provides medical imaging technology with extraordinary progressive potential to determine abnormal changes at the cellular level and will improve diagnostic accuracy. It also covers "AI-based precision oncology approaches" to precisely target individual cells and its role in overcoming the limitations of NGS by AI-assisted toolsets. AI-based applications in digital pathology and ethical concerns are also discussed in detail in this review to update readers about the future of medical technology.

## **II. ARTIFICIAL INTELLIGENCE IN MEDICINE**

Artificial intelligence in healthcare is the use of complex algorithms and software, in other words artificial intelligence (AI) is the analysis, interpretation and human understanding of complex medical and healthcare data to simulate human cognition. Specifically, AI is the ability of computer algorithms to draw predictive conclusions without direct human input.

What differentiates AI technology from traditional technologies in healthcare is its ability to receive information, process it, and deliver a well-defined output to the end-user. AI does this through machine learning algorithms and deep learning. These algorithms can recognize patterns in behavior and build their own logic. To reduce the margin of error, AI algorithms need to be tested repeatedly. AI algorithms behave differently from humans in two ways: (1) Algorithms are literal: if you set a goal, the algorithm cannot adjust itself and can only understand what it is explicitly told, (2) and it is not possible to explain the internal behavior of some deep learning algorithms. [1]

The primary objective of healthcare AI applications is to analyze the relationship between prevention or treatment techniques and patient outcomes. [2] AI programs have been developed and applied to practices such as diagnostic procedures, treatment protocol development, drug development, personalized medicine, and patient monitoring and care. Medical institutions such as The Mayo Clinic, Memorial Sloan Kettering Cancer Center, [3] [4] and the British National Health Service, [5] have developed AI algorithms for their departments. Large technology companies, such as

IBM [6] and Google, have also developed AI algorithms for healthcare. Additionally, hospitals need AI software to enable operational initiatives such as increasing cost savings, improving patient satisfaction, and meeting their staffing and workforce needs. [7] Companies are developing predictive analytics solutions that help health care managers improve business operations through increasing utilization, reducing patient boarding, reducing length of stay, and optimizing staffing levels.[8] Clinical researchers are now focusing extensively on ML algorithms, which are believed to enable computers to learn from vast pharmaceutical big data on an industrial scale, using super-computers and machine learning at low cost and in less time. Gives the ability to discover new drugs. equipment, as previously used in self-driving cars. The Exascale Compound Activity Prediction Engine (XCAPE) project, funded by Horizon 2020, a European funding program, is one of the big data analysis chemogenomic projects for chemical compound targeting biological proteins in silico models. It aims to compile comprehensive datasets of chemogenomics from authoritative databases (ChEMBL and PubChem) to predict protein interactions and gene expression for industrial scale pharmaceutical companies. ExCAPE is a scalable ML model for complex information management and its application at the industrial scale, especially in the pharmaceutical industry to predict compound biological activity and its interactions at the protein level. Nevertheless, various complex cellular limitations need to be addressed at a scalable level through algorithms and this project is expected to be further expanded by accelerating ML-based super-computers for rapid drug discovery. Recent advances in medicine for chemical synthesis include microfluidic and AI-assisted drug-designing. It has been widely proven that the trained DL-derived ML model outperformed all comparable practice strategies when applied to a database of pharmaceutical companies.

### **III. ARTIFICIAL INTELLIGENCE IN HEALTHCARE**

Artificial intelligence in healthcare is a broad term used to describe the use of machine-learning algorithms and software, or artificial intelligence (AI), to mimic human cognition in the analysis, presentation, and understanding of complex medical and healthcare data. is done for Surpass human capabilities by providing new methods of diagnosing, treating, or preventing disease.[1][2] Specifically, AI is the ability of computer algorithms to draw predictive conclusions based only on input data.

The primary objective of healthcare AI applications is to analyze the relationship between clinical data and patient outcomes.[3] AI programs are applied to practices such as diagnosis, treatment protocol development, drug development, personalized medicine, and patient monitoring and care. What differentiates AI technology from traditional technologies in healthcare is its ability to collect larger and more diverse data, process it, and produce a well-defined output for the end-user. AI does this work through machine learning algorithms and deep learning. These processes can recognize patterns in behavior and build their own reasoning. To obtain useful insights and predictions, machine learning models must be trained using a large amount of input data. AI algorithms behave differently from humans in two ways: (1) Algorithms are literal: once a goal is set, the algorithm learns exclusively from the input data and can only understand what it has been programmed to do. (2) and some deep learning algorithms are black boxes; Algorithms can make predictions with extreme accuracy, but provide little or no understandable explanation of the reasoning behind its decisions other than the data and the type of algorithm used.

Since the widespread use of AI in healthcare is relatively new, research is ongoing on its application in various fields of medicine and industry. Additionally, unprecedented ethical concerns related to its practice, such as data privacy, automation of jobs, and representational bias, are receiving more attention.[5]

### **IV. ARTIFICIAL INTELLIGENCE BASED MEDICAL IMAGING**

We are now at the beginning of an AI-based technological era, whereas only 10 years ago, the number of publications on AI related to medical imaging was very limited. This number reached 800 in the year 2016-2017 and it is expected to increase drastically in the coming years. AI offers excellent progressive opportunities to Medical Imaging Technology (MIT) and is based on computational models and bioinformatics based algorithms. It can determine any abnormal cellular growth and biological changes in the body. AI-assisted MIT is not only going to play a pivotal role in radiology, but it is also going to have a huge impact on medical resonance imaging and neuroradiography. The healthcare system would be incomplete without radiology, especially in cancer and other cancer related complications. Radiologists are expected to have more digital knowledge than any other medical professional. They have always been

at the forefront of the adoption of digital information related to medical imaging [35]. AI can identify abnormal results at first glance, showing a higher sensitivity rate than other traditional technologies. Of course, radiologists should play a key role in communication with patients about AI-interpreted results. At this point in time AI will never replace radiology, but the need for radiologists is decreasing over time due to image interpretation efficiency by AI. Technology-oriented experienced radiologists are highly needed to design specialized algorithms for high-throughput data analysis with high precision and accuracy. After performing a wide range of experimental analysis, AI-based algorithms can detect particular patterns to provide insight into unusual findings. Traditional computer aided detection (CAD) systems can indicate the presence or absence of image characters, while AI-based systems extract all visible and non-visible image features to produce more accurate results.

The algorithm can detect the texture, color, shape of the lesions as a doctor would. Users receive an instant risk assessment for skin lesions within 30 seconds and the algorithm has been proven to detect 95% of skin cancers at an early stage. However, physician intervention is still necessary as we cannot trust the algorithm 100%.

DL is superior to traditional ML due to its high performance and AI-based cognitive ability. This has not only increased the image graphics but also reduced the cost and length of the process.

#### **V. ARTIFICIAL INTELLIGENCE IN DIGITAL PATHOLOGY AND DRUG DISCOVERY**

The first large scale clinical study in digital pathology was conducted by examining approximately 2000 patients with over 16,000 reads (data files in various diagnostic formats) of various tumor types. This study paved the way towards digital diagnosis using the digitized WSI system. Various developmental projects for innovative AI-based image analysis in oncology have been undertaken by biomedical engineers and data scientists. Currently, technology involvement of AI-based analysis of patient's radiology, morphological patterns and histopathology data is considered to improve diagnostic accuracy using new biomarkers for precision oncology.

The learning process of artificial intelligence and ANN works in layers. Each layer is a container of neurons and data processing requires grouping between different layers (neurons). All different layers are specialized to perform specific transmission like human differentiated cells, including dense (fully connected) layers, concentric layers, pooling layers, recurrent layers, normalization layers, and many others. Convolutional layers are specialized for processing imaging data such as digital pathology images.

#### **VI. AI TO DECODE MOLECULAR SIGNALING CASCADES AND CANCER MECHANISMS**

Various high-throughput technologies have been used to quantify gene expression. Microarray technology is commonly used to determine genetic expression, but has some limitations as it is expensive, requires expert handling, and interprets genetic information with a large pool of data sets. Therefore, oncologists realized the need for cancer molecular signatures to detect abnormal gene expression. He monitored patient response to drugs and then devised methods for precise disease management. ML has now been successfully applied to CAD. Medical experts around the world are sharing their diagnosis and treatment data and with applications of AI, such information can be automatically stored (cloud scaling). This has led to the establishment of the Tumor Atlas.

AI basically uses two approaches, neural networks and fuzzy logic, to overcome human intelligence. Neural networks are extremely difficult to explain (black boxes) while fuzzy logics are easy to explain. However, both are used by medical experts to diagnose breast cancer. There are several types of cancer, including pancreatic and gastric cancer, that are diagnosed only after they reach an advanced stage. Similarly, screening for lung cancer is a very complicated process. Medical experts used a low-dose CT scan method for screening, which is an inadequate procedure for monitoring this cancer type compared to blood profiling, in which AI-based tools analyze plasma profiles of ctDNA and miRNA.

Cancer treatment is about to be revolutionized with the help of AI, the most powerful yet smart weapon in the fight against cancer. Nonetheless, the lack of computational algorithms and knowledge of information technology by physicians and practitioners prevents the implementation of AI in developing countries.



## VII. AI IN SURGERY

Recent developments in innovative AI-based applications and surgery are a very exciting area of research. Clinical machine interaction has been aiding oncologists for decades. It has been observed that AI assistance significantly contributes by reducing the incidence of breast conserving surgery (mastectomy) by 30.6%, whereas, in previous practices, high-risk patient tissue biopsies were found to be benign only after subsequent surgery. ML models that accurately predict high-risk cancer lesions through image-guided needle biopsies and pathological updates are a core need of today's clinical practice: they can limit unnecessary surgical excision. Random forest ML models have been developed by various research groups for the prediction of cancer survival and long-term cognitive outcome. In a clinical study, 335 high-risk cancer patients were analyzed by the Randomized One ML model and observed that it could prevent about one-third of unnecessary surgeries. Collective surgical consciousness (CSC) has recently been noted for surgical procedures in the operating room, for individual and population data analysis. Computational algorithms have been used in some clinical settings where pre-operative comprehensive risk scores were calculated by artificial neural networks (ANNs) based on digital image analysis. Similarly, ML assistance is also available during surgery, virtually via surveillance cameras and real-time video images, assisted by ANNs based on whole population data analysis from specific genetic pool data (patient age, gender, and other bodies) Can give clinical judgment and predictions. biological parameter). Such AI support also suggests clinical care and personalized care management strategies after comprehensive analysis in real-time, just like Siri.

### **Ethical concerns of artificial intelligence and machine learning based robotic therapy**

ML has a substantial impact on health care processes. This may affect treatment and diagnosis, reflecting serious ethical considerations. ML healthcare applications range from fully autonomous AI for cancer diagnosis to non-autonomous mortality prediction to guide the allocation of healthcare resources [5]. AI and ML therapeutic innovations range from virtual psychiatrists to social robots in dementia and autism disorders. therapeutic chatbots, avatars and social assistant devices are translated into clinical application and their ethical concerns mainly focus on long-term applications of AI and therapeutic robots, thereby reducing complete patient dependence (not socially acceptable ) Might be possible. Furthermore, the integration of AI tools into everyday life and medical care is changing ethical judgments and societal expectations as there is a great deal of difference between human and machine communication [6]. One of the toughest issues in today's AI is transparency. Many AI and ML algorithms, especially deep image analysis algorithms, are impossible to explain or explain. Even researchers or doctors who are familiar with this operation are unable to explain them [3]. Others have argued that continued use of AI and ML in treatment or diagnosis may be harmful as distributional changes may occur, thus suggesting that target data will not match ongoing patient data and lead to erroneous conclusions. . The relationship between data elements is likely to change due to changes in population (gene pool), technology, and process of care. Another application of AI is in mental health practice centers, where it can facilitate patient autonomy. These AI and ML technologies need to be used to instruct patients to ensure that the patient does not mistake the intelligent system for a human-driven application. In addition, the consent of applications obtained outside the medical environment raises worrying concerns [8]. AI is sensitive to wrong decisions and wrong risks.

### **Implication**

The use of AI and ML is predicted to reduce medical costs as there will be greater accuracy in diagnosis and better predictions in treatment planning as well as greater disease prevention.

Other future uses of AI and ML include brain-computer interfaces (BCIs), which are anticipated to help people move, speak, or those with spinal cord injuries. BCI will use AI to help these patients move and communicate by decoding neural activations.

As technology develops and is implemented in more workplaces, many fear that their jobs will be replaced by robots or machines. The US News Staff (2018) writes that in the near future, doctors who use AI and ML will "win out" over doctors who do not. AI and ML will not replace healthcare workers, but will allow them to devote more time to bedside care. AI can lead to healthcare worker burnout and cognitive overload. Overall, as Quan-Haase (2018) states, technology "extends the accomplishment of societal goals, including higher levels of security, better means of

communication across time and space, improved health care, and increased autonomy". ". As we adapt and use AI and ML in our practice, we can enhance our care for our patients resulting in greater outcomes for all.

### VIII. CONCLUSION

There is no doubt that surgery, chemo and radiotherapy will remain standard cancer therapy for many years to come, but at the same time, there is growing interest from the scientific community to further mature current clinical strategies to combat cancer. The involvement of computational input and assistance will be a tangible reality for the clinical setting of the future and will produce a significant technological revolution to predict and diagnose issues related to human health in near real time.

AI avoids emotional problems, cultural and ethical beliefs, and fatigue. The intelligence of optimal decision-making and continuous upgrades through artificial neural networks and DL will be excellent tools to aid medical practitioners in the diagnosis and discovery of carcinogenesis in a quicker time frame. The natural human brain has a limited capacity to process large amounts of data and information available.

Driven by huge fascination among the technology-oriented scientific community, AI-based DL tools have a lot of scope for the healthcare sector at the micro and macro level. These limitations include unsupervised training set algorithms, unsupervised learning implementation, patient data privacy, data set size, and classification based on more than 100 different cancer types, which warrant significant attention to the use of human computer interface (HCI) and AI. Let's demand Reproducibility of clinical experiment is one of the major hurdles in molecular drug discovery, which takes many years after clinical trials to launch effective formulations in the market. Reproducible computational drug designing has been a promising tool for future drug development with increased specificity and reduced cost.

The evaluation of a large set of complex and diverse healthcare data can be managed by the analysis of big data and ML tools to reduce limitation and false-positive data. Finally, AI in clinics is not meant to put radiologists and other medical professionals out of business. AI is not fully autonomous and cannot grow beyond human participation. AI in the medical profession is a novel and potential tool to achieve a specific treatment performance and identify the correct diagnosis at the highest possible level.

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# Impact of NGOs on Rural Women: A Sociological Study Special Reference to Ajmer District

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**Abstract:** *The objective of the article is to analyze the impact of Non-Governmental Organizations (NGOs) on the mobility of Ajmer rural women in the public sphere, as this is an area where only men generally come, while women are confined to their homes and neighborhoods. Lives. In other words, the author explored how, and to what extent, NGOs have brought about changes in women's freedom of movement in the public sphere. The authors were influenced by existing literature that portrays Ajmer as a district characterized by poverty, patriarchy and inequality, where rural women have no tradition of participating in the labor force, and where women's mobility is severely restricted. banned from In this study, indicators of women's mobility were explored which included the movement of women in various public places such as markets, medical centres, children's schools and cinemas.*

**Keywords:** NGO, Impact, Rural, Women, Public etc

## I. INTRODUCTION

Social development has emerged as an important concern in contemporary society today. Most of the parameters of social development are getting more attention than ever before. The success of the World Summit on Social Development is proof that economic upliftment without social emancipation is not considered real development. It is a very important fact that human development

The paradigm, which puts people at the center of its concern, is now a universally accepted strategy for the development of a nation. There is a growing consensus among development thinkers that people are and should be the starting point, center and target of every development intervention. The real asset of a nation is its people, both male and female, and development aims at creating an environment to enable them to enjoy long, healthy and creative lives. However, the harsh reality is that "in no society do women have the same opportunities as men".

For countless centuries in India, women have been kept under men and socially oppressed women have been excluded from the race of development in the name of customs, traditions and religion. The various religions practiced in India as well as the personal laws based on them gave women a lower status than men. Women had no significant existence of their own. She existed for men and always played second fiddle to them. Women in India were expected to have no personality of their own apart from their relationship with their husbands. They could find no other expression of their innate talents or desires than as housewives. In fact they were only seen as complementary to men.

As a result, they have been denied opportunities for their social, economic and political development, thereby reducing their status in society. Since women constitute almost half of the country's total population, this denial has contributed in no small part to India's continuing under-development in terms of three main indicators of development, namely life-expectancy, educational attainment and income. India ranks 134 out of 174 countries, so if development is to have any meaning then women should also be given their due place in development, perhaps even more consciously because of their already relatively more disadvantaged position.

In advanced countries, women have been powerful agents of social change. According to a World Bank report, increasing women's well-being has significant inter-generational benefits and productivity gains in the future.

Women empowerment can be achieved through political power, education, employment, NGOs and SHGs. These are dominated by NGOs and SHGs and fruitful success of women empowerment must take place in multiple dimensions including economic, socio-cultural, familial/interpersonal, legal, political and psychological. Since these dimensions

cover a wide range of factors, women can be empowered within any one of these sub-domains. The Human Development Report from 1999 demonstrated that practically no country in the world treats its women as well as its men according to measures of life expectancy, wealth and education. The female work participation rate in Rajasthan is reported to be 11% with a gender gap of 52% which is comparable to West Bengal but less than Punjab. 56% of women are in community service, 17% in manufacturing and 8.6% of rural women are in agriculture. Only 4% of women are in the formal sector, compared to 10% of men.

## II. CURRENT STATUS OF RURAL WOMEN

After independence there have been many changes in all walks of life, scientific and technological. The impact of industrialization and urbanization has brought about a perceptible change in the socio-economic and political scenario of the Indian society. As a result there has been a drastic change in the ideas and values, manners and customs, way of life and culture, resulting in a change in the age-old tradition of Indian civilization. But this thrust of change is not uniform among all sections of the population as the major share of technological development was shared by the urban masses. Despite this technological and scientific development, the age-old social values of gender discrimination still prevail in our country. Many women's liberation movements were launched to eradicate this gender discrimination but male supremacy is still prevalent especially in rural areas. This age-old value of male supremacy is still prevalent. Women are not getting proper status to play their special role in the society. The female population, especially the rural areas, is far behind in the field of economy and education.

The wide gap between male and female literacy in rural and urban areas in India is emblematic of gender disparities.

### **Education:**

As elsewhere, education is one of the most important determinants of women's development in India. Women's economic and social returns are higher than men's, 2001-02 According to the Sixth Report of the Parliamentary Committee on the Empowerment of Women on Educational Programs for Women, 2001-02 Education helps girls get better work opportunities and better productivity. Apart from this, it will also reduce the pressure of population.

### **Health:**

Women's access to health care is both an outcome and a determinant of their status in society. Broadly speaking, four groups of factors are found to influence women's access to health care. They are need (i.e. the extent of ill health), affordability (i.e. the social factor that determines whether women can obtain health care outside the home), ability (primarily economic status) and availability of health care service for women.

### **Labor Participation:**

The National Sample Survey on Employment and Unemployment in India during 1999–2000 estimates the number of women in the workforce to be around 124 million. This was about 31 per cent of the total workforce, of which over 88 per cent belonged to rural areas. The female workforce participation rate is as low as 29.5 percent in rural areas and 12.4 percent in urban locations.

### **Economic condition:**

Measuring the contribution of women to the betterment of society is a challenging task. A woman's unpaid domestic labor is usually ignored because what she creates is a 'use value' and there is no reliable way to calculate its economic value. Even if women do join the labor force and produce 'exchange value' through their paid employment, it is unlikely that we may be able to assess their actual contribution, as is present. The sometimes huge male female wage gap across all sectors of the Indian economy.

### **Welfare and Empowerment of Rural Women:**

Well-being and empowerment are distinct but interrelated and overlapping concepts in the context of women. The terms welfare or development typically refer to socio-economic development measured in terms of income, literacy, health, savings, employment, etc. In contrast, empowerment refers to the strengthening of groups and individuals through interactions in all levels of social organization. It is a social mental and to some extent an external process. It has to grow over time in the case of socially and economically poor and disadvantaged groups at the individual, family and community levels and among both genders. Empowerment of women comes from assessing women for what they are and where they are. It is not wrong to use these two words synonymously in the context of women.



### **Women Empowerment Schemes**

- BetiBachaoBetiPadhao Scheme
- Archive - One Stop Centre Scheme
- Archive - Women Helpline Scheme
- UJJAWALA : A Comprehensive Scheme for Prevention of trafficking and Rescue, Rehabilitation and Re-integration of Victims of Trafficking and Commercial Sexual Exploitation
- Sakhi Niwas
- Ministry approves new projects under Ujjawala Scheme and continues existing projects
- SWADHAR Greh (A Scheme for Women in Difficult Circumstances)
- NARI SHAKTI PURASKAR
- Awardees of Stree Shakti Puruskar, 2014 & Awardees of Nari Shakti Puruskar
- Women Helpline Scheme
- Mahila police Volunteers
- Mahila Shakti Kendras (MSK)
- NIRBHAYA

### **Welfare Schemes for Women in India**

Under Article 15(3), the Constitution of India allows for positive discrimination in favor of women. The article under Right to Equality states that: "Nothing in this article shall prevent the State from making any special provision for women and children." Furthermore, Directive Principle 39(a) of State Policy states that: "The State shall, in particular, direct its policy to ensure that citizens, men and women equally, have adequate means of livelihood." Right."

Rashtriya Mahila Kosh (National Credit Fund for Women) was established in 1993 to provide loans to low-income women in India. Programs recently launched by the Government of India include the Mother and Child Tracking System (MCTS), the Indira Gandhi MatritvaSahyog Yojana, the Conditional Maternity Benefit Scheme (CMB), as well as the Rajiv Gandhi Scheme for the Empowerment of Adolescent Girls - SABLA.

### **Impact of Beneficiaries of NGOs**

The NGOs have also considered the impact of programs on beneficiaries, the participation of beneficiaries in programs, and the opinions of beneficiaries about NGOs. Impact is the positive or negative effect an organization has i.e. it measures the effectiveness. The following impact indicators were selected to assess the impact of NGOs.

- a. Beneficiary participation.
- b. Programs for development of knowledge and skills of the beneficiaries.
- c. Beneficiaries' opinion about NGOs.

### **Non-Governmental Organization (NGO)**

The growth of NGOs has emerged as a force to reckon with because of their involvement in the contemporary socio-economic development process and to fill the void created by the apathy and audacity of the two major sectors i.e. public and private. NGOs have been considered as the third sector, which have focused on various issues of contemporary importance, such as women empowerment, ecology, environment, human rights, distribution of natural resources, etc. Their mission is often social change and the upliftment of millions of underprivileged people. These organizations try to play the role of development catalysts and pressure groups so that the power system of the state can be closely scrutinized. They give morality to the people; Encourage them to raise their voice against ecologically damaging industries, local power nexuses and vested interests against government policies/decisions/laws and in the process create a united and unified force in the form of people's protests, movements build out.

Non-governmental means that the organization is not accountable for receiving operational finance, such as staff salaries, from a government department. This does not mean that it cannot cooperate with the government in planning and implementing programs. In India, however, the term NGO is often used interchangeably with "voluntary organization". Many "voluntary organizations" in India are started by government employed officials and funded by the

government. For example, some Mahila Mandals (women's clubs) are started by a village level worker; who is a government employee while others are initiated by persons who are not employed in the government. Mahila Mandals established in both ways receive government funding but are officially called "voluntary organizations". The term non-governmental organization (NGO) is preferable to avoid confusion and to correctly classify the types of development organizations.

#### **Characteristics and specialties of NGOs:**

- 1) Voluntary: They are formed voluntarily, there is an element of voluntary participation in the organization. NGOs are built on the commitment of a few individuals.
- 2) Legal Status: The NGO is registered with the Government under the Societies Act Trust Act and some Trade Union Act etc. The NGO is also registered under the Foreign Contribution Regulation Act (FCRA) with the Ministry of Home Affairs, Government of India. This is to be entitled to receive money abroad.
- 3) Independent: NGOs are free in planning and implementation of their programs, they are not bound by hard and fast rules like government institutions.
- 4) Flexible: NGOs are flexible in intervention they are not bound by red tape and bureaucratic constraints. They will not stop people's initiatives in the name of audit objections.
- 5) Non-Profit Oriented: NGOs do not run on profit objectives. Surplus profits from economic projects if any are not distributed to the members or stakeholders are reused for development purposes.
- 6) Value Driven: NGOs are motivated by social values and humanitarian principles and hence they try to promote a value based society.
- 7) Catalyst: NGOs facilitate communities for social action but they do not undermine or distort themselves in the process of intervention.

#### **Types of NGOs:**

Thus eight types of NGOs could be distinguished as per the above categorization.

- 1) Charity NGOs
- 2) Relief and Rehabilitation NGOs
- 3) Service providing NGOs
- 4) Social Development NGOs
- 5) Economic Development NGOs
- 6) Empowerment NGOs
- 7) Support NGOs
- 8) Network NGO

#### **Developmental Role of NGOs:**

The role of NGOs in the socio-economic development of the country is noteworthy. They have been contributing to national development for a long time traditionally voluntary organizations were social service organizations with changing times and humanitarian activities. Along with the broad base, voluntary organizations also changed. The earlier discussion on their origin shows how the organization took reformation on religion into national movements and at present they occupy a prominent place in promoting developmental efforts.

##### **(a) Rural development.**

Promoting rural development is another important area of concern for NGOs. NGOs that are dedicated to rural development inspire people's perspective through education, training and decision making. This, in turn, helps societies especially those that are transactional and aim for rapid socio-economic development.

##### **(b) NGO in Women Development**

While looking at the role of NGOs in development in general, it would be appropriate to look at their specific role in women's development. Voluntary efforts for the cause of women began (in their modern form) in the late 19th century. They were altogether the work of a few individuals who were devoted to the welfare of the society. Origins like

Brahmo Samaj, PrarthanaSamaj, all were against the prevailing evils in the society. He fought against the practice of sati, was successful in stopping child marriage and encouraged widow remarriage and female education.

**(c) To support government programmes.**

Linking people and government can be considered as an important role of NGOs in the process of development, they add in their own way the funds sanctioned by the government by using locally available resources in fulfilling the objectives. In addition, by providing information about local conditions, priorities, local resources, NGOs are assisting governments in local planning and target setting.

**III. CONCLUSION**

Rural women have the power to change many things in the society and the country. If we have to make our country a developed country, then first of all it is very important to empower women through the efforts of men, government, lowly and women. In India, the scope of development is not narrow, but very wide, as it includes not only economic development but also development on the social front, quality of life, empowerment, women and child development, education and awareness of citizens. To achieve this, a holistic approach and collaborative efforts involving various departments, agencies and even NGOs are required. NGOs or non-governmental organizations have more advantages of working in rural areas than government organizations because NGOs are more flexible, NGOs are specific to a particular locality and moreover they Committed to serving the public and the community as a whole. Inspired by Mahatma Gandhi, women in independent India have worked for women empowerment through various organizations. Indian women became self-reliant after getting education and worked for the upliftment of women through many institutions. He alerted everyone for the development in the social, economic, cultural and political vision of women. After independence, due to the efforts of many non-governmental organizations, poor and uneducated women got information about the benefits of self-reliance through legal rights. All these women's organizations made arrangements for adult education center, vocational education center, sewing center, working women's housing, home for old age, home for neglected etc. In the second half of the 19th century, many national level women's organizations were functioning. In the villages of Ajmer city, so far no work has been done on NGOs on rural women, so the researcher has chosen this topic. This study is also suitable for awakening the rural women. NGOs work only with the help of the government. Strengthened links between civil and public society through public support for NGOs will provide new opportunities for joint action.

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# Influence of English Teaching Method with Reference to Listening, Speaking and Writing, for the Learners of Ghaziabad

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**Abstract:** *To teach speaking holistically and comprehensively, it is valuable for teachers to be knowledgeable about what speaking competence involves and how different aspects of speaking competence relate to each other. Johnson (1996, p. 155) describes speaking as a “combinatorial skill” that “involves doing various things at the same time”. The presents a model of second language speaking competence that comprises knowledge of language and discourse, core speaking skills, and communication and discourse strategies. Learning to speak in a second language involves increasing the ability to use these components in order to produce spoken language in a fluent, accurate and socially appropriate way, within the constraints of a speaker’s cognitive processing.*

**Keywords:** English, Listening, Speaking, writing etc

## I. INTRODUCTION

It has been rightly said that "a teacher should not only teach but also inspire and motivate". And for this, an effective teacher is essential to ensure maximum learning outcomes. Without a doubt, language teaching and learning is a complex process, and what works in one context may fail in another. But it is very important for teachers to have a clear understanding of the different methods and approaches so that they can immediately decide which teaching method to apply depending on the classroom situation and the needs of the learners.

Fig1. – The Associated Jobs with knowhow of English Language.



Therefore, it can be said which method is effective. Also, another important thing is that the goal of language teaching is very clear to us. There are five most spoken global languages: English (1.268 billion), Mandarin (1,120 billion), Hindi (637.3 million), Spanish (537.9 million) and French ( 276.6 million) worldwide. English is the most widely spoken language in the world and has been recognized as an official language by 67 different countries. There are many



career opportunities for professionals who are fluent in English. Here are attractive career opportunities in the new era in the world with excellent English ability.

## II. LITERATURE REVIEW

A 2003 study conducted by Michael Russell and his colleagues found that teachers use technology, including e-mail, more for preparation and work-related communication, and less often for instructional purposes. Interestingly, this finding seemed especially true among less experienced teachers, despite their self-reported high levels of comfort using technology. In John Savery's 2002 study, however, 90 percent of faculty surveyed reported using e-mail five times or more per semester for instructional use.

**Reddy, Lokanadha, G (2004)** - Identification and Assessment of Second Language Learning Difficulties among Higher Secondary Students – The objective of the study was to identify and assess the difficulties of the second language learner at the higher secondary level and to offer remedial measures. It was found that the students have difficulty in reception and lack phonological competence.

Munzaki 2016 – The purpose of the study is to identify which methods were used in teaching grammar at courses and to describe the teaching techniques that were applied in classroom. The participants were five English Education students who have been teaching English at English courses. They were selected using purposive sampling with a consideration that they have completed Teaching Method, Micro Teaching, and Teaching Practice (PPL) subjects in their previous semesters. This research was conducted by using qualitative descriptive and two techniques for collecting data namely observation and interview. Based on the research findings, writer found that all of the selected teachers used Grammar Translation Method (GTM) as the main teaching method which was sometimes combined with some techniques of other methods such as Direct Method, Communicative Language Teaching (CLT), and Bilingual Method.

### **Speaking as a Mode of Teaching and Learning English**

The first component, Knowledge of Language and Discourse, requires mastering the sound patterns of the language (in English, this means being able to pronounce the language intelligibly at segmental and suprasegmental levels), knowing the grammar and vocabulary of the language (spoken structures, grammatical features, lexis) and understanding how stretches of connected speech (discourse, genre) are organised, so that they are socially and pragmatically appropriate (register). Core Speaking Skills refers to developing the ability to process speech quickly to increase fluency (e.g. speech rate, chunking, pausing, formulaic language, discourse markers). It also involves being able to negotiate speech (e.g. building on previous utterances, monitoring understanding, repairing communication breakdown, giving feedback), as well as managing the flow of speech as it unfolds (e.g., initiating topics, turn-taking, signalling intentions, opening/closing conversations). The third component, Communication Strategies, involves developing cognitive strategies to compensate for limitations in language knowledge (e.g. circumlocution, paraphrasing, gestures, word coinage, approximation, avoidance), metacognitive strategies (e.g. planning in advance what to say, thinking consciously about how you say something), and interaction strategies (e.g. asking for clarification/repetition, reformulating, rephrasing, and checking comprehension).

Comparing spoken and written language Many approaches typically used in language teaching to teach speaking have taken little account of the features of spoken language, and have tended instead to fall back on grammars that are essentially based on written text. Technological advances in recording speech and the establishment by linguists of corpora of speech utterances have led to much greater knowledge about the similarities and differences between these two modes of communication. It is very valuable for language teachers to be aware of some of the main differences and of the features that typically characterise speech, as this will allow them to make more informed decisions about what to teach.

### **Writing skills in English language teaching methodology**

Writing as a skill is very important in teaching and learning a foreign language; it helps pupils to assimilate letters and sounds of the English language, its vocabulary and grammar, and to develop habits and skills in pronunciation, speaking, and reading.

*The practical value of writing is great because it can fix patterns of all kinds (graphemes, words, phrases and sentences) in pupils' memory, thus producing a powerful effect on their mind.* That is why the school syllabus

reads: "Writing is a mighty means of teaching a foreign language". Writing includes penmanship, spelling, and composition.

**What is writing?**

*The skills-based approach views writing as a collection of separate skills, including letter formation, spelling, punctuation, grammar, organization, and the like.* This approach also views writing as a product-oriented task. In this respect, McLaughlin state that writing, like many other complex tasks, requires "learners organize a set of related subtasks and their components". In contrast, the whole-language approach views writing as a meaning-making process which is governed by purpose and audience rather than by compositional rules.

*From the author's point of view, a thorough definition of writing should involve both skills and meaning.* This is precisely the perspective taken by Krashen who states:

*Writing competence is necessary, but is not sufficient.* Writers who are competent, who have acquired the code, may still be unable to display their competence because of inefficient composing processes. Efficient composing processes, writing "performance", can be developed via sheer practice as well as instruction.

**The importance of writing**

*In the area of EFL, writing has many uses and functions. To begin with, the ability to write acceptable scientific English is essential for post-graduate students who must write their dissertations in English. Moreover, writing EFL allows for communication to large numbers of people all over the world. It also provides students with physical evidence of their achievement. This in turn helps them to determine what they know and what they don't know. As Irmischer notes, "In our minds, we can fool ourselves. Not on paper. If no thought is in our minds, nothing comes out. Mental fuzziness translates into words only as fuzziness or meaninglessness".*

*Writing can also enhance students' thinking skills. As Irmischer notes, "Writing stimulates thinking, chiefly because it forces us to concentrate and organize. Talking does, too, but writing allows more time for introspection and deliberation" (loc. cit.).*

*Additionally, writing can enhance students' vocabulary, spelling, and grammar.* Finally, writing skills often needed for formal and informal testing.

**Table 1.** Spoken and written language: Typical features

Spoken language	Written language
Basic unit is the clause (utterance)	Basic unit is the sentence
Clauses linked by conjunction ( <i>and, but, so</i> etc) to build the text	Clauses linked by subordination ( <i>who, which, when</i> etc) to build the text
Frequent use of formulaic chunks ( <i>I was lucky enough</i> )	Little use of formulaic language
Informal language preferred ( <i>we used to get together</i> )	Formal language preferred ( <i>commenced</i> )
Range of noticeable performance effects (hesitations, pauses, repeats, false starts, incompleteness)	Few/no noticeable performance effects
Frequent use of ellipsis (omission of grammatical elements, <i>started at the same time</i> )	Little use of ellipsis
Frequent use of personal pronouns ( <i>I, we</i> )	Little use of personal pronouns

**Strategies for Effective Teaching of Listening**

Listening strategies are techniques or activities that contribute directly to the recall of listening input. In the recent days, a number of listening strategies have been formulated to match with every different listening situation and because of this, in teaching listening skills, the language learners are facilitated in getting adjusted to their listening behavior to deal with a variety of situations, types of input, and listening purposes. Listening strategies can be broadly classified as

Top-down strategies and Bottom-up strategies. Top-down strategies are listener based; the listener relies on the background knowledge of the topic, the listening context, the text type, and the language and they help the listener to interpret the ideas he has listened.

Strategic listeners also use metacognitive strategies to plan, monitor, and evaluate their listening. Metacognitive development can be described as conscious development in one's metacognitive abilities, such as the move to greater knowledge, awareness and control of one's learning, selecting strategies, monitoring the progress of learning, correcting errors, analyzing the effectiveness of learning strategies, and changing learning behaviors and strategies when necessary. The use of metacognitive strategies activates one's thinking and leads to improved performance in learning in general.

Activates one's thinking and leads to improved performance in learning in general. The metacognitive strategies train the language learner to cope with the demands of listening. It is quite evident that metacognitive strategies make their learning more effective, hence, they are able to maximize the information received and thus this can be used to improve their listening skills. Wenden (1998) argues that learners who use their metacognitive abilities seem to have the following advantages over the others:

- Learners become more strategic.
- Progress in learning is faster with improved quality and speed of their cognitive development.
- They are confident in their abilities to learn and hence can provide accurate assessments of why they are successful learners.
- They think clearly about inaccuracies when failure occurs during an activity.
- Their tactics match the learning task and adjustments are made to reflect changing circumstances.
- They perceive themselves as continual learners and can successfully cope with new situations.

Differentiating Between Listening Skills By identifying a set of distinctive behaviors that work together toward comprehension, teachers allow learners yet another glimpse into the listening process. Listeners may be used to employing micro-skills in their native language, but specific activities need to be designed to help them transfer those skills into a new language. Although each skill could be practiced separately, the key to skills instruction is not to treat them as a laundry list of discrete practice points that students get or do not get. Rather, skill training should become a part of a larger listening proficiency picture, inviting students to try new behaviors in a variety of contexts and tasks.

### **What characteristics make a good teacher of second language listening skills?**

When teachers teach, they seem to take charge of everything. They select input, design and sequence activities, determine tasks, and decide what constitutes a correct response. When several students give the desired answer, the teacher acknowledges their effort and moves on, never pausing to think if everyone in the class understood the text, and if not, what caused their confusion. When students make a mistake, teachers deem it their professional duty to immediately correct it. By doing that, teachers hope they are keeping the lesson going and also helping learners avoid the same mistake in the future. This approach puts the teacher in control of classroom activity and allows students to check the accuracy of their responses, but does it change students' listening behavior?

In a process-oriented classroom, the teacher assumes a more supportive role, facilitating rather than controlling and testing listening. She continues to manage the classroom business of planning, implementing, and assessing listening while taking a noninterventive stance in listening instruction (Field, 2008). Instead of presenting students with the correct answer, she guides them in comparing responses and reflecting on different steps they took to achieve comprehension. She encourages students to become aware of their listening, monitors their efforts, and provides feedback on their performance.

### **III. CONCLUSION**

The objectives and aims of teaching English in India should be well understood by the teachers and the learners, only then real teaching and learning of English will be possible.

English Language alone opens avenues for a wide range of Career Opportunities. Ghaziabad is a city in the Indian state of Uttar Pradesh. It is sometimes referred to as the "Gateway of UP" because it is close to New Delhi, on the main route into

Uttar Pradesh. It is a part of the National Capital Region of Delhi. There is a large and planned industrial city, well connected by roads and railways, and is the administrative headquarters of Ghaziabad District as well as being the primary commercial, industrial and educational centre of western Uttar Pradesh and a major rail junction for North India.

Although spoken and written language are clearly related, typically they serve different social purposes and have different audiences. Speakers and writers draw on common linguistic resources, but they utilise them in different ways. As Halliday (1985, p. 45) notes, "... the kinds of meanings that are transmitted in writing tend to be somewhat different from the kinds of meanings transmitted through speech". By way of illustration, compare the following texts, that deal with the same content and meanings. The speaker in Text 1 is describing the experience of studying in a Master's course offered as a distance learning program.

Ghaziabad is situated at the border of Delhi and is connected to Delhi through local trains, buses and other modes of roadways travel. Ghaziabad is known for its Industrial area, business and commerce. It is also a preferred location of the students to pursue their education and career.

As far as placements and employability is concerned, Ghaziabad is close to Delhi and nearly is open to the professional career opportunities that are offered to people who stay in proper Delhi. At the same time, those who find Delhi to be high on living expenses, find a dwelling in Ghaziabad.

To be able to compete and perform well in college cocurricular activities, job interviews, and perform well at job itself, people willing to migrate (to the US, Canada, the UK, New Zealand, Australia etc.) are expected to have a fair command on English Language which is one of the most used languages for communication, transaction, relationship building purposes. It is a must to know for English educators and learners, that which method of English teaching or learning is most effective, interesting, motivating, ensure maximum learning retention. The research work would identify the most effective method for teaching and learning depending on the context of the language usage. It would provide insight to the students, professionals and educators to contextually chose the best method and modify the teaching curriculum at institutes and work place.

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# Role of Parenting Style and Personality Traits in Academic Achievement of Adolescents with Special Reference to Jaipur City During Pandemic

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**Abstract:** *Academic achievement is one of the most important indicators of learning and understanding across all educational systems. Academic achievement is undoubtedly a very important research topic for educational psychologists. There are many factors that affect educational outcomes such as family structure, emotionality and transition to socialization, social status, changes in body, level of aspirations, their achievements, religious beliefs etc. In addition, self-esteem, parenting style and personality characteristics are just a few of the most important factors. Therefore, identifying such factors that affect student performance and determining the size of these effects may be important to helping students improve their academic achievement. Adolescence is a transition period for students to transform into young adults. The current study focuses on how self-esteem, parenting styles and personality traits affect academic achievement of adolescents during the pandemic. In addition, the role of personality traits during the pandemic as a mediator in the relationship between self-esteem and academic achievement and parenting style and academic achievement will also be studied.*

**Keywords:** Academic Achievement, System, Style, Traits, Factors etc.

## I. INTRODUCTION

The corona virus (COVID-19) pandemic has unleashed a tsunami of challenges for humanity over the last two years. COVID-19 has had a significant impact on people's lives all across the world, especially children and adolescents. The SARS-CoV-2 virus causes corona virus disease (COVID-19), which is an infectious disease. Due to the emergence of the new corona virus many countries, including India, are experiencing an unprecedented health emergency. In December 2019, the virus was discovered in a fish market in Wuhan, China (Chen et al., 2020). In March 2020, the World Health Organization (2020) declared the virus as pandemic after it spread to practically all countries and territories. The pandemic prompted governments around the world to go into lockdown, resulting in people being forced to stay in their homes to prevent the spread of COVID-19 and a rise in the number of cases. The virus has affected the lives of billion people across the globe in many ways such as psychologically, physiologically and socially. This pandemic wreaked havoc on the health care system, the economy, education, and other areas. Work cultures were affected by the epidemic, which resulted in a transition from offline to online mode, while many others lost their jobs as a result of the pandemic's abrupt impact. The unexpected epidemic had an impact on schooling since students were confined to their homes and, in particular, children were prohibited from leaving their homes.

On March 11, 2020, The World Health Organization (WHO) declared the Coronavirus disease (COVID-19) a pandemic and suggested several actions to reduce its effects on the population. More than a year later, the pandemic has changed the lifestyles of millions across the world, claiming 5,077,791 lives in the process. The COVID-19 pandemic with its continuous spread and unpredictable epidemiological control has affected people psychologically. Adolescents appear to be less vulnerable to COVID-19, but they have been exposed to the biopsychosocial stressors generated by the pandemic. Due to this health emergency, educational institutions in more than 190 countries had to stop face-to-face classes. In Mexico, according to the Secretary of Public Education (SEP, 2020), a total of 5,144,673 adolescents who attended high school individually had to continue their studies at home, which radically changed their social and social

environment. Family conversation. Prior to the pandemic, in 2018, 5.3% of students between the ages of 15 and 17 were in a severe educational gap, and 20.3% were in a moderate educational gap, defined as having grades below the expected grade relative to the student's age, according to the Indicators of the National Education System. was defined as receiving The effectiveness of distance learning after the pandemic remains unclear; However, preliminary studies on the long-term effects of skipping' school suggest that it will negatively affect student achievement.

### **Adolescence**

All over the world, in the 21st century, life is going through significant changes and the most affected are the teenagers. Adolescents are the citizens of tomorrow. The patterns of behavior adopted by an individual during adolescence will be maintained throughout life. They affect the health and well-being of a person. Personality development is strong in this period and remains the same for a long time. Proper shaping of personality during adolescence can create a valuable human resource for our nation.

### **Self-esteem**

Self-esteem exerts a strong influence on individuals' expectations of themselves and their judgments about their behavior. People with high self-esteem are willing to test the validity of their projections about themselves. Having a high level of self-acceptance, they have an inclination to accept others as well as those who hold completely different opinions from them and enjoy satisfactory relationships with others.

### **Parenting style**

Parents exert a significant influence on their children's academic achievement at different levels of education through their different parenting styles. To be successful in their higher education and in life, adolescents and young adults need trusting, supportive, and caring relationships with their families, especially with their parents.

### **Academic achievement**

Students in a classroom are concerned with the development and reconstruction of knowledge through expertise, inspiration, collaboration, exploratory speech, and teacher intervention. Student construction of knowledge by discovering real issues through asking and researching questions, planning and investigating, collecting, analyzing and decoding data and information, drawing conclusions and reporting findings (Blumenfeld, 1992) want opportunities.

### **Rationale for the study**

Life has become fast in 21st century so there is tremendous competition in every field. Where everyone wants to achieve their goal of success. This study is important for identifying students who need help and helping them as needed. So they may be able to achieve success in the desired direction. Therefore, there is a need to study the factors affecting academic performance. The present study is an attempt to examine the role of self-esteem, parenting style, personality factors in academic achievement of adolescents. Adolescence is a transition period for students to transform into young adults. His introduction to school life presents many new challenges to his academic pursuits. There are many empirical findings related to academic performance among adolescents as well. Academic performance was found to be associated with several factors. Despite the existing literature on academic achievement, research is needed to explore the role of other important variables such as self-esteem, parenting styles, and personality traits in predicting academic achievement among adolescents.

## **II. LITERATURE REVIEW**

Researchers have found a correlation between parents' discipline, style, and support and their children's mental health and self-esteem. Permissiveness, parental rejection, and rigidity are all associated with negative consequences like depression, anxiety, violence, and suicidal thoughts. However, when they work together and are used with care by parents, the effects are positive (McKinney et al., 2016; Nunes & Mota, 2017). How parents react and behave when raising their children significantly influences their children's development, both in terms of whom they become and how they develop. Children must have a positive relationship with their parents to learn how to be decent people,

acquire the skills necessary for success in life, attain financial independence, and attain emotional stability. This relates to how parents perceive and treat their children. Most parents adopt one of the four parenting styles: authoritarian, permissive, indifferent, or overprotective. Others have combined the ‘indifferent’ and ‘overprotective’ styles into one called ‘authoritative style’, and therefore their division of the parenting styles is three (Flouri & Midouhas, 2017; Pinquart, 2017). Recent research studies establish the importance of parenting styles on children’s academic performance. These studies have focused on parents rather than children. However, fewer researchers have tried to explore factors and impact on children’s performance instead of parenting styles (Hallers-Haalboom et al., 2014).

**2.1 Objective**

The objective of the study was to establish the effect of parenting style on the academic achievement of adolescent students in secondary schools.

**2.2 Research Methodology**

- Population, Sample Size, and Sampling Procedures
- The study targeted a population of 2409 students.
- In addition, ten principals were also randomly sampled for interview. Fourteen randomly sampled schools out of 47 secondary schools in Ajmer, Rajasthan. A sample of students was also taken in different schools using simple random sampling technique. In addition, out of 47 headmasters of day secondary schools, ten headmasters were randomly sampled.

**2.3 Data analysis**

Information from the parenting styles questionnaire was analyzed to establish the different parenting styles that the students experienced at home. The questionnaire was on a 5 point uniform response scale: SA (strongly agree), A (agree), N (neutral), D (disagree), SD (strongly disagree). Responses were scored based on how the students responded to the questionnaire.

**III. RESULT ANALYSIS AND DISCUSSION**

A multiple regression analysis was conducted for different parenting styles and academic performance of adolescents. The results of the regression analysis are shown in subsequent tables.

**Table 1.1:** Regression Analysis Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.795 <sup>a</sup>	.630	.640	.760

a. Predictors: (Constant), Authoritative, Authoritarian, Permissive, Neglectful;

According to the analysis, these variables statistically predict adolescents' academic performance,  $F(4, 244) = 45.539$ ,  $p < .05$ ,  $R^2 = .640$ .

The findings in Table 1.1 also show that the independent variables (authoritative, authoritarian, permissive, neglectful parenting style) explain (64.0%) of the variability of the dependent variable (adolescents' academic performance). Therefore, the remainder (38%) may be accounted for by other variables not recorded in the present study. The analysis also showed that all four variables added statistical significance to prediction,  $p < .05$ .

**Table 1.2:** ANOVA<sup>b</sup>

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	58.781	9	13.561	5.429	.000 <sup>a</sup>
	Residual	20.656	35	.695		
	Total	78.437	43			

A. Predictors: (Continuous), Authoritarian, Authoritarian, Permissive, Defiant

B. Dependent Variable: Academic Performance of Adolescents

The ANOVA result from Table 1.2 shows a significant difference ( $p = 0.000$ ) for the four predictors (authoritative, authoritarian, permissive, neglectful) as our alpha value was  $p < 0.05$ . This implies that the means differ more than would be expected by chance alone. It can be concluded that the effect of the four predictors on the academic performance of adolescents varies.

**Table 1.3:** Multiple Regression Analysis for Academic Performance of Adolescents

Model	Unstandardized Coefficients		Standardized Coefficients		T	Sig.	95% Confidence	
	B	Std. Error	Beta				Lower Bound	Upper Bound
1 (Constant)	1.080	1.146		.953	.033	1.282	4.572	
Authoritative	.752	.175	.334	4.094	.017	.282	.485	
Authoritarian	-.652	.168	-.764	-1.816	.011	-.251	.424	
Permissive	-.495	.188	-.625	-1.184	.026	-.373	.424	
Neglectful	-.783	.198	-.467	-1.575	.031	-.489	.576	

**A. Dependent Variable: Academic Performance of Adolescents**

From the significance column in Table 1.3, it can be concluded that all the predictor variables (Authoritative, Authoritarian, Permissive, Defiant) are significant as they are less than normal alpha of 0.05 ( $p < 0.05$ ). This finding agrees with that of Rogers, Thule, Ryan, Adams, and Keing (2009) in Canada, who found that parents who adopt strong authoritarian parenting styles contribute to lower academic performance of students. Mohammad, Koorosh, and Hamid (2011) demonstrated that authoritarian parenting styles were negatively associated with children’s academic achievement in Iranian families. Hong (2012) concluded that both parenting practices and parenting styles affect children’s school achievement. Cherry (2013) in South Africa indicated that the regression model results for academic performance were significant,  $F(12, 10361) = 149.14$ ,  $p < .001$ . Verenikina, Viall, and Lisaghat (2011) revealed that this parenting style had an effect on academic performance ( $r = .76$ ,  $p < .05$ ).

**IV. CONCLUSION & RECOMMENDATION**

So it can be concluded that permissive parents found it difficult to discipline their children, spoiled their children and condoned their bad behavior. This parenting style has a negative effect on a child's academic performance, and the more permissive a parent is, the less likely their child is to do well in the classroom. Neglecting parents were not concerned about their children's well-being in the classroom or social development and this could harm their children's academic performance. Teachers Service Commission (TSC) should train teachers on how to handle children of different parenting styles for good academic performance for all. This is because studies have shown that parenting styles affect academic performance. Teacher counselors should seek ways to strengthen their relationships with children and with parents to gain a better understanding of their parenting styles and then to tailor each child according to the parenting style implemented. Must be handled. This will help them to understand the various adjustment problems of individual students and then help the students to perform well in academics. Parents should adopt authoritative parenting styles that will enhance proper communication between them and their children. They should also visit the schools and inquire about the academic performance of their children. This will help in reducing the dropout and enhance the academic performance of the students. With respect to the outcome of parenting style, it was found that parental value toward achievement, parental interest in homework, and parental involvement in school work accounted for a unique proportion of the variance in achievement outcome. Predicted. Bury, JR (1981) examined whether both maternal and paternal parenting (perceived by adolescents) were positively related to academic achievement. Parenting style is influenced by many factors, including community exposure and resources, poverty level, neighborhood quality, and cultural or ethnic background. Several studies explored the relationship between the Big Five personality factors and academic performance in an educational context. It is widely accepted that the Big Five personality factors (neuroticism, extraversion, openness, agreeableness, and conscientiousness) capture most of the individual differences in behavior patterns and therefore can be used to study daily behavior and performance across a wide range of domains. is done for are suitable. There is a growing literature on self-esteem, parenting styles and personality factors in the

context of educational settings among adolescents in the Western world, but there is a lack of research on this particular area in the Indian context. The current study focuses on how self-esteem, parenting styles, and personality traits may influence the academic achievement of adolescents during the pandemic. Additionally, the role of personality traits as mediators between self-esteem and academic achievement and parenting style and academic achievement during the pandemic were also studied.

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# Enhancing Sustainable Practices through AI-Driven Green Technology

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**Abstract:** *The convergence of artificial intelligence (AI) and green technology presents a transformative approach to address pressing environmental challenges and foster sustainability. This paper explores the synergy between AI and green technology, showcasing how AI-driven solutions can revolutionize various sectors to reduce carbon footprints and promote sustainable practices. Through smart energy management, waste management and recycling optimization, precision agriculture, climate modeling and prediction, transportation enhancement, and natural resource management, AI's capabilities are harnessed to enhance eco-friendly initiatives. This abstract provides a succinct overview of the potential for AI to drive sustainable practices, leading us into an era where technology acts as a catalyst for positive environmental change. The paper begins by contextualizing the pressing need for sustainable solutions, highlighting the detrimental impacts of conventional technologies on the environment. It underscores the urgency of integrating innovation with nature-conscious practices to mitigate climate change, resource depletion, and pollution. The central theme revolves around exploring the multifaceted advancements in green technology that collectively offer a promising pathway toward a balanced and sustainable future. Through an interdisciplinary lens, the paper examines key areas of green technology innovation, including renewable energy sources, waste management systems, smart agriculture, and eco-friendly materials. A comprehensive analysis of each domain showcases their potential to revolutionize industries while minimizing environmental harm. The paper also discusses the challenges that may impede the widespread adoption of these technologies, such as economic constraints, regulatory frameworks, and public awareness. Furthermore, the research paper investigates successful case studies where the integration of green technologies has led to tangible benefits, both in terms of ecological preservation and economic growth. These case studies provide valuable insights into the practical feasibility of implementing green solutions across diverse contexts. The paper underscores the critical role of innovation in shaping a sustainable future, emphasizing the need for a collective commitment from governments, industries, and individuals. By harmonizing human ingenuity with the wisdom of nature, a harmonious equilibrium can be achieved, where progress aligns with planetary well-being. The research paper contributes to the ongoing discourse on green technology by illuminating its transformative potential and inspiring further exploration in the quest for sustainability.*

**Keywords:** Artificial Intelligence, Ecological Preservation, Green Tech, Sustainable Solution.

## I. INTRODUCTION

The introduction of green technology marks a pivotal shift towards sustainable innovation. By prioritizing environmental harmony and efficiency, green technology encompasses a range of practices, systems, and products that minimize resource consumption, reduce emissions, and promote renewable energy sources. This transformative approach addresses pressing ecological concerns while fostering economic growth and resilience. As industries and societies increasingly recognize the imperative of environmental stewardship, the integration of green technology emerges as a crucial driver in shaping a more sustainable future. Green technology, often referred to as "Green Tech,"

represents a transformative approach to technological innovation that prioritizes environmental sustainability and ecological harmony. It emerges as a response to the escalating global concerns over climate change, resource depletion, and environmental degradation caused by conventional technologies. Unlike their traditional counterparts, green technologies are designed to minimize their negative impact on the planet by incorporating principles of energy efficiency, resource conservation, and reduced emissions.

The core objective of green technology is to strike a harmonious balance between human technological advancement and the preservation of the natural world. It encompasses a wide spectrum of fields, from renewable energy sources and energy-efficient building designs to sustainable agriculture practices and eco-friendly transportation systems. In recent years, the urgency to address environmental challenges has accelerated the development and adoption of green technologies across industries and sectors. Governments, businesses, and individuals alike are recognizing the imperative to transition toward cleaner and more sustainable technological solutions. This transition not only addresses environmental concerns but also holds the potential to stimulate economic growth, create jobs, and improve the overall quality of life. This paper delves into the advancements, challenges, and potential impacts of green technology in our quest for a sustainable future. By exploring the innovative approaches and real-world applications of green tech, we can better understand its role in mitigating environmental risks and shaping a more resilient and ecologically balanced world. The global cumulative investment in renewable forms of energy and green technology processes exceeded \$200 billion in the year 2017, according to a United Nations study published in 2018. \$2.9 trillion has also been invested in sources such as solar and wind power since 2004. The UN also reported that China was the world's largest investor in the field, with about \$126 billion invested in 2017.

## II. HISTORY OF GREEN TECHNOLOGY

The history of green technology, also known as environmentally friendly or sustainable technology, is a narrative of the development and adoption of various technological innovations aimed at reducing the negative impact of human activities on the environment. Here's a brief overview of its evolution:

- **Early Awareness (Pre-20th Century):** While not explicitly termed "green technology," early civilizations practiced sustainable techniques such as crop rotation, water conservation, and passive solar design. However, the concept of intentionally designing technologies to minimize environmental impact wasn't widespread at this time.
- **Industrial Revolution (18th to 19th Century):** The Industrial Revolution marked a significant shift in technology and energy use. While it brought about unprecedented advancements, it also led to increased pollution, deforestation, and resource depletion. Efforts to mitigate these impacts were limited during this era.
- **Mid-20th Century:** The environmental movement gained momentum after World War II, as concerns about pollution, deforestation, and the use of synthetic chemicals grew. Rachel Carson's book "Silent Spring" (1962) played a pivotal role in raising awareness about the harmful effects of pesticides.
- **1970s - 1980s: The Emergence of Green Technology:** The energy crisis of the 1970s prompted interest in renewable energy sources like solar, wind, and geothermal. The creation of the U.S. Environmental Protection Agency (EPA) in 1970 signaled increased government involvement in environmental protection. This period also saw the development of more energy-efficient appliances and vehicles.
- **1990s - 2000s: Technological Advancements:** The 1990s witnessed the commercialization of hybrid electric vehicles, like the Toyota Prius, which brought attention to the potential of cleaner transportation. Solar and wind technologies improved in efficiency and cost-effectiveness, making them more viable alternatives to fossil fuels. International agreements like the Kyoto Protocol (1997) aimed to address climate change by reducing greenhouse gas emissions.
- **2010s: Mainstreaming Green Technology:** The 2010s saw a surge in interest and investment in green technology. Electric vehicles became more popular, with companies like Tesla leading the way. Advancements in battery technology improved energy storage, enabling greater use of renewable sources. Smart grid technology and energy-efficient building designs gained prominence.

**III. PRESENT AND FUTURE OF GREEN TECH**

Green technology continues to evolve rapidly. Innovations include more efficient solar panels, grid-scale energy storage solutions, advanced recycling technologies, sustainable agriculture practices, and increased focus on circular economy principles. The urgency of addressing climate change has led to greater emphasis on clean energy, carbon capture, and decarbonization across industries. Throughout this history, the development of green technology has been driven by a combination of environmental concerns, technological innovation, regulatory changes, and market demand. The journey toward a more sustainable future remains ongoing, as researchers, engineers, policymakers, and businesses collaborate to create a cleaner and more environmentally responsible world.

**IV. SECTORS USING GREEN TECH**



**Figure 1: Sectors Using Green Technology**

Green technology has found applications across a wide range of sectors, demonstrating its versatility and potential to contribute to sustainability. Some of the prominent sectors that are adopting and utilizing green tech include:

- **Energy Production and Distribution:** Green tech is most notable in the energy sector, where renewable energy sources such as solar, wind, hydroelectric, and geothermal power are harnessed to generate electricity. These sources offer cleaner alternatives to fossil fuels, reducing greenhouse gas emissions and dependency on finite resources.
- **Transportation:** The transportation sector is incorporating green tech through the development of electric vehicles (EVs), hybrid vehicles, and improved fuel efficiency. EVs, in particular, contribute to reduced emissions and air pollution, transforming the way we commute.
- **Construction and Architecture:** The construction industry is integrating green technology by adopting sustainable building materials, energy-efficient designs, and smart building systems. Green buildings utilize

renewable energy sources, efficient insulation, and advanced automation to minimize energy consumption and waste generation.

- **Agriculture and Food Production:** Sustainable farming practices and precision agriculture techniques are being employed to optimize resource use, reduce chemical inputs, and enhance crop yields. Green tech in agriculture includes the use of organic farming methods, vertical farming, and innovative irrigation systems.
- **Waste Management:** Green technology is revolutionizing waste management by promoting recycling, composting, and waste-to-energy processes. Technologies like anaerobic digestion and waste incineration with energy recovery help extract value from waste materials while minimizing their environmental impact.
- **Water Management:** Green tech is applied in water treatment and conservation, with innovations such as water-efficient appliances, greywater recycling systems, and advanced filtration technologies. These solutions contribute to the sustainable use and management of water resources.
- **Manufacturing and Industry:** Industries are adopting green technology by implementing energy-efficient processes, utilizing eco-friendly materials, and reducing waste production. Sustainable manufacturing practices help reduce pollution and resource consumption.
- **Information Technology (IT):** Green tech is also making its mark in the IT sector through data center optimization, energy-efficient servers, and cloud computing. These advancements reduce energy consumption and the carbon footprint associated with digital infrastructure.
- **Renewable Resource Management:** Beyond energy, green tech extends to the management of renewable resources like forests, oceans, and fisheries. Sustainable forestry practices, marine conservation efforts, and responsible fishing methods all fall under the purview of green technology.
- **Healthcare:** The healthcare sector is incorporating green tech by adopting energy-efficient medical equipment, reducing hazardous waste, and implementing sustainable practices in healthcare facilities.
- **Textile and Fashion:** The fashion industry is adopting sustainable practices such as using organic and eco-friendly fabrics, reducing water consumption during production, and implementing circular fashion models to reduce waste.
- **Tourism and Hospitality:** Green tech is being integrated into hotels, resorts, and travel services to reduce energy consumption, minimize waste generation, and promote eco-friendly tourism practices.
- **Renewable Energy Storage:** Besides energy production, green technology is also involved in the development of advanced energy storage solutions, such as high-capacity batteries and grid-level energy storage systems.
- **Transport Infrastructure:** Green finance and sustainable investing are becoming more prevalent, encouraging investments in environmentally friendly projects and technologies that have a positive impact on the planet.
- **Education and Awareness:** Green tech is employed in creating educational tools, platforms, and campaigns to raise awareness about environmental issues and encourage sustainable behaviors.
- **Forestry and Conservation:** Green tech assists in monitoring and managing forests, tracking wildlife populations, and implementing conservation efforts to protect biodiversity.
- **Chemical Industry:** The chemical sector is developing eco-friendly processes and materials to reduce pollution, toxicity, and resource consumption in various chemical production processes.
- **Social Innovation:** Green tech is used to address social challenges, such as providing clean water solutions in remote areas, improving access to renewable energy in underserved communities, and enhancing disaster response systems.
- **Consumer Electronics:** Companies are designing energy-efficient electronic devices, promoting repairability and recyclability, and reducing electronic waste.
- **Art and Design:** Artists and designers are incorporating sustainable materials and techniques into their creative works, promoting environmentally conscious aesthetics.

The application of green technology continues to expand across various sectors as societies and industries increasingly prioritize sustainability and environmental responsibility.



### **V. ADVANTAGE OF GREEN TECHNOLOGY**

Green technology offers a multitude of advantages that resonate with both environmental preservation and societal progress. By prioritizing sustainability, it significantly reduces the ecological footprint of industries and human activities. Green tech fosters energy efficiency, leading to lower resource consumption and reduced emissions. This not only mitigates climate change but also enhances resource availability and resilience. Moreover, the adoption of green technology spurs innovation, creating new economic opportunities and jobs within emerging sectors. It improves air and water quality, promotes healthier living conditions, and establishes a foundation for long-term environmental harmony. In essence, green technology provides a holistic approach to addressing global challenges, ensuring a sustainable future for generations to come.

### **VI. IMPORTANCE OF GREEN TECHNOLOGY FOR SUSTAINABILITY**

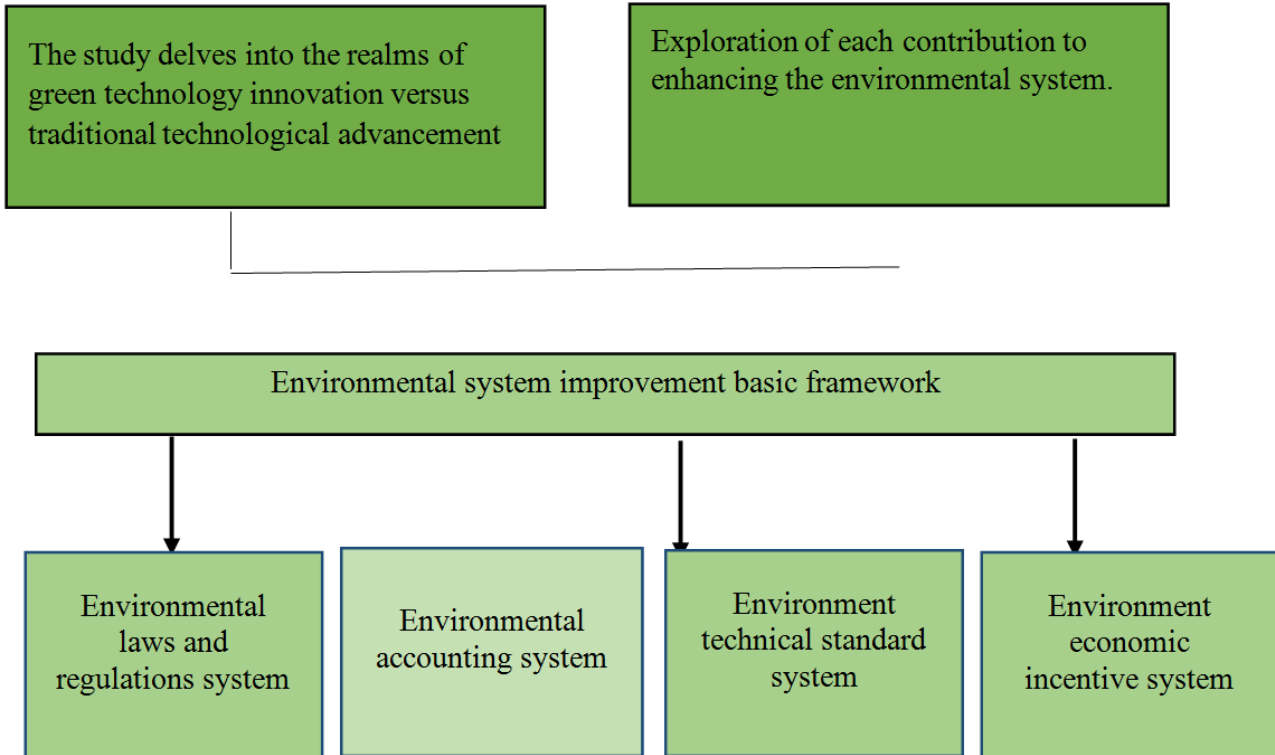
Green technology is indispensable due to its pivotal role in addressing the pressing environmental challenges that threaten the delicate balance of our planet. As human activities continue to strain natural resources and contribute to climate change, the integration of green technology becomes a critical imperative. This technology offers innovative solutions that prioritize sustainability, offering a pathway towards a more harmonious coexistence between human progress and ecological integrity. One of the foremost reasons for the indispensability of green technology lies in its ability to mitigate the adverse impacts of traditional, resource-intensive technologies. By emphasizing energy efficiency, waste reduction, and the use of renewable resources, green technology helps to alleviate the strain on finite resources and reduces harmful emissions. This approach is crucial for curbing the acceleration of climate change, preserving biodiversity, and safeguarding ecosystems that support all forms of life. Furthermore, green technology serves as a catalyst for economic growth and job creation in emerging sectors. As societies transition towards more sustainable practices, there is an increasing demand for skilled professionals, researchers, and entrepreneurs who can innovate and implement green solutions. This not only drives technological advancement but also stimulates economic resilience and competitiveness. Importantly, green technology holds the promise of improving public health and enhancing quality of life. By minimizing pollution, promoting cleaner air and water, and reducing exposure to hazardous substances, it directly contributes to the well-being of communities. Additionally, green technologies often lead to the development of smart and sustainable infrastructure, transforming urban planning, transportation, and public spaces into models of efficiency and livability.

As the world faces the reality of finite resources and ecological thresholds, green technology stands as a beacon of hope. It offers a proactive approach to sustainable development that is aligned with the needs of the present and the future. Without the integration of green technology, the risks posed by climate change, resource depletion, and environmental degradation would be exacerbated, potentially leading to irreparable damage to ecosystems and compromising the quality of life for generations to come. In this context, the indispensability of green technology transcends a mere choice; it represents a responsible and necessary path forward for the well-being of both humanity and the planet we call home.

### **VII. ENVIRONMENTAL SYSTEM IMPROVEMENT FROM THE PERSPECTIVE OF THE GREEN TECHNOLOGY INNOVATION MODEL**

This paper aims to develop a foundational framework for enhancing environmental systems based on the model of green technology innovation. This is accomplished by conducting a comparative analysis of green technology innovation and conventional technological innovation, along with an examination of their impacts on environmental improvement. Through these means, the study seeks to establish a fundamental structure for enhancing environmental systems using insights from the green technology innovation perspective. Examining environmental system enhancement through the lens of green technology innovation offers a unique vantage point. This perspective not only evaluates the advancements in environmental sustainability brought about by green technology but also underscores its potential to revolutionize the way we address ecological challenges. The contrast between green technology innovation and traditional technological innovation is particularly evident in their underlying philosophies. Green technology prioritizes harmony with nature, mimicking natural processes, and minimizing disruption to ecosystems. In contrast, conventional technological innovation often focuses on short-term gains and can inadvertently contribute to resource

depletion, pollution, and habitat degradation. Recognizing these distinctions, the shift towards green technology innovation emphasizes holistic and systemic thinking, encouraging interdisciplinary collaboration and a more profound consideration of the consequences of innovation.



**Figure 2:** Environmental system improvement framework of the green technology innovation model

**Environmental Laws and Regulations System:** The environmental laws and regulations system constitutes a legal framework established by governments to safeguard the environment, natural resources, and human health. These laws, enacted through legislative processes, empower regulatory agencies to formulate specific rules that govern activities with potential environmental impact. Covering areas such as pollution control, resource management, waste disposal, and biodiversity conservation, the system enforces compliance through monitoring, permitting, and penalties. Public participation is often encouraged, and international agreements address global challenges. By promoting responsible practices and addressing emerging concerns, the system plays a pivotal role in fostering sustainability and protecting ecosystems for current and future generations.

**Environmental Accounting System:** The environmental accounting system is a methodical approach to quantifying and managing the economic value of natural resources and environmental assets. It involves tracking and assessing the costs and benefits associated with environmental activities, such as resource consumption, pollution reduction, and conservation efforts. By integrating environmental data into financial reporting, organizations can make informed decisions that balance economic growth with ecological sustainability. This system aids in recognizing the true value of environmental resources and encourages businesses to adopt more responsible practices, contributing to a greener and more sustainable future.

**Environment Technical Standard System:** The environmental technical standard system establishes a set of uniform criteria and guidelines for assessing and managing various environmental aspects. These standards cover areas like air and water quality, waste management, and emissions control. They provide a common framework for industries, organizations, and regulatory bodies to ensure compliance with environmental regulations and promote sustainable practices. By setting clear benchmarks for performance and environmental impact, the system facilitates effective communication, enhances transparency, and fosters continuous improvement in environmental management and protection.

**Environment Economic Incentive System:** The environmental economic incentive system employs financial mechanisms to encourage environmentally friendly behaviors and practices. By attaching costs or benefits to environmental actions, this system aims to align economic interests with ecological well-being. It includes measures like pollution taxes, carbon trading, and subsidies for renewable energy adoption. By internalizing environmental costs and rewarding sustainable choices, the system encourages businesses and individuals to minimize negative environmental impacts, fostering a more balanced and sustainable approach to economic development.

### VIII. CONCLUSION & FUTURE SCOPE

In conclusion, the integration of AI with green technology holds immense potential for creating a more sustainable and eco-friendly world. By optimizing energy usage, improving waste management, advancing agriculture practices, enhancing climate modeling, revolutionizing transportation, and managing natural resources more effectively, AI-driven green technology can contribute significantly to mitigating environmental challenges. Embracing these innovations can lead us toward a future where technology and nature coexist harmoniously, fostering a healthier planet for generations to come. The pursuit of harmonizing nature and innovation through advancements in green technology marks a pivotal stride towards securing a sustainable future. The intricate interplay between technological progress and environmental preservation underscores humanity's evolving responsibility to mitigate the detrimental impacts of modernization. As the discourse around climate change and resource depletion intensifies, the integration of innovative solutions that prioritize environmental health becomes paramount. The strides made in fields such as renewable energy, waste management, and sustainable agriculture are testaments to our collective commitment to safeguarding our planet. By synergizing nature's wisdom with the marvels of innovation, we not only pave the way for cleaner and more efficient technologies but also foster a profound respect for the delicate balance of ecosystems. The journey towards a sustainable future is ongoing, demanding continued dedication to research, collaboration, and policy-making that place nature at the heart of our technological evolution. As we bridge the gap between innovation and environmental consciousness, we illuminate a path towards a future where technology and nature coexist harmoniously, paving the way for generations to thrive in a world marked by equilibrium and stewardship.

The future scope is promising and holds immense potential to reshape our world towards a more environmentally conscious and sustainable trajectory. As technology continues to evolve, several key areas warrant exploration and emphasis within this theme such as Cross-Disciplinary Collaboration, Circular Economy Integration, Renewable Energy Revolution, Smart Cities and Infrastructure, Nature-Inspired Design, Ecosystem Restoration Technologies: Green technology can aid in ecosystem restoration and conservation efforts. Advances in reforestation methods, soil health improvement, and marine habitat restoration can have far-reaching positive impacts on biodiversity and ecosystems, Policy and Regulatory Support, Environmental Data Analytics, Education and Awareness, Global Partnerships. In conclusion, the future scope for "Harmonizing Nature and Innovation: Advancements in Green Technology for a Sustainable Future" encompasses a wide spectrum of opportunities to create positive change. By embracing these avenues, we can work towards a world where nature and innovation coexist harmoniously, paving the way for a more sustainable and resilient future for all.

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# A Study of Change Management Practices in Management Education with Emotional Intelligence

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**Abstract:** *In the fast-growing business world, change management skills play a critical role in moulding change in favour of the competitive advantage. Change management is the lubricant that oils the wheels of organizations in the race for competitive advantage. In such a situation, emotional intelligence takes the centre stage which not only enhancing their change management skills but also in changing the course of change in favour of the organization. Many organizational change efforts face resistance mainly because of the method of implementation. Change Management involves the ability to communicate, influence, collaborate and work in harmony with colleagues. Emotional intelligence competencies allow organizational members to acknowledge the need for change, remove barriers, and enlist others in pursuit of new initiatives aimed at organizational success. The present research paper attempts to explore the relationships of emotional intelligence of teaching and non-teaching staff in management institutions with the change management practices. This paper also examines as to which dimension of emotional intelligence significantly contribute in predicting and enriching their change management skills. A total of 486 employees from management institutions have been surveyed by using well-established measures of emotional intelligence and change management skills. Correlation and regression analysis unveils that self-awareness and self-management are the significant predictors and contributors in change management skills.*

**Keywords:** change management, competitive advantage, lubricant, method of implementation, emotional intelligence.

## I. INTRODUCTION

The world is undergoing the knowledge landscape. Schools, colleges, and universities are among society's major agents of socialization. Certain occupational roles, notably termed as 'the professions', require a special period of preparation means education in a professional school. In the professional school, the student learns the special knowledge, skills and values which will be necessary for responsibly fulfilling his /her duties.

### Management Education:

The management education plays a significant role in today's dynamic and volatile environment. Rapid changes in the markets in terms of technology, economy as well as changing mind sets of the human resources is making it a challenge in making of dynamic and industry ready managers. When the quality of the management education is enriched, it will create global management professionals who will contribute qualitatively to the industries and uplift the overall global economic developments.

Management education in India has seen a lot of changes and improvements. Management Education witnessed a sea change in its educational system. Process of liberalisation, privatization, globalisation has not only replaced traditional approach with a more efficient professional approach; but also introduced new age courses in accordance with industry demand which have more economic value in today's time, Management education has got a new dimension with this changing time. Initially Marketing, Finance and Human Resource Management were considered as functional area of management, but it is covering much more functional areas like Operations, Information Technology, International



Business, Supply Chain Management, Retail, Sports, Hospital, Hospitality Management and more. The demand for trained management trainees is growing day by day in India.

There are more than 5000 B-schools in India where students pay a massive sum hoping to find their dream career in management field. Unfortunately, neither all the students are getting what they expected, nor the management institutions can keep pace with the trends and the expectations from the industry due to various reasons. Maharashtra registered maximum management institutions with 410 in academic year 2022-23 as per Ministry of Education. Mumbai being a financial hub of the country is having more than 210 management institutions under various universities and other autonomous bodies. There are variations in the number of colleges due to various reasons in terms of total strength of students, their satisfaction levels, suitability to the industry, and overall development of the students. The facilitators like teaching, non-teaching, industry experts do matter a lot for the development of an institution. Lastly, the process and the management who are driving the institute need to keep pace with the policies, rules and regulations of various government bodies. They do face many limitations in their process of managing an institution.

**AICTE Approved Management colleges in Mumbai region**

S.No	Academic Year	Number of Management Colleges (PG) in Mumbai Region	Total Number of colleges in Maharashtra
1	2014-15	79	426
2	2015-16	78	406
3	2016-17	75	388
4	2017-18	79	379
5	2018-19	78	369
6	2019-20	74	366
7	2020-21	99	396
8	2021-22	96	403
9	2022-23	94	410

**Definitions: Management Education**

An education imparting the skills and abilities to be a part of a process to systematise a set of activities to be undertaken in various functional activities to achieve maximum organisational objectives with minimum costs and time.

Is a discipline of higher education, where knowledge related to business and administration in various fields like finance, marketing, human resources, operations, systems, and overall personality development of a student to lead both profit and non-profitable organisations, small or big with the broad outlook and future vision?

**Management Institution:**

An institution whose business is imparting management education at post-graduation level affiliated to universities as well as autonomous colleges.

(This research done only with post-graduation level management degree institutions)

**Change management**

Change management is a systematic approach dealing with the transition or transformation of an organization's goals, processes, or technologies. The purpose of change management is to implement strategies for effecting change, controlling change, and helping people to adapt to change.

Change Management is a set of processes that are incorporated to ensure significant changes are implemented in a systematic and controlled way to effect organisational change. The main goal of change management is to reduce the risk associated with the implementation of change in the business environment. Other fundamental goal is rapid recovery of change related problems when changes are implemented.

Usually, organisational enhancement starts with business processes. In process management, work is organised and managed as an end-to-end process instead of sum of disjointed functions. Process Management, firmly rooted in a business enterprise makes real and lasting improvements. Organizations undergo many changes due to both internal as well as external pressures. Some of the change pressures are environmental pressures, Fashion pressures, Mandated

Pressures, geopolitical pressures, market decline pressures, hyper competitive pressures, reputation, and credibility pressures. Broadly the organisational pressures for change due to growth pressure, integration & collaboration pressure, identity pressure, new broom pressures and Power & Politics pressures.

Basically, changes are applicable to three areas like in structure, technology, and people, for overall development towards end objective.

Change Management Systems, culture, organisational change, top management commitment, information technology infrastructure and organisational performance as dependent variable. Efficiency, effectiveness, and flexibility can be used as dimensions.

#### **Change Management Practices:**

The process by which organisations move from their present state to some desired future state to increase their effectiveness to find improved ways of using resources and capabilities to increase an organisation's ability to create value.

#### **Emotional Intelligence and Change Management**

Change Management is a process to accelerate productive adoption of change. Moving successfully through change inevitably produces strong emotions; stakeholders assess what the change means to them which will be highly variable. William Bridges, the pre-eminent authority on change and transitions, suggested that change involves multiple stages. A dip in productivity is expected as people cope with confusion, frustration, and denial, before they can successfully become engaged around new beginnings.

To keep pace with changes in the workplace requires the ability to continue to learn new technologies, evolving work relationships, and understanding emerging trends. By its nature, learning requires a degree of vulnerability being open to making mistakes and even failure; and a willingness to stretch comfort zones while climbing the learning curve. As a Harvard Business Review article details, people with high emotional intelligence have greater adaptability, demonstrate more curiosity, and are open to lessons from both successes and failures. Emotional intelligence helps lower defensiveness and negativity that blocks our ability to learn, adapt and innovate. Gallup findings show most workers not engaged at work, "retired on the job" these employees are not actively learning.

#### **Ability-based Model of Emotional Intelligence**

Peter Salovey and John D. Mayer after continued research have further refined the definition of EI to "The ability to perceive emotion, integrate emotion to facilitate thought, understand emotions and to regulate emotions to promote personal growth". Further research narrowed down the EI definition into "the capacity to reason about emotions, and of emotions, to enhance thinking". EI comprises of the capacity of an individual to precisely perceive the emotions, to access them and to produce the emotions, so as to assist an individual in processing his/her thoughts, to assist in comprehending emotions and the emotional knowledge of an individual, and to regulate emotions thoughtfully to encourage growth in emotions as well as intellect.

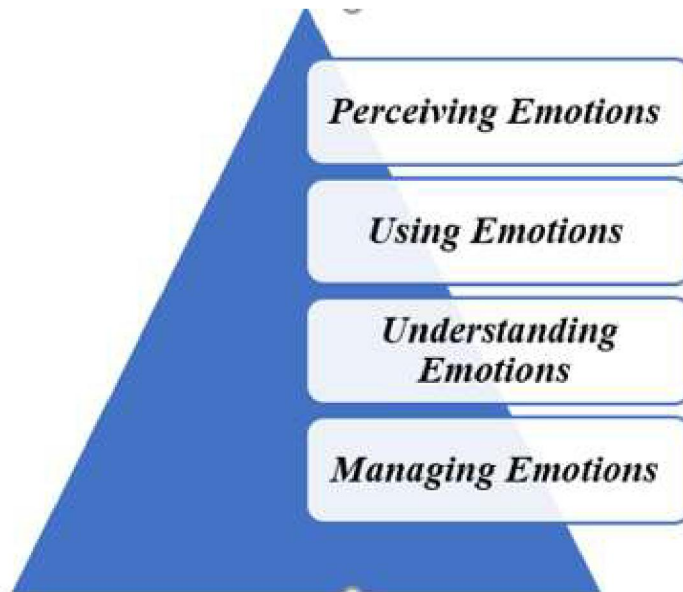
The ability-model of EI endorses four abilities in individuals:

**Perceiving Emotions** –It explains the capability of an individual to perceive and interpret facial emotions, pictorial emotions, emotions in voice, and in cultural objects. It also includes the capability to categorize a person's own emotions. The ability to perceive emotions represents a basic feature of emotional intelligence, as it makes the processing of all other emotional information feasible.

**Using Emotions** – The usage of this capability is in harnessing emotions to enable intellectual aspects like problem-solving and thinking. An emotionally intelligent individual capitalizes his ever-changing mood to fit into the task to be accomplished. Understanding Emotions is the ability that talks about comprehending emotions and the complex relationships between emotions.

**Managing Emotions** – this ability talks about regulation of emotions in oneself as well as in others. A person, who is emotionally intelligent can channel his adverse emotions and accomplish them to attain individual goals.

Peter Salovey, John D. Mayer, and Caruso developed the Mayer-Salovey and Caruso Emotional Intelligence Test (MSCEIT) for measuring the ability-based EI which has a series of items related to emotion-based problem-solving (Figure )



**Figure 2.1: Salovey and Mayer's Ability Model of Emotional Intelligence**

The Wong and Law Emotional Intelligence Scale (WLEIS) developed by CS Wong and KS Law in 2002 is another measure of EI that is based on the ability model.

This scale measures the following four dimensions of EI:

- i. Use of emotion (UOE)
- ii. Regulation of emotion (ROE)
- iii. Self-Emotional Appraisal (SEA)
- iv. Others' Emotional Appraisal (OEA)

#### **Need for Research**

Earlier in managerial knowledge, majority of the industry were satisfied with economics knowledge. Over the period the industry needed cross-functional experts, hence the management institutions are constantly thriving to include the skills related to overall development of a student as an emotional intelligence Manager.

Keeping this as a base, this study is aiming to study the management practices to bring a desired changes by using emotional intelligence which were implemented by the management institutions in Mumbai region.

#### **Rationale of the study:**

Institutions of Management Education can frame the change practices with logic for desired improvement and implement them keeping pace with rapid changes in terms of technologies, living patterns, spending capacity of the people, overwhelming market conditions.

Management institutions can conceptualise core knowledge asset and trying to provide overall development of their stake holders by adapting new strategies, grabbing, and creating new opportunities in learning.

## **II. REVIEW OF LITERATURE**

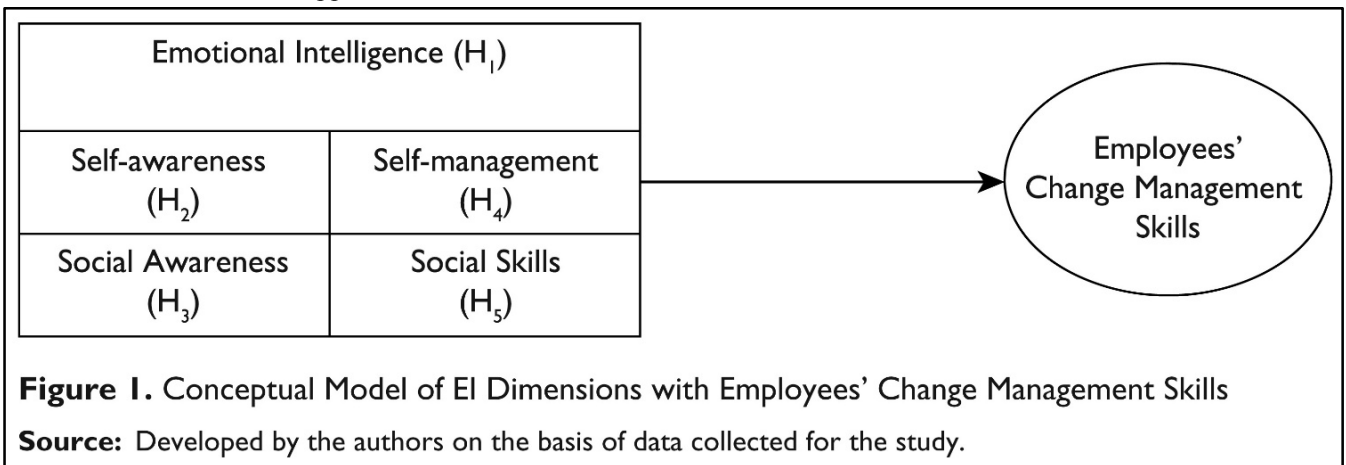
**Umesh Mukhi, Camilla Quental** (2023) in their work *New Normal and Old Wisdom: Converging CEO and Academic Perspectives for Responsible Management Education and Leadership* suggests reflective pointers for decision-makers in management education; business schools can lead integrating sustainability in their purpose and practice; relevance of the spiritual dimension and its significance in business schools and organisations; and proposing a holistic view in comparison with a traditional view of business education.

**Arus, Valerie Anderson, (2022)** in their research work, ‘The Navigational Challenges of a blended learning approach to teaching in business and management’ contributes the new knowledge about the factors that affect the deployment of blended learning in the context of management school. While contributing the theory by extending conceptualisation of academic reflexivity and agency it discusses implications for academics and policy makers who are involved in introducing blended learning in management education contexts.

**Moon, J. (2021)** explored the EI theory in relation to risk-based decision making. The outcomes of the research established the role of EI in cleaning harmful internal biases and confirmed that the presence of EI is a factor of success in decision making and leadership. The results also established that transformational leader is less biased and more emotionally intelligent in comparison to transactional leaders. The above attributes generate an appropriate risk attitude and augment risk-intelligent decisions.

**Harry N (2021)** studied the effect of EI with meaningfulness as moderating variable in predicting professional efficacy and exhaustion of call centre agents. The outcome established that sense of meaningfulness, capability to manage emotions of others’ and perceive emotions moderated the relationship of professional efficacy and exhaustion in a significant way.

**Andi Hari Krishnan (2012)** in his research established a positive correlation of EI dimensions namely- Appraisal of Emotions in Self and Others, Emotions Expression, Emotions Regulation, Utilization of Emotions, Empathy, Social Skills, Optimism, Self-Motivation, Happiness, and Handling Relationships with Personality Traits of being conscientious, agreeable, extravert and open to experience. A positive but very low correlation of Neuroticism was observed with the utilization of emotion, appraisal of Emotion in self and others, empathy, optimism, and handling relations. A negative correlation of neuroticism was observed with emotion expression, emotion regulation, social skills, self-motivation, and happiness.



**Areas of Research:**

<b>The Management</b>	Systems & processes – Mission & Vision Policies for the welfare of the faculty, staff and the students Overall improvement of the Institute like number of courses offered, number of students, various committees. Infrastructure Managerial Innovations
<b>Human Factors</b>	Leaders, Faculty, Staff, Students
<b>Internal Context</b>	Institutional Framework, Campus Overall Operations, Communication, Library, Labs (Computer, Language, and simulation labs), Education (teaching pedagogy), Student engagement activities for overall development
<b>External Context</b>	Recruitment Companies, service providers, Government bodies, Regulators, Associations with other organisations/institutes and other Ecological factors

The study conducted using Change Management Models for easy and clear understanding of the practices. An exclusive conceptual model can be prepared suitable for management education.

#### **Gap Analysis**

As the skills required in management field is being changed constantly. The management institutions who are in the process of preparing market ready managers also need to adopt the required changes in their processes of grooming of the faculty, the students, and the management. Every year it is observed that there are variations in terms of numbers of the management institutions as well as their courses, teaching, handling various subjects which are relevant to the market in given period.

At present, we don't have much information about the impact of change management practices on management education in the Indian context. This study helps to bridge this gap.

### **III. RESEARCH OBJECTIVES**

To the study the relationship between change management and Emotional intelligence of both teaching and non-teaching employees of the management institutions.

To study the effect of the change management on the students' emotional intelligence while making them suitable for the management world.

#### **HYPOTHESES**

To guide the study, the following hypotheses were formulated and tested at 0.01 level of significance.

**H<sub>0</sub>:** Emotional intelligence is not powerful in successful change management in Management Education

**H<sub>1</sub>:** Emotional intelligence is powerful in successful change management in Management Education.

### **IV. RESEARCH METHODOLOGY**

#### **Research design:**

Present research was a survey of Management institutions in Navi Mumbai and Mumbai regions where population data was gathered and then conducted research on these segments. The research design was quantitative in nature.

#### **Descriptive Research:**

The main characteristic future of this method is that the researcher has no control over the variables. Researcher can only report what had happened or what is happening. In this method survey of all kinds were used. This research was pre-planned and well-structured research. For the present study we had used a proper structured questionnaire to measure what respondents feels and what they did to get a reliable and valid data. Cross-sectional design was used in this study, which involves the collection of information from given sample of population at one point of time.

#### **Questionnaire:**

Through literature review, the questionnaire were prepared from the contributions of various researchers. For example Sutton and Wheatley (2003): Understanding emotional intelligence of students. Questionnaire was divided into two parts.

Part A: Demographic like Name, gender, age, service length, qualification Experience

Part B: Close and open ended questions. (The 5-point and 7- point Likert scale developed by Meyer and Allen(1990)was used for measuring different dimensions, factors ,conditions of teaching and non-teaching staff.

#### **Data collection:**

For the present study, both primary and secondary methods were chosen.

#### **Primary data:**

Primary data was collected by the methods of survey, interviews, field observation. This Questionnaire were quantitative and statistical form like charts, graphs, diagrams, and tables.



**Secondary data:**

Secondary data was collected through various books, magazines, working papers, journals, websites, reports etc. Secondary data was used to design the questionnaire and set the parameters which influence the Emotional Intelligence

**Population:**

Mumbai and Navi Mumbai are the cities of tremendous potential of growth. There are various Management education institutions in Navi Mumbai and Mumbai.

**Sample Size and type of Sampling:**

The simple Random sampling technique was used to collect data from the respondents. The sample comprised of 486 participants from the population.

**Statistical tools and techniques used for data analysis:**

Office 365 (Excel 2202), Descriptive statistics such as Mean, Standard Deviation, Median, Percentile etc. were used for data analysis.

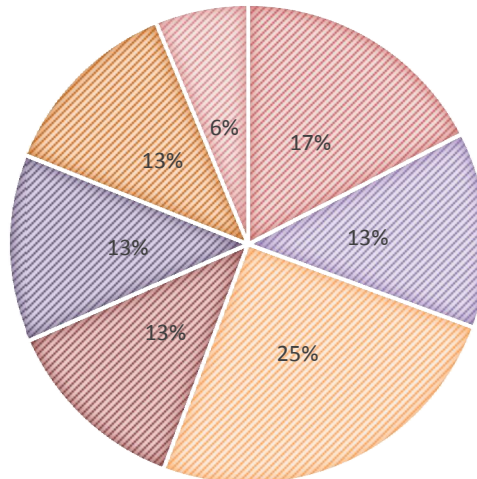
**V. CALCULATION**

**Table 1: Goleman's (2001) Emotional Intelligence Competencies Clusters**

Self (Personal Competence)		Other (Social Competence)
Recognition	Self-Awareness <ul style="list-style-type: none"> <li>• Emotional self-awareness</li> <li>• Accurate self-assessment</li> <li>• Self-confidence</li> </ul>	Social Awareness <ul style="list-style-type: none"> <li>• Empathy</li> <li>• Service orientation</li> <li>• Organization awareness</li> </ul>
Regulation	Self management <ul style="list-style-type: none"> <li>• Self-control</li> <li>• Trustworthiness</li> <li>• Conscientiousness</li> <li>• Adaptability</li> <li>• Achievement drive</li> <li>• Initiative</li> </ul>	Relationship management <ul style="list-style-type: none"> <li>• Development others</li> <li>• Influence</li> <li>• Communication</li> <li>• Conflict management</li> <li>• Leadership</li> <li>• Change catalyst</li> <li>• Building bonds</li> <li>• Teamwork &amp; collaboration</li> </ul>

## FACULTIES, STAFF AND STUDENTS OF VARIOUS COLLEGES

■ SIES ■ D.Y.Patil ■ SMI ■ KBP ■ ICLES' ■ PCE ■ OTHERS



Total 486 responses from the Faculty, Staff and Students of various Management Institutions were collected. All gave their perspective towards the relationship between change management and Emotional intelligence.

Sr.No.	Management Education Institution/College Name	Total no.of respondents replied
1	SIES	31.8 %
2	DY.Patil	18.02%
3	SMI	18.02%
4	KBP	9.1%
5	ICLES'	9.1%
6	PCE	9.1%
7	OTHERS	4.5%

### Gender among the respondents

Gender plays an essential role in the level of emotional intelligence. Typically, it is understood that female have a higher level of emotional intelligence than the male. In addition to that, we assume that female students fare well in academic performance than male students. The distribution based on gender has shown in Table.

### Classification of the Respondents Based on Gender

Gender	State University		Private/Deemed University		Total	
	N	%	N	%	N	%
Male	247	96.5	9	3.5	256	51.2
Female	239	98.0	5	2.0	244	48.8
Total	486	97.3	14	2.7	500	100

The above table states that the percent of respondents are male, 96.5 percent are from state universities, and 3.5 percent are from private or deemed universities. On the other hand, 48.8 percent of the respondents are female, in that 98 percent are studying in the state universities, and 2 percent are graduating in private or deemed universities. From the above statistics, almost an equal proportion of women are studying in the universities due to the present scenario, which provides equal opportunities to both the gender.

**Age among the respondents**

The respondents' age is one of the essential profile variables, which impacts the level of emotional intelligence more. In general, the respondents with higher age have learnt more through experience, and their level of emotional intelligence may increase to an appreciable level. Hence, age is included as one of the profile variables. The respondents' age is confined to 17 to 19 years, 20 to 22, and more than 22 years. The distribution of respondents based on their age has shown in Table.

Age	State University		Private/Deemed University		Total	
	N	%	N	%	N	%
17 to 19 years	267	98.5	5	1.8	271	54.2
20 to 22 years	179	96.8	5	2.6	185	37
More than 22 years	40	90.9	4	9.1	44	8.8
Total	486	97.2	14	2.8	500	100

Above table clearly reveals that the majority of the respondents (54%) involved in the study are in the age group of 17 to 19, followed by 37 percent are in the age of 20 to 22, and 8.8 percent are in the age group of more than 22 years. In this maximum of the respondents who are in the age of 17 to 19 are studying in-state universities.

**Summary of responses: Relationship between emotional intelligence and change management.**

Sr. No	Statement	Strongly Disagree	Disagree	Neither agree/disagree	Agree	Strongly Agree	Total
1	I know that emotions I'm feeling at every moment and why	28	45	87	111	215	486
2	I mention the unethical actions of others	67	82	78	156	103	486
3	My view of the events is extremely flexible	18	25	87	155	201	486
4	I am willing to sacrifice myself in the name of the organization's goals	38	48	72	105	223	486
5	I operate more from the expectation of success for fear of failure	17	20	42	75	332	486
6	I usually mobilize others to undertake unusual efforts	12	19	33	105	317	486
7	I don't hesitate to skip the usual routines when it is necessary to carry	21	64	95	148	158	486

	out the work						
8	I actively seek out opportunities to meet the group's mission	10	11	19	29	417	486
9	I do my job better each day	20	65	97	146	158	486
10	I adapt my responses and tactics to changing circumstances in the environment	67	82	78	156	103	486
11	I am organized and careful with my work	15	17	33	47	374	486
12	I stay balanced, positive and unflappable even in the most critical moments	72	69	69	68	208	486
13	I consider myself an effective person, capable of taking on challenges and master new tasks	13	19	33	49	372	486
14	I understand the links between my feelings, my thoughts, my words and my actions	4	19	28	90	345	486
15	I can reflect and learn from the experience	23	30	48	53	332	486
16	My sense of humor helps me to distance to myself	38	48	70	105	225	486
17	I remain undisturbed during the critical	33	72	42	152	187	486
18	I take responsibility for my actions	9	32	38	75	332	486
19	I provide original solutions to problems	13	15	27	57	374	486
20	I always look for new ideas in a wide variety of sources	15	17	33	47	374	486

**SELF-ASSESSMENT QUESTIONNAIRE**

Statement	Strongly Disagree	Disagree	Neither agree / disagree	Agree	Strongly Agree	Total
Commitment	30	25	66	157	208	486
Initiative	21	64	95	148	158	486
Optimism	10	11	19	29	417	486
Empathy	20	65	97	146	158	486

Service oriented	67	82	78	156	103	486
Tolerance	15	17	33	47	374	486
Political awareness	72	69	69	68	208	486
Communication	13	19	33	49	372	486
Networking	4	19	28	90	345	486
Teamwork and cooperation	23	30	48	53	332	486
Development of others	38	48	70	105	225	486
Influence	33	72	42	152	187	486
Change Management	9	32	38	75	332	486
Conflict Management	13	15	27	57	374	486
Leadership	15	17	33	47	374	486
Team Building	23	30	48	53	332	486
Emotional awareness	38	48	70	105	225	486
Appropriate self-assessment	33	72	42	152	187	486
Self-confidence	9	32	38	75	332	486
Emotional self-control	13	15	27	57	374	486
Integrity	15	17	33	47	374	486
Responsibility	23	30	48	53	332	486
Adaptability	38	48	70	105	225	486
Innovation	33	72	42	152	187	486
Motivation of achievements	9	32	38	75	332	486
Commitment	13	15	27	57	374	486
Initiative	15	17	33	47	374	486

## VI. FINDINGS AND CONCLUSIONS

The outcomes provide an answer to the below research questions put forth during the literature review and the objectives framed for the current study.

1. How far the plans, practices, and developmental change management models implemented in the management education are being successful in terms of overall development of the institutions, the faculty, and the students?
2. Are the future plans capable of providing positive results as per the trending market conditions?

The first findings were the demographic features of the respondents. The results demonstrated that Emotional Intelligence had a significant relationship with change management. From the results, it can be further concluded that in order to be competitive and to gain a competitive edge over their contemporaries, the Management Institutions need to focus not merely on strategies to beat the competition but also on the emotional competency of their faculties and students. It was earlier believed that employees should leave their emotions behind before entering the workplace. But in today's scenario where organizations have a lot of diversity, it is essential for employees to provide the necessary emotional support to their colleagues with whom they spend a considerable amount of time. What is important is that employees learn to manage their emotions well for enhanced productivity and better decision making. There is an increasing need to develop the emotional competencies of the employees for a better work-life balance, work engagement, motivation, stress handling, etc. EI is a new-age skill that is highly essential for all levels of employees.

The leaders need to address change in a positive manner by keeping the plight of the employees into consideration while restructuring. The management and the government should take the necessary steps to improve upon the emotional intelligence (Kotsou et al., 2019) of employees since it is significantly associated with attitude towards change, performance, leadership, work engagement, etc. Since EI is the most sought-after skill, the government should make this applicable in the school and university curriculum so that individuals develop the skills of empathy, awareness about self and others, better use and regulation of emotions. By learning about EI, the individuals will learn



how to use their emotions, how to regulate them, how to regulate their own emotions and feelings of self as well as that of others which will lead to better relationships at the workplace.

### VII. IMPLICATIONS

This paper would guide the institutions on their way ahead to match the requirement of the market while planning various activities in their institutions.

This paper provides useful knowledge, and the skill sets relevant for aspiring students as well as the faculty.

Faculty can get a clear picture by this paper where the discussion will be there on various eligibilities, policies of various statutory bodies in grooming themselves.

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# A Critical Analysis of Software Defects Ability to Understand using of Software Testing

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**Abstract:** *Remaining defects are the cause of significant issues in the software development industry and not fixing them sooner increases the risk of negative effects such as system crashes, customer dissatisfaction and higher costs. Despite these observations, companies do not always remove newly found defects due to varying factors. These factors, which lead to longer term defects, are not well studied and therefore require more research.*

**Keywords:** Cause, Defect, Software, Testing, and Effect etc

## I. INTRODUCTION

In today's world people's jobs, comfort, safety, entertainment, decisions and their lives depend on computer software, so it is better to get it done right [1]. This is one reason why software testing is extremely important. Software testing is as essential as any other phase of the software development life cycle. Testing should be done before deploying the software for use, it helps to discover errors in time and ensure the working of the software as required, it also helps to correct the defects discovered after the product is put into use. reduces. Software testing is an important part of software quality assurance (SQA), an activity used to evaluate and improve software quality [2]. Software testing includes a set of activities performed with the sole purpose of finding errors in software. It verifies and verifies whether the software or product is working correctly without any errors or defects, enabled bugs. In the testing phase, errors from previous phases should be detected, this ensures software reliability and quality assurance [3]. Software testing tools facilitate generated information management, communication, test execution, generation and production [6]. Therefore, the use of appropriate software testing tools effectively and efficiently enhances the testing process. Currently, a large amount of software testing tools are available to assist at any stage of the testing process [7]. Even though many software testing tools are primarily useful in managing and keeping track of scheduled or performed software tests; However, some software testing tools provide automation for core testing tasks [4] ; This reduces costly, time-consuming and error-prone manual testing [8]. Test automation facilitates the identification of errors and defects in specially developed software effectively and efficiently; Because it increases the reliability factor, saves time and increases productivity in human efforts and also reduces costs in the long run [4].

## II. LITERATURE REVIEW

Software defect prediction is a hot topic in the field of software engineering. Many fault prediction algorithms have been proposed [9], which are mainly based on machine learning, such as linear regression model (LRM) [10], decision tree [11] and ensemble learning [12], etc. The goal of software defect prediction mainly includes two categories: classification and ranking. The classification task focuses on the correct classification of software parts. Many algorithms [13, 14] have been proposed, but no conclusion has been drawn on the most optimal algorithm. This paper focuses on the ranking task. Different from classification, it focuses on testing priority of software parts. By ranking the prediction results, high-risk software parts can be identified. Elberg and Ohlson proposed an Elberg diagram to estimate the accuracy of the predictive model. They proved that most software defects were contained in 20% of the modules. Zimmerman [15] demonstrated that high-complexity modules carry high risks. To improve the efficiency of ranking prediction, several different approaches have been proposed. Ostrand et al. [16] developed a negative binomial regression as a predictor for predicting defects in the next release based on the code in the file in the current release.

Yang [17, 18] introduced a learning-to-rank (LTR) approach with overall difference evolution to obtain the coefficients of a linear model. Most of the research in defect prediction mainly focuses on algorithmic improvement and performance comparison, while little attention is paid to the optimization of forecasting strategy. The novelty of this paper is to propose an optimization strategy that combines defect prediction and STP to improve the prediction accuracy. Cross-project defect prediction (CPDP) is another research point related to defect prediction in this paper. CPDP is often used when automatic prediction is impossible because of not enough training data or poor data quality [16]. Some experiments [20] have shown that CPDP can provide acceptable prediction results if the training data is carefully chosen. In addition, Herbold [21] proposed a distance-based strategy for selecting training data. The results demonstrated that their strategy could significantly improve the effectiveness of CPDP, but it was still not competitive with defect prediction within the project. Transfer learning [22] was introduced to build a more effective CPDP model based on weighted data transferred from cross-project data.

## OBJECTIVES

To identify the factors that companies consider when deciding whether to allow and retain defects.

## METHODS

A two-step method is applied where a snowballing based literature review is used to identify research gaps in order to gain an understanding of the research area. These results are then complemented by an empirical and industrial case study with 16 interviews. Interviews were analyzed with an approach inspired by thematic coding, which led to the main findings of the study.

## III. RESULT ANALYSIS

What factors are considered in industrial practice when deciding not to remove a defect?

The results of the interviews identified 11 different factors that lead to slack defects, in short the factors. The results also indicate that known and unknown defects are treated differently, as factors are considered in different ways. To find out what factors participants use to perpetuate defections, interviewees were first asked how they define defections, listed in question 4.5, also to check whether the results match Let's look at how the literature defines defects [13]. The results indicate a heterogeneous view of what is at fault within the sample. While some interviewees define it as when the system stops working, others said it is when the system does not respond as expected. These statements are also related to factors such as the priority of the defects as well as their severity, e.g. minor or major. However, some of the interviewees also stated that they do not have any known flaws on the system yet. This information was considered during the analysis to help ensure that the interview results were interpreted correctly. Following, each of the identified factors is described. Cost: The cost of removing a defect is affected if the defect is fixed, where higher cost leads to lower priority and thus less likely to be fixed. As Interviewee P5 said, "Um, it could be something that's a trifle and fixing it will cost more development time than maintaining it". However, this statement is only true when considering the perceived value of addressing the defect. As such, high value, but costly, defects are more likely to be addressed than low value defects. This factor is generally considered important, as most of the interviewees (N=10) mention it during the interview. However, a subset (N=6) either did not mention it, or did not find it significant. Time: Time, as a complementary metric to cost, is also commonly considered by the interviewees (n = 7) and in relation to the time required to fix the defect. Time is considered to influence the priority of the defect in the same way as cost, ie cost is also considered while prioritizing the defects. As stated by interviewee P7 "Some defects take a long time to fix" Severity: Severity of a defect is one of the main factors mentioned by some of the interviewees (N=4). Interviewees say that even though they knew that less severe defects could cause problems later in development, many interviewees chose not to take action. This is mainly the case for defects of low perceived severity, while defects of high perceived severity are generally addressed. As stated by interviewee P10 when explicitly asked about the factors that are considered; "How serious is the defect" impact: Impact, defined as the impact on the system or its development, is one of the more commonly reported factors by most interviewees (N=5). High impact defects are more likely to be addressed than low impact defects. Difficult to fix "[when] the impact [of the defect] is low" as stated by interviewee P14: The perceived difficulty of fixing a defect was also expressed by interviewees (N=3). As stated by interviewee

P15 "we don't know how to solve this [defect]". This factor is related to time/cost and so is related to the value provided by addressing the defect. Therefore, if a defect is considered difficult to fix with little value gain, it is discarded and may become languishing. Outdated functionality: Defects associated with out-of-date, or legacy, functionality are considered less important to address by some interviewees ( $n = 1$ ). Therefore, defects found in new functionality, or functionality under development, are more likely to be addressed than defects in older, established functionality. Security: This factor was specifically brought up by interviewees ( $n = 1$ ) working in companies with systems that deal with sensitive data. Interviewees stated that defects with a high perceived impact on security are given higher priority than defects with a low impact. As stated by interviewer P4 "exposing user credentials, or, um, being able to manipulate data you shouldn't be allowed to do these kinds of things". Affecting the business: Defects affecting the business rather than the system are given a lower priority by some interviewees ( $n = 2$ ). It should be noted that this factor was presented by the developers, meaning their perspective is more on development, whereas a manager may provide a different answer for priority. As stated by interviewee P4 "But, uh, the impact on the business is always, kind of the first [thing we consider]". This result also indicates that different roles may value the same factor in different ways. Impact traffic: This factor was only mentioned by one interviewee ( $N=1$ ), who was in a company in a domain where system traffic is important. For this factor, the impact on traffic is related to its assigned priority, which means that higher impact implies higher priority. This factor also highlights that there is variation in what factors are considered in different domains. As stated by interviewee P13 "So for us, the first question is always where do these faults affect traffic". Risk: Risk, mentioned by one interviewee ( $n = 1$ ), relates to the impact of defects on the project rather than the product itself. The amount of risk is correlated with the priority of the defect, such that higher risk implies higher priority. As stated by interviewee P13 "And this is because when you have a defect, you must consider how much of a risk it is, or if it is a minor or a major defect".

### **Effect of chronic defects**

To what extent do long-lived defects affect a software product? As presented, there are a number of factors that go into the decision if a defect should be prolonged or not. Additionally, as such, it was determined that there were multiple reasons for the defects to persist. However, long-standing defects are always likely to have an impact on software development or its organization. According to the interview results, the impact of defects depends on the severity of the defect, i.e. if it is a minor or major defect [2]. A synthesis of the interviewers' perceptions on severity leads us to the following definitions: • Major defect: Any defect that affects the functionality of a system to such an extent that it leads to a system crash is considered a major defect. Is. • Minor Defect: Any defect which has only minor or no impact on the functionality of the system is considered as minor defect. For example, performance defects are considered minor defects by most participants ( $n = 10$ ). Note that the severity in these definitions focuses on the functional characteristics of the system. This result could be due to several factors, e.g. Companies policies/preferences, interviewer's knowledge of non-functional attributes, etc. The purpose of RQ2 was to identify the impact of defects on the system. This was of interest as related research highlighting defects have negative effects on software systems and therefore assumed that supporting evidence would be observed [13]. However, the results indicate the opposite as the majority ( $n = 13$ ) of the interviewees stated that minor lingering defects have no effect on the system. Interviewee P4 said that "they are living for us. It may as well be that, because they are minors, they are not causing any problems". In fact, this lack of effectiveness was cited as one of the reasons why the defects are allowed to persist. According to some of the more experienced interviewees ( $n = 5$ ), some of the defectors said that the defects could remain in the system for more than 10 years and would probably never be fixed. However, this observation was not entirely conclusive, as statements from some interviewees indicated that lingering faults could change and become more dominant over time. Interviewee P9 said that "a defect can last for 20 years if it is not causing problems". For example, it was observed that defects classified as minor in the past turned into major defects for future releases of the software. As stated by interviewee P2 "It may happen that minor defects become problems later". This change resulted in a major and immediate effort to rectify the defects. As a result, estimating the impact and impact of defects over time is difficult and can lead to unforeseen circumstances and additional costs. However, it should be noted that the perceived future impact of a defect was not obtained as a factor. One reason for this observation may be the perceived complexity of such estimates, which necessitates future research into the effects of defects over time.



#### IV. CONCLUSION

The study provides industrial practitioners with insight into factors to consider when deciding whether a defect will persist. Contrary to the body of knowledge, the study also provides evidence, that lingering defects may not be a major problem in practice. However, due to the size of the study and its interview sample, future research is needed.

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# Comparative Analysis of Machine Learning and Deep Learning Algorithms to Classify Cancer Based on Microarray Genes

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**Abstract:** *Cancer classification is a topic of major interest in medicine because it allows accurate and efficient diagnosis and facilitates a successful outcome in medical treatment. previous studies using large-scale RNA profiling and supervised machine learning (ML) algorithms to construct molecular-based classifications of carcinoma cells from breast, bladder, adenocarcinoma, colorectal, gastro esophagus, kidney, liver, lung, ovarian Human tumors have been classified. , pancreas, and prostate tumors. These datasets are collectively known as the 11 Tumor Database, although this database has been used in many works in the ML field, no comparative study of different algorithms could be found in the literature. On the other hand, advances in both hardware and software technologies have led to substantial improvements in the accuracy of solutions using ML, such as Deep Learning (DL). In this study, we compare the most widely used algorithms in classical ML and DL to classify tumors described in the 11 tumor database.*

**Keywords:** Dataset, Database, Algorithm, ML, DL, Cancer etc

## I. INTRODUCTION

Cancer describes a class of diseases in which genetic mutations cause malignant cells to form inside the human body. As these cells grow, they divide indiscriminately, spread throughout the organs and, in some cases, can result in loss of life. Cancer is the second leading cause of mortality globally after cardiovascular diseases [1]. Recently, gene expression analysis has emerged as an important tool for addressing fundamental challenges associated with cancer diagnosis and drug discovery [2,3]. Gene expression analysis also provides information about the contribution of different genes to cancer initiation and progression. Consequently, changes in gene expression can be used as markers for the early detection of cancer and to identify targets for drug development. Such approaches may open up the possibility of health care that is more personalized, preventive, and predictive [4].

Gene expression is the process by which information in DNA is converted into instructions for making a protein or other molecule. It involves transcription of DNA into messenger RNA (mRNA), followed by translation into proteins. Gene expression analysis is used to assess the sequence of genetic changes that occur under certain conditions in a tissue or a single cell [5]. This involves measuring the number of DNA transcripts present in sampled tissue or cells in order to obtain information about which genes are expressed and at what levels. One component of gene expression quantification is the comparison of sequenced reads corresponding to the number of base pairs sequenced from a DNA fragment to a recognized genomic or transcriptome source. The accuracy of quantification depends on sequenced reads containing sufficient specific information to allow bioinformatics algorithms to correlate reads with appropriate genes. Prevailing methods for assessing gene expression include DNA microarray and next-generation sequencing (NGS) methods. The DNA microarray method uses a two-dimensional array with microscopic spots, in which short sequences or genes bind to known DNA molecules through a hybridization process. NGS methods of massively parallel sequencing provide exceptionally high-throughput analysis, scalability, and speed, and they have been used to determine the nucleotide sequence of complete genomes, or single DNA or RNA segments [6,7]. Is. RNA-sequencing, also known as RNA-seq, is an NGS method that involves converting RNA molecules into complementary DNA (cDNA) and determining the sequence of nucleotides in the cDNA for gene expression analysis and quantification. Is. Compared to DNA microarrays, RNA-Seq [8,9] offers several advantages, including greater specificity and resolution,

increased sensitivity to differential expression, and greater dynamic range. RNA-Seq can also be used to examine the transcriptome of any species to quantify RNA at a specific point in time.

## II. LITERATURE REVIEW

Salem et al. [9] suggested genetic programming-based cancer classification with the help of information gain (IG) for feature selection. Lin et al. [10] introduced genetic algorithms with silhouette statistics for feature selection and classification on the SRBCT dataset. We have seen that the feature selection method is non-optimal as it generates thousands of features resulting in over-fitting of the model. Sharbaf et al. [11] proposed a hybrid approach for gene selection and classification of microarray datasets using cellular learning automata and ant colony optimization. They have investigated the effect of various rank-based feature selection methods and they use three classifiers for validation, namely Support Vector Machine (SVM), K-Nearest Neighbors (KNN), and Naive Bayes. Kumar et al. [12] built a feature selection and classification algorithm based on the MapReduce concept with a KNN classifier. Nguyen et al. [13] proposed a holistic gene selection for microarray data classification and applied their model on four standard datasets namely DLBCL, leukemia, prostate and colon datasets. To validate the method, five existing classifiers, namely, Linear Discriminant Analysis, KNN, Probabilistic Neural Network, SVM, and Multilayer Perceptron (MLP) were used and they claimed that the proposed method has stability across different classifiers, but They could not manifest the claimed stability beyond this. Five classifiers. Lofty and Kescharz [14] introduced a hybrid of Principal Component Analysis (PCA) and Brain Emotion Learning for microarray cancer data classification. They validated the work on three datasets which are not sufficient to confirm about the generalizability of the method. Ravi et al. [26] have done a comprehensive review to reveal the potential of deep learning models in health informatics. He has illustrated various deep learning architectures such as deep feed-forward, convolutional networks and recurrent networks applied to problems in several problem areas. Kar et al. [15] proposed particle swarm optimization-based feature selection for classification of microarray cancer data. The acute lymphoblastic leukemia–acute myeloid leukemia (ALL-AML) and SRBCT datasets were used to validate the method. They perform an experiment ten times on each dataset and the average of these ten runs is reported as the final result.

### Research Methodology

ML and DL techniques can learn features of a given problem from a certain amount of data. These data are usually randomly divided into two groups: training and validation. A training dataset is used to calibrate the parameters of the model, and a validation dataset is used to evaluate the performance of the model (Eraslan et al., 2019). We have also included Decision Tree-Methods (DT) such as Random Forest (RF). Unlike linear models, DT and RF are invariant to data scaling and work well with features at different scales. Finally, we applied deep neural networks (DNNs), such as fully connected neural networks, also known as multi-layer perceptron (MLP) and convolutional neural networks (CNN). MLPs are suitable for non-linear data, while CNNs automate the expensive work of engineering facilities; An indispensable task in the classical ML approach. The above algorithm is explained extensively in Michie, Spiegelhalter, and Taylor (1994) and Chollet (2007). The datasets used represent measurements of gene expression using cancer microarrays and normal biopsies (Statnikov et al., 2005; Bolon-Canedo et al., 2014), and are consolidated into “11 tumor databases”, Which is available online for free.

[https://github.com/simonorozcoarias/ML\\_DL\\_microArrays/blob/master/data11tumors2.csv](https://github.com/simonorozcoarias/ML_DL_microArrays/blob/master/data11tumors2.csv). This database contains 174 samples with 12,533 gene expression microarrays for 11 different cancer types.

For the experiments, we divided the information into two groups; The first group corresponds to features (X) and the second group corresponds to classes (Y). The features form a matrix of size  $m \times n$  and the classes are a vector of size  $n \times 1$ , where  $m$  is the number of samples and  $n$  is the number of genes for each class (12,533). The dataset, which contains 174 samples, is randomly divided into two subgroups (80% training and 20% validation), consisting of 139 samples for training and 35 samples for validation. Initial calibration of the ML and DL algorithms (training) was done using the training set; Then, hyperparameter tuning was performed with the validation set and the accuracy of the algorithms was measured.

**III. RESULT ANALYSIS**

**Table 1.1:** Classification of cancers in 11 tumor databases.

Class	Cancer type	Number of patients
0	Ovary	29
1	Bladder/Ureter	10
2	Breast	28
3	Colorectal	25
4	Gastroesophagus	14
5	Kidney	13
6	Liver	9
7	Prostate	28
8	Pancreas	8
9	Adenocarcinoma	16
10	Lung squamous cell carcinoma	16

Four different datasets were created for training and validation of each ML or DL algorithm. For the first dataset, we did not apply any preprocessing operations; For the second, we performed a scaling process; For the third, we applied PCA with 96% of the variance retained to reduce the data dimensionality, achieving a dimensionality reduction from 12,655 to 85 features. Finally, for the final dataset, we applied both scaling and PCA, achieving dimensionality reduction from 12,655 to 115 features (principal components). We evaluated the performance of well-known ML classification algorithms including KNN, SVC, LR, LDA, NB, MLP, RF and DT. Next, we evaluated DL architectures, such as Fully Connected Neural Networks (FNN) and Convolutional Neural Networks (CNN). Two types of networks were used for DL; The first is a fully connected neural network and the second is a convolutional neural network. The FNN consists of three fully connected layers of 100 neurons each and a SoftSign activation function; then, a final layer of 11 neurons with sigmoid activation function are generated to generate cancer type probability.

**Hierarchical analysis**

Before evaluating the classification algorithms, we visualized internal clusters in the data and determined how these clusters are affected by various preprocessing methods applied to our data. Using the downloaded raw data, we built a hierarchical graph (unsupervised learning) using different methods and concluded that Ward's method produced the most balanced clusters. Then, using only Ward's method, we conducted additional analyzes using different datasets, including raw data, scaled data, data transformed by PCA, and data scaled and transformed by PCA. Finally, we created a dendrogram and a heatmap to find out if the data could be clustered into groups without any classes with the best results. Four well-separated groups, but the heatmap displayed other well-conserved groups, which may indicate that the four main groups can be divided into subgroups.

Based on a priori knowledge that the number of cancer types is eleven (11), we were interested in determining how the hierarchical clustering algorithm produced cluster assignments. Therefore, we applied the best parameters found previously (clustering method: Ward, and input: raw data and data reduced by PCA).

**Table 1.2:** Cluster structure and original number of individuals from each class of cancer.

Class	Original number	Clustering using raw data	Clustering using data processed by PCA
0	29	49	49
1	10	31	30
2	28	18	41
3	25	6	6
4	14	33	27
5	13	27	12

6	9	8	8
7	28	2	3
8	8	6	6
9	16	4	3
10	16	11	11

In this work, we show the application of unsupervised and supervised learning approaches of ML and DL for the classification of 11 cancer types based on microarray datasets. We observed that the best average results are obtained using the raw dataset and the LR algorithm using the training and validation data, leading to an accuracy value of 100% (validation set, using the hold-out split method). One can assume that overfitting has occurred because the confusion matrix has shown extremely well-behaved behavior; However, a comparison of training and validation accuracies between parameters using the entire dataset may indicate the true accuracy in both the training and validation datasets. Additional tests should be performed with independent data to rule out potential overfitting.

On the other hand, MLP and LDA showed a high accuracy value of 97.14% in the validation dataset. This improvement in accuracy was achieved by optimizing several parameters (number of neurons in the MLP) and preprocessing the dataset with PCA.

After tuning the four parameters, RF achieved high results with a maximum accuracy of 85.71%. In contrast, DT achieved 51.14% accuracy, indicating that despite tuning several parameters (in our case, three), DT does not work properly for the dataset used in this study.

**Table 1.3:** Best value of tuned hyperparameters in deep neural networks

Parameter	Best value	
	FNN	CNN
Batch size	20	10
Epochs	100	10
Training optimization algorithm	Adagrad	SGD
Learn rate	0.2	0.1
Momentum	0	0
Network weight initialization	Normal	Glorot_normal
Neuron activation function	Softsign	Linear
Weight constraint	3	1
Dropout regularization	0	0.4

#### IV. CONCLUSION

Cancer is predicted to become the deadliest disease for humans in the future (Degenais et al., 2019); Therefore, early diagnosis, recognition and treatment are needed to control the disease. ML and DL techniques are promising tools for classification of cancer types using complex datasets such as microarrays. In this study, we obtained predictions with 93.52% and 94.46% accuracy, which will allow patients with this type of pathology to quickly and accurately detect their disease and will also contribute to the discovery of new selective drugs. Treatment of this type of tumor. In our work, we propose a deep feed-forward neural network approach for classification of binary class microarray datasets. To validate the proposed method, eight standard microarray cancer datasets namely CNS, colon, prostate, leukemia, ovarian, lung-Harvard 2, lung-Michigan and breast cancer are used. To overcome the curse of dimensionality and other problems associated with the nature of data, PCA is used as a dimensionality reduction technique. Feature scaling is done using the min-max approach. To calculate the magnitude of error during training and testing, binary cross-entropy is applied as it is a standard loss function and recommended for binary classification problems. For optimization purposes, we have optimized ADAM. A comparative study of the proposed method is done with the state-of-the-art methods. Experimental results on these standard microarray datasets and comparative analysis with state-of-the-art methods show that the performance of the proposed method is highly acceptable. To measure the performance of the proposed method, we have contributed performance measures such as classification accuracy, precision, recall, F-



measure, ROC curve, confusion matrix, and log-loss. The classification accuracy of the proposed method on four datasets, namely Leukemia, Lung-Michigan, Ovarian and Prostate, is 1.00, which shows an ideal classification performance. Furthermore, the proposed method scores an accuracy of 0.99 on Lung-Harvard2, 0.96 on CNS and Colon, and 0.95 on Breast Cancer.

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# Environment Protection and Health Under Constitutional Framework of India

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**Abstract:** *The constitution of India is not an inert but a living document which evolves and grows with time. Healthy environment is vital to human life as it allows a person to grow physically, mentally and intellectually healthy. Hence, it is vital that a healthy environment attained constitutional recognition as part of the fundamental right. Therefore, it is essential for a state to adopt an active and dynamic jurisprudence and constitutional framework into its legal system. The environment is everything around us—the air we breathe the water we drink and use, and the food we consume. Our interactions with the environment are complex and are not always healthy. Environmental health laws and policies are created to regulate and safeguard our environment."The Environmental Law System is an organized way of using all of the laws in our legal system to minimize, prevent, punish, or remedy the consequences of actions which damage or threaten the environment, public health and safety."*

**Keywords:** Environmental Protection, Constitution of India, Health

## I. INTRODUCTION

A rapid increase in global warming, deforestation, air, water and other forms of pollution is posing a great threat to the environment and its living beings. The degradation of the environment through a plethora of activities carried on by individuals is detrimental to the health of all the living beings, including human beings, plants and animals. Fundamental status has been given to the concept of protecting the environment as it is essential to promote human health to have a healthy environment and affords a right to a healthy environment to all. Preserving the environment protects the health of every individual and a healthy individual promotes the development of the environment which is the need of the hour.

## IMPORTANCE OF ENVIRONMENTAL LAW

Environmental laws play a huge part in protecting humans, animals, resources, and habitats. Without these laws, there would be no regulations concerning pollution, contamination, hunting, or even response to disasters. Environmental law works to protect land, air, water, and soil, negligence of these laws results in various punishments like fines, community service, and in some extreme cases, imprisonment. Without these environmental laws, the government would not be able to punish those who treat the environment poorly. Environmental law and legislation are central in protecting our current and future generations as well as the different plants and animals in the greater ecosystem that we live in. Environmental law ensures that individuals and governments, cooperates and do not cause harm to the environment or its ecosystems.

## PROVISIONS IN INDIAN CONSTITUTION

Law acts as a means of regularizing the human conduct and provides the smooth functioning of society. Since the word 'Environment' did not find its existence in the Indian Constitution, it became essential to insert provisions in the constitution as it is the supreme law of the land and such insertion thus, would prove to be fruitful to protect the environment from exploitation. In India, the 42<sup>nd</sup> Amendment Act, 1976 is the resultant of the Stockholm Declaration, 1972. The Parliament of India has passed a historic constitutional amendment in 1976 which enshrined two new articles i.e. Article 48A and 51A (g) to protect and improve the environment. Apart from these two articles, some of the fundamental rights (such as Articles 14, 19, 21, and 32) incorporated in Part III of the Constitution act as a savior for the environment.

**Directive Principles of State Policy (Part IV) Article 48A:** Protection and improvement of environment and safeguarding of forests and wildlife. The State shall endeavour to protect and improve the environment and to safeguard the forests and wildlife of the country.

In *T.N. Godavarman Thirumulpad v. Union of India*,<sup>1</sup> The Chhattisgarh government plead that the State did not have enough money to save Wild Buffalo- an endangered species. The Court rejected the plea of and directed that because it is the duty of the State under Article 48-A of the Constitution to take immediate steps to ensure the protection of the endangered species from extinction.

**Fundamental duties (Part IV A) Article 51 (A) (g):** To protect and improve the natural environment including forests, lakes, rivers, and wildlife, and to have compassion for living creatures.

In *Kinkeri Devi v. State*,<sup>2</sup> The Himachal High Court held that under Articles 48-A and 51-A (g), both State and citizens have constitutional duty to not only protect the environment but also, improve, preserve, and safeguard the natural environment including forests, lakes, rivers, flora, and fauna, etc. of the country.

**Article 14 and Article 19(1)(g):** Article 14 states: "It is the duty of the State to treat all person equal or equal protection before the law within the territory of India". The right to equality may also be violated by government decisions having an impact on the environment. In order to prove the denial of the right to equality many environmental groups often seek to Article 14 to quash arbitrary municipal permission for construction that are violating the development regulations.

**Article 21:** "Every person shall be given the right to life and personal liberty unless restricted by the law or conflicting the law." In *Maneka Gandhi v Union of India*, the Supreme Court while elucidating on the importance of the „right to life“ under Art. 21 held that the right to life is not confined to mere animal existence, but extends to the right to live with the basic human dignity (Bhagwati J.) Similarly while interpreting Art.21 in Ganga Pollution Case as discussed before, Justice Singh justified the closure of polluting tanneries observed: "we are conscious that closure of tanneries may bring unemployment, loss of revenue, but life. Health and ecology have greater importance to the people." (Shanthakumar 2007)

Apart from the constitutional mandate to protect and improve the environmental conditions, there are a series<sup>3</sup> of legislations are available on the subject but more relevant legislations for our purpose are the **Forest [Conservation] Act**, 1980; the **Water [Prevention and Control of Pollution] Act**, 1974; the **Wildlife [Protection] Act**, 1972; the **Environment [Protection] Act**, 1986; the **Air [Prevention and Control of Pollution] Act**, 1981; the **National Environment Tribunal Act**, 1995; the **National Green Tribunal Act**, 2010; the **Biological Diversity Act**, 2002 and the **Hazardous Wastes [Management and Handling] Amendment Rules**, 2003 etc.

## DOCTRINE AND PRINCIPLES EVOLVED BY THE COURTS

The doctrines evolved by courts are a significant contribution to the environmental jurisprudence in India. Article 253 of the Constitution of India indicates the procedure on how decisions made at international conventions and conferences are incorporated into the legal system. The formulation and application of the doctrines in the judicial process for environmental protection are remarkable milestones in the path of environmental law in India.

**Public Trust Doctrine** Indian legal system is essentially based on common law, and includes the public trust doctrine as part of its jurisprudence. The state is a guardian of natural resources, and natural resources are available for public for their enjoyment by nature and it cannot be changed into private property. The state is under a legal duty to protect the natural resources. In *M.C. Mehta v. Kamal Nath*<sup>3</sup>, the Supreme Court applied this doctrine for the first time in India to an environmental problem. According to the Supreme Court, the public trust doctrine primarily rests on the principle that certain resources like air, sea waters and forests have such a great importance to the people as a whole that it would be wholly unjustified to make them a subject of private ownership.

<sup>1</sup>(2012) 3 SCC 277

<sup>2</sup>AIR 1988 HP 4

<sup>3</sup>(1997) 1 SCC 388

**Doctrine of Sustainable Development** Environmental pollution and degradation is a serious problem nowadays. Judiciary to being a social institution has a significant role to play in the redressal of this problem. The progress of a society lies in industrialization and financial stability. But, industrialization is contrary to the concept of preservation of environment. These are two conflicting interests and their harmonization is a major challenge before the judicial system of a country. The judiciary, in different pronouncements, has pointed out that there will be adverse effects on the country's economic and social condition, if industries are ordered to stop production. Unemployment and poverty may sweep the country and lead it towards degeneration and destruction. At the same time, polluting industries impend the stability of the environment. The judiciary was, therefore, of the opinion that the pollution limit should be within the sustainable capacity of the environment.

In *Vellore Citizens Welfare Forum v. Union of India*<sup>4</sup>, the Supreme Court opined, the traditional concept that development and ecology are opposed to each other, is no longer acceptable, sustainable development is the answer. Sustainable Development means to fulfil the need of present generation without compromising the needs of future generation. Sustainable development is a balancing concept between ecology and development.

**Polluter Pays Principle:** The countries moving towards the industrial development had to face the serious problems of giving adequate compensation to the victims of pollution and environmental hazards. That the polluter must pay for the damage caused by him is a salutary principle evolved very early in Europe when that continent was haunted by a new spectre, that of unprecedented pollution. In *M.C. Mehta v. Union of India*<sup>5</sup>, a petition was filed under Article 32 of the Constitution of India, seeking closure of a factory engaged in manufacturing of hazardous products. While the case was pending, oleum gas leaking out from the factory injured several persons. The significance of the case lies in its formulation of the general principle of liability of industries engaged in hazardous and inherently dangerous activity.

**Precautionary Principle** The precautionary principle says that if any action or project has some possible risk which can cause harm to public and environment and the person who is taking that action has knowledge about those risk, that in the absence of scientific measures that action or project is harmful, then the burden of proof lies on those persons who are taking that action that it is not harmful. The Precautionary principle says that there is a social responsibility to protect the public from any kind of harm, in case when scientific investigation point towards a risk. These protections can be relaxed in the case when person taking action can prove with sound evidence that no harm will result. In *Vijayanagar Education Trust v. Karnataka State Pollution Control Board, Karnataka*<sup>6</sup> the Karnataka High Court accepted that the precautionary doctrine is now part and parcel of the Constitutional mandate for the protection and improvement of the environment. The court referred to *Nayudu cases*<sup>7</sup> which laid down that the burden to prove the benign nature of the project is on the developer if it is found that there are uncertain and non-negligible risks

## II. CONCLUSION

In conclusion, the right to a healthy environment is a fundamental human right that is essential for the enjoyment of other human rights such as the right to life, health, and development. The degradation of the environment poses a significant threat to human health, the economy, and the planet as a whole. There is no deficiency of available legislations on environmental protection in India but enforcement of these legislations has been far from satisfactory. There is urgent need for the effective, successful and well-organized enforcement of the Constitutional mandate and other environmental legislations or laws in India. A positive approach on the part of everyone in society is essential for effective, speedy and efficient enforcement of these legislations.

## III. RECOMMENDATION

Associating human rights and condition is an important sourcebook that investigates the unfamiliar region that lies amongst natural and human rights enactment. People can guarantee basic uniformity and satisfactory states of life in an

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<sup>4</sup>AIR 1996 SC 2715

<sup>5</sup>1987 SCR (1) 819

<sup>6</sup>AIR 2002 Kant 123

<sup>7</sup>Andhra Pradesh Pollution Control Board v. MV Nayudu, AIR 1999 SC 812

condition that allows an existence of poise and prosperity. There is a pressing need to figure laws remembering the way that the individuals who dirty or crush the common habitat are not simply carrying out a wrongdoing against nature, but rather are abusing human rights also. Without a doubt, wellbeing has appeared to be the subject that extensions holes between the two fields of natural security and human rights. The progression of the connection between human rights and condition would empower fuse of human rights standards inside an ecological degree, for example, anti-discrimination principles, the requirement for social investment and the assurance of powerless gatherings.



# Finer Issues in Real Estate Sector and Works Contract in GST

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**Abstract:** Real estate industry is one of the major industries performing in growth & development of the country. After a drastic halt in pandemic, Real estate industry has again picked up to rise. Many projects which were shut in middle of 2020, are in the completion stage now. "Currently making up 7% of the GDP, the real estate industry is predicted to increase that to 10% by 20251. The industry in India is expected to be worth USD 1 trillion in the next years as the country strives for a USD 5 trillion economy2.

Though there is lot more potential for this industry to grow but being unorganised, real estate faces many challenges with respect to compliances of taxes, employment, litigations & managing cost profitability of projects etc. It is very crucial for builders & Developers to maintain all the internal & external aspects of a project like Quality of Structure, Cost, Profit margin, Sales, following rules regulations, compliance with Government policies, Labour Management etc.

Few of the recent reforms in Taxation Norms (GST- March 2019) & RERA Regulations play not less than a revolutionary role in Real Estate Industry. Keeping these recent changes in consideration what challenges /Issues are being faced by this industry and various segment of people operating in real estate industry are discussed in brief

**Keywords:** Real estate sector, GST, RERA, Problems & Challenges faced, Concerns, Suggested solutions

## I. INTRODUCTION

Real Estate is one of the booming industries of economy. Because whether its need or for the sack of investment and growth of immovable properties are always seen with potential of development. Any real estate project is generally of 2 years to 10 years of gestation and if we go through last decade to look into changes/reforms made in taxation for real estate, we will find taxation system has been rolled up for four times in last decade with all minor /major changes.

Period	Tax Regime
01.07.2010 to 30.06.2012	Positive list-based service tax and vat applicable for building material supply
01.07.2012 to 30.06.2017	Negative list-based service tax and vat applicable for building material supply
01.07.2017 to 31.03.2019	GST old scheme (Real Estate)
01.01.2019 till date	GST new scheme (Real Estate) Notification dated 29.03.19

While handling any Real Estate project, a project promotor, developer or builder face certain challenges. It may be related to operational management of project (e.g. Labour, maintaining profitability procurement of material etc.) or any compliance related challenge (Related to any act applicable on real estate) here we shall be discussing the practical issues faced by Real Estate industry & Works contracts pertaining to GST Act & RERA

## II. LITERATURE REVIEW-

Harshita Shukla, (2023) "Five key challenges faced by the real estate sector"

Author in this study says that like other industries Real estate is also integral part of global economy so the growth and profitability of this sector. The five factors that impact/ Challenge the real estate sector are (1) Economic Volatility and

Market Fluctuations (2) legal complications and Regularity Hurdles (3) Technological Disruption and Innovation (4) Rising Costs And Affordability Concerns (5) Changing Consumer Preferences And Expectations  
Abhishikta Munjal (2023) “The Indian Real Estate Market - Future and Challenges”

Writer has highlighted the current and upcoming scenarios in real estate industry. After covid 19 sales in real estate market has been shot up and high in Q1 2022 since from 2015 statistic. Writer says currently market prices of input material are too high due to inflation and applicable taxes and real estate being one of the industries where still there is lot of dependency on labour. Two of the crucial things required in real estate sector are Land and funding both going in scarcity leading to lot of challenges.

Avneesh Sood, (2023) “The Impact of GST On the Indian Real Estate Sector”

Real estate is most essential sector in the economy contributing almost 6 to 7 percent of GDP of India, as this sectors contribution is not limited to GDP, Employment but also development of infrastructure. One of another big challenge tis industry faced was Pre and post GST challenges. Pre GST various Taxes were levied and complex structure was there this resolved with one nation tax GST. But since after GST also there are various filed in Real estate sector that require clarity in GST

### **III. ISSUES**

#### **Levy of GST on additional FSI**

Explanation of Issue: - Floor space index (FSI) is maximum permissible floor area that can be built on particular piece of land. If a builder needs additional space to make more floor than he can approach the local municipal authorities. So additional FSI is a “grant or permission” by local municipal authority to land owner or builder/ developer for making additional floor over & above normal FSI. Thus it’s not a “service” but permission or grant, still GST @ 18% is charged on additional FSI/premium FSI.

Suggested solution: - Granting additional FSI is not a service and just a permission, accordingly there shouldn’t be any GST on it, as it increases cost burden for end customer.

#### **No GST applicable, If the immovable property is sold after First Occupation (FO) or Completion Certificate (CC) whichever is earlier- Redundant words**

Explanation of Issue: - Para 5 of schedule III read with para 5(b) of schedule II of CGST Act says “If any consideration for a property is received after issuance of CC or FO whichever is earlier then promotor or builder need not to be liable for GST”.

Here words after its First Occupation (FO) are redundant and confusing. FAQ No.29 issued by CBI&C, circular F No.354/32/2019- TRU dated 7/5/2019 say First Occupation means very First Occupation in a project according with laws, rules & regulations of state/central govt. or any other authority. So just staying in apartment before CC is not “First Occupation” rather it shall be considered illegal if person stays in property before CC/OC”.

Thus, the words “or after First Occupation” in the mentioned para of the act gets redundant/meaningless in act.

Suggested solution: - Redundant words which doesn’t add on to clarity but creates confusions or misinterpretation should be removed

#### **Deeming provision on “Value of Land”**

Explanation of Issue: - As per Schedule III of CGST Act, Value of land is neither considered as sale of goods nor considered as supply of service thus exempt from GST. Deeming provision for Value of Land for the purpose of calculating exemption, shall be deemed to be the 1/3<sup>rd</sup> of the amount charged for a property/flat etc”.

A promotor/builder has no option to take actual value of land in considering the exemption- FAQ No 36 issued by CBI&C, Circular No.F.354/32/2019-TRU dated 7/5/2019.

Here issue are

In many large/metro cities land cost is much higher than 33% of total value. In such cases, the promotor is supposed to pay GST on much higher value ultimately, it’s a burden to end consumer.

Deeming provision cannot override a section and the value cannot exceed as specified in sec 15 of act red along with relevant valuation rules in act (sec 15- value of taxable supply).

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Suggested solution: - Actual value of land should be exempt rather than deeming it to be 33% which may go wrong in various large cities.

**GST on Prime Location Charges (PLC), External Development Charges (EDC), Parking space charges (PSC), Club membership & Maintenance service**

Explanation of Issue: - PLC, EDC, PSC all these types of charges are naturally bundled with the cost of flat, one can say it's a by-product of flat sold. So, charging GST on the flat amount along with the cost of naturally bundled services is absolutely fine. Problem arises with club membership charges which is not naturally bundled service and the maintenance service which is provided by promotor till a housing society or RWA (Resident Welfare Association) is formed. Club membership fees/deposit is taxable @ 18% in the hands of promotors. maintenance service is also charged to GST and promotor is liable for same without exemption of Rs.7500 per month which is available to housing societies & RWA's for each flat owned.

Suggested solution- Club membership deposit/fee should be charged in the hands of club & not to builder as it's not a naturally bundled service with flat. Similar exemption of Rs.7500 per month to promotor/builder shall be provided as its available to any housing society or RWA for each owner of flat. Any amount of maintenance charged above Rs 7500 per month per flat is chargeable to GST @ 18% on the total amount of maintenance changes. Same rule should be applied to promotor as he just a temporary mediator. Government can decide a period till which promotor can collect the maintenance charges.

**Point of taxation in case of Transfer of development rights/FSI/Long term lease before 31.03.2019**

Explanation of Issue: - As per notification 4/2018-CT (Rate), dated 25-1-2018, till 31<sup>st</sup> March 2019 "Liability of promotor and land owner arise at the time when transfer of possession or right in constructed property is transferred by any conveyance deed or similar sort of agreement.

Thus, even if the CC is not obtained but conveyance deed etc. documents is signed, GST liability arises for landlord here the concern that needs to be highlighted is, in my humble view tax liability should not arise even when promotor just identify some flats which shall be given to land owner at later stage. Promotor is required to pay Suggested solution- This is taken care in the act after 01.04.2019

**Reverse charge on TDR/FSI, which was not the case till 31-03-2019**

Explanation of Issue: - Up to 31-03-2019 landowner liability arises when flats are given with possession to landowner by signing conveyance deed. Here 2 issues are till 31-03-2019. It was forward charge i.e. Primary liability is with landowner in case of transfer of development right or FSI but after 31-03-2019 promotor needs to pay GST arising on TDR.

Suggested solution: - In case of TDR, if landowner is a registered person, then primary liability should be on forward charge and not on reverse charge.

**Criteria for Affordable house**

Explanation of Issue: - Affordable Residential Apartment means any apartment whose carpet area is

i) Not exceeding 60 sqmts in metropolitan cities

or

ii) Not exceeding 90 sqmts in non-metro cities

And

iii) Gross amount charged for flat is not more than 45 lakhs

Here issue is, area differentiation is being considered looking into locality of metro & non metro cities but amount limit is not considered. If we look practically then in the range of 45 lakhs, we can get just around 30 sqmts area, both the criteria can't be served in case of metro cities, where as in non-metro cities you get around 90 sqmts area in 45 lakhs.

So, if a middleclass person wants to take more than 1 BHK (i.e., more than 30 sqmts) but not exceeding 60 sqmts area in metro cities. Then he will certainly not fall in category of affordable house.

Suggested solution: - Reconsidering amount limit for metro cities so that it matches for the area of property up to 60 sqmts

ITC (Input Tax Credit) on construction of any immovable property used for business purpose

Explanation of Issue: - ITC is not available for construction of any immovable property which is used for furtherance of business purpose, whether its construction by third party on contract basis or by owner ITC is not available. Even though the constructed property is used for letting out & GST is paid on Rental Income then also ITC is not allowed. There is an interesting case study of “Safari Retreats Private Ltd vs Chief Commissioner of Central Goods & Service Tax (Orissa High Court)<sup>3</sup>. Here Orissa high court allowed to take ITC on constructed property as GST was charged on Rental Income generated from same property but this case is pending with supreme court for attainment. There is various other AAR which disallow ITC on such immovable properties.

Here issue is sec 17 (5)(d) of (GST act restricting the seamless flow of credit injustice & contradictory to rational of GST. Restriction of ITC can be understood where there is breakage of chain in tax, accordingly here ITC should be allowed when GST is charged on the income generated by such immovable asset.

Suggested solution: - ITC should be allowed, awaiting supreme court’s judgement for referred case study.

Petitioner / Applicant	SAFARI RETREATS PRIVATE LIMITED AND ANOTHER
Respondent	CHIEF COMMISSIONER OF CENTRAL GOODS & SERVICE TAX & OTHERS
Court	Orissa High Court
State	<b>Odisha</b>
Date	Apr 17, 2019
Order No.	W.P.(C) No.20463 OF 2018
TR Citation	2019 (4) TR 2241

**No ITC available to Builders /Promoters on purchase of Building Material Supply etc. and also, they are supposed to make 80% of total purchases of Input material (used for construction of property) from a registered dealer ultimately less benefit of the scheme and cost remains almost same for the end user.**

Explanation of Issue: - Promoters/Builders can avail concessional rate of 1% & 5% of GST by satisfying certain condition and few of the condition is

“Input tax credit shall not be availed”.

&

At least 80% Input & Input services (other than TDR /FSI etc.) should be procured from registered dealer. On shortfall promotor/builders liable for paying GST on RCM

For cement, if procured from unregistered dealer shall be liable for GST under RCM.

[Notification 3/2019- Central Tax (Rate) 3/2019- Integrated Tax (Rate) dated 29 March 2019]

Here issue is when ITC benefit is not flown to builder/promotor and 80% of inputs need to be procured from registered dealer and 100% of cement needs to be procured from registered dealer then it inflates the cost of project and the benefit of “affordable housing scheme/concessional GST rates” on affordable houses reduces to the large extent. On top of it we also need to consider that cement was charged @ 12.5% of vat earlier after GST its 28%. This gives a big hit on costing part of flats and ultimate benefit that reaches to consumer is very minimal.

Suggested solution: - Reduction of GST rate on cement and also if same 80/20 rule can be applied in case of cement as well that shall be beneficial for end users.

### How houses in India gets expensive practical issue

Explanation of Issue: - A builder/promotor has to sell the property at a minimum price of “circle rate” per Sqft. Builders/promoters keep their property rates 2 times/3 times of circle rate but while registering the property a price around “circle rate” is considered and balance payment of flat builder receives in cash. This leads to corruption.

Investors or people with black money buy more due to this & this sort of demand raises the normal prices of flats and also government revenue is corrupted.

Suggested solution: - Any law or ruling that can stop this corruption

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#### IV. OBJECTIVES

Real Estate is a booming industry and directly co-related to growth of the economy. Taxation system is one of the important factor that plays role in growth of an Industry. Sudden outbreak of covid 19 pandemic had led to the implementation of stringent lockdown activities resulted in halt of various construction & development activities. This research intends to analyse the following objectives

Analysethe Challenges faced by Real Estate Industry after drastic amendments in GST Act (Notifications, March 2019) Projects were completely stopped after above GST amendments due to COVID lockdowns. Now Real Estate industry is again into boom, projects are operating at normal capacity. That's a perfect time to analyses pre & post scenario of GST in Real Estate by analyzingthe troubles in Real Estate

Observing and finding the problems/Hurdles in Real estate industry and what can be the suggested solutions.

What are the Positive outcomes of GST & RERA implementation

#### V. RESEARCH METHODOLOGY

Research methodology is the way a researcher intends to tell ho he or she have carried her research and tried to prove his stated facts. There are various ways of conducting research methodology we have selected Interview & Survey methods to conduct this research. Data collection method was through interview Questionnaire. 12 Interviews were done and 75 questionnaires were collected as research data from Builders and Buyers.

#### VI. DATA COLLECTION, SUGGESTIONS AND RECOMMENDATION

Based on data collected in interview and questionnaires we came to understanding that 98% of builder's promoters developers were aware of the New notifications of GSTapplicable to real estate sector. 55% Builders, Promoters & developers were with the opinion that this scheme is challenging to understand as various rules regulation are applicable on different aspects of real estate, different rates and forward and reverse charge mechanism makes it very complicated to understand. 68% of Builders, Promoters & developers felt this scheme has organised their projects in more efficient way. 25% Builders, Promoters & developers agreed increase in profit margins due to this scheme launch 35% were not sure on this. 37% Builders, Buyers, Promoters & developers felt this scheme to be overall beneficial for them, though the compliance mechanism has increased after implementation of GST & RERA but at the same time ratio of transparency has increased for buyers, economic opportunities and market variants.

#### VII. CONCLUSION

RERA and GST have contributed a lot for bringing up the transparency at the end of buyers investors and economy as whole. There are still some lacunas with respect to managing things on builders and contractors side which impacts the other variants of the real estate industry and ultimately the economy. Some of the burning issues are being highlighted. GST has various effects in different industries with different products. Government policy with respect to GST in real estate was to give benefit to a common buyer to buy an affordable house at cheaper rates, more rule, regulations and extra compliances for builders & developers was to streamline the industry and to be par with RERA Act as well. Overall GST has brought up lot of positive changes in Real Estate industry with respect to increased revenue (market size), GDP, FDI and compound annual growth rate. According to a market report of Real Estate industry "Real Estate Market is expected to exhibit CAGR of 9.2% during 2023 to 2028" (Imarcgroup.com). Accordingly, GST has overall positive impact on economic growth with respect to real estate industry.

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# The Role of Artificial Intelligence in Environmental Monitoring and Conservation

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**Abstract:** *This research paper delves into "The Role of Artificial Intelligence in Environmental Monitoring and Conservation." With the pressing global challenges of climate change, habitat destruction, and biodiversity loss, the integration of artificial intelligence (AI) technologies has emerged as a potent tool in safeguarding our planet. This study provides a comprehensive overview of how AI is revolutionizing the fields of environmental monitoring and conservation. AI-enabled remote sensing techniques, including satellite imagery analysis, drones, and sensor networks, offer new avenues for collecting vast amounts of environmental data with precision and efficiency. Furthermore, AI-driven image recognition, acoustic monitoring, and GPS tracking are playing pivotal roles in wildlife conservation efforts, aiding in the protection of endangered species. The paper explores the application of AI in monitoring ecosystem health, encompassing pollution detection, deforestation analysis, and habitat preservation. It also investigates how AI-powered predictive modeling enhances our ability to forecast environmental changes, from climate modeling to natural disaster prediction, enabling proactive measures for mitigation and adaptation. Additionally, AI's prowess in processing and analyzing diverse datasets is vital for integrating information from climate records, biodiversity databases, and environmental sensors, providing valuable insights for informed decision-making in conservation strategies.*

**Keywords:** Artificial Intelligence, Environmental Monitoring, Conservation

## I. INTRODUCTION

The precarious state of our planet's environment, characterized by accelerating climate change, habitat degradation, and the alarming decline of biodiversity, has thrust environmental monitoring and conservation into the forefront of global priorities. In the quest to safeguard Earth's delicate ecosystems, a formidable ally has emerged in the form of Artificial Intelligence (AI). This alliance between technology and environmental science holds immense promise, revolutionizing the way we perceive, understand, and address ecological challenges. This research paper embarks on a journey to explore "The Role of Artificial Intelligence in Environmental Monitoring and Conservation," shedding light on the pivotal role that AI plays in the preservation of our natural world.

Over the last few decades, rapid industrialization, urbanization, and the unsustainable exploitation of natural resources have precipitated an environmental crisis of unprecedented proportions. The consequences are starkly evident in rising global temperatures, more frequent and severe natural disasters, and the relentless encroachment on critical ecosystems. In this dire context, AI stands as a beacon of hope, offering innovative solutions to the multifaceted challenges that confront us.

AI, as a branch of computer science, empowers machines with the capacity to mimic human intelligence and adapt to diverse data inputs. This ability has proven invaluable in the realm of environmental science, where intricate patterns, extensive datasets, and real-time monitoring demands are the norm. Whether through AI-enhanced remote sensing technologies, wildlife conservation applications, or predictive modeling, artificial intelligence has demonstrated its potential to amplify our efforts to monitor, understand, and conserve the environment.

This paper seeks to unravel the multifaceted tapestry of AI's involvement in environmental preservation. It will delve into the various facets of AI applications, ranging from its capacity to enhance data collection through remote sensing,

to its role in protecting endangered species through advanced monitoring techniques. It will also explore AI's ability to decipher ecosystem health indicators, predict environmental changes, and provide decision-makers with the necessary insights for informed conservation planning. However, it is imperative to acknowledge that AI's integration into environmental monitoring and conservation does not come without its own set of challenges. Ethical concerns, data privacy issues, and the potential for algorithmic biases pose significant questions that demand careful consideration as we navigate this new frontier. This research paper will draw upon case studies from around the world to illustrate the tangible impact of AI on environmental protection, and it will conclude by pondering the future trajectories of this alliance. As we stand at the precipice of profound environmental change, the intersection of artificial intelligence and environmental science offers a glimmer of hope, illuminating the path toward a sustainable coexistence between humanity and the natural world..

## II. OBJECTIVES

Here are the primary objectives:

- **Examine AI Applications:** Investigate and categorize the various applications of AI in environmental monitoring and conservation, including remote sensing, wildlife protection, ecosystem health assessment, predictive modeling, and data analysis.
- **Evaluate Effectiveness:** Assess the effectiveness and efficiency of AI technologies in comparison to traditional methods in environmental data collection, analysis, and decision-making.
- **Case Studies:** Present and analyze case studies from different regions and ecosystems that demonstrate the real-world impact of AI in conservation efforts.
- **Ethical Considerations:** Discuss the ethical and privacy considerations associated with AI in environmental monitoring, addressing issues such as data privacy, algorithmic bias, and transparency.
- **Future Prospects:** Explore potential future developments and trends in AI for environmental conservation, including emerging technologies and interdisciplinary collaborations.
- **Policy Implications:** Investigate the policy implications of AI integration in environmental monitoring and conservation, considering regulatory frameworks and guidelines that may be needed to ensure responsible AI use.
- **Knowledge Transfer:** Facilitate the transfer of knowledge from AI experts to environmental scientists and conservation practitioners, fostering collaboration between these fields.
- **Awareness and Education:** Raise awareness about the benefits and challenges of AI in environmental conservation among policymakers, researchers, and the general public.
- **Sustainability:** Examine the sustainability of AI-powered solutions, considering their long-term environmental impact and resource requirements.
- **Interdisciplinary Insights:** Encourage interdisciplinary dialogue and collaboration between experts in AI, environmental science, ecology, and related fields to address complex conservation challenges.

## III. VARIOUS APPLICATIONS OF AI IN ENVIRONMENTAL MONITORING AND CONSERVATION

### Remote Sensing:

- **Satellite Image Analysis:** AI algorithms analyze satellite imagery to monitor changes in land cover, deforestation, urban expansion, and other environmental changes.
- **Climate Monitoring:** AI processes satellite data to track climate variables like sea surface temperature, atmospheric conditions, and greenhouse gas concentrations.

### Wildlife Protection:

- **Image Recognition:** AI-powered cameras and drones can identify and track wildlife, helping to combat poaching and monitor population trends.
- **Acoustic Monitoring:** AI analyzes audio recordings to identify species by their calls, aiding in wildlife conservation efforts.

**Ecosystem Health Assessment:**

- Water Quality Monitoring: AI processes data from sensors and satellites to assess water quality in rivers, lakes, and oceans, detecting pollution and harmful algal blooms.
- Air Quality Monitoring: AI analyzes air quality sensor data to detect pollutants and assess air pollution levels in urban areas.

**Predictive Modeling:**

- Climate Modeling: AI-driven climate models simulate future climate scenarios, helping scientists understand climate change impacts and plan mitigation strategies.
- Natural Disaster Prediction: AI analyzes meteorological and geological data to predict events like hurricanes, earthquakes, and wildfires, enabling early warnings and disaster preparedness.

**Data Analysis:**

- Big Data Processing: AI algorithms process large datasets, such as biodiversity records and environmental sensor data, to extract valuable insights and patterns.
- Decision Support Systems: AI provides decision-makers with actionable information for conservation planning, land use management, and policy formulation.

**Conservation Planning:**

- Optimizing Protected Areas: AI helps determine optimal locations for protected areas based on ecological data, species distribution, and human activities.
- Sustainable Land Use: AI assists in identifying sustainable land use practices, such as reforestation and sustainable agriculture, to reduce environmental impact.

**Monitoring Invasive Species:**

- Species Detection: AI aids in identifying and monitoring invasive species that threaten native ecosystems, helping to control and manage their spread.

**Habitat Restoration:**

- Robotic Systems: AI-driven robots can be used in habitat restoration by planting trees, removing invasive species, or reestablishing native vegetation.

**IV. AI-POWERED PREDICTIVE MODELING REPRESENTS A TRANSFORMATIVE APPROACH TO FORECASTING ENVIRONMENTAL CHANGES**

AI-powered predictive modeling represents a transformative approach to forecasting environmental changes, enabling proactive measures for both mitigation and adaptation. This section delves into how AI enhances our ability to predict and respond to various environmental challenges:

**Climate Modeling:**

- Enhanced Accuracy: AI techniques, including deep learning and neural networks, can process vast climate datasets to improve the accuracy of climate models. This leads to more precise predictions of temperature changes, extreme weather events, and sea-level rise.
- Long-Term Projections: AI-driven climate models extend our understanding of long-term climate trends, aiding policymakers in crafting effective climate change mitigation and adaptation strategies.
- Scenario Analysis: AI allows for scenario analysis, helping researchers explore different emission scenarios and their potential impacts on climate variables.

**Natural Disaster Prediction:**

- Early Warning Systems: AI analyzes real-time data from various sources, such as weather stations, satellites, and sensors, to provide early warnings for natural disasters like hurricanes, tornadoes, and floods.
- Earthquake Prediction: AI algorithms process seismic data and historical earthquake patterns to identify potential earthquake risks, enabling preparedness measures in earthquake-prone regions.
- Wildfire Prediction: AI-powered systems analyze weather conditions, vegetation health, and historical wildfire data to predict areas at high risk of wildfires, allowing for timely evacuations and firefighting efforts.

**Disease Outbreak Forecasting:**

- Epidemiological Models: AI-driven epidemiological models analyze data related to disease transmission, population movement, and healthcare infrastructure to forecast disease outbreaks. This aids in allocating resources and implementing containment measures.

**Air Quality Prediction:**

- Urban Air Quality: AI predicts air quality in urban areas by considering factors like traffic patterns, meteorological conditions, and pollution sources. This information supports public health interventions and policies to reduce air pollution.
- Wildfire Smoke Dispersion: During wildfires, AI models can predict the dispersion of smoke, assisting authorities in issuing health advisories and planning evacuations.

**Agricultural Forecasting:**

- Crop Yield Prediction: AI models analyze weather data, soil conditions, and historical crop yields to predict agricultural output. Farmers can use these predictions for crop management and resource allocation.

**Ocean and Marine Ecosystem Prediction:**

- Ocean Temperature and Currents: AI processes oceanographic data to predict changes in sea temperature, currents, and the behavior of marine species. This is vital for fisheries management and understanding the impact of climate change on marine ecosystems.

**Adaptation Planning:**

- Infrastructure Resilience: AI helps assess the vulnerability of critical infrastructure to environmental changes, enabling the design of resilient buildings and transportation systems.
- Natural Resource Management: AI informs sustainable natural resource management by predicting shifts in species distribution, enabling adaptive conservation strategies.
- In summary, AI-powered predictive modeling is a valuable tool for foreseeing environmental changes and their impacts.

**V. AI IS USED FOR TRACKING AND PROTECTING ENDANGERED SPECIES THROUGH TECHNIQUES:**

AI plays a crucial role in tracking and protecting endangered species through various innovative techniques such as image recognition, acoustic monitoring, and GPS tracking. Here's an exploration of how these methods are employed:

**Image Recognition:**

- Camera Traps: AI-powered camera traps are strategically placed in wildlife habitats. These cameras capture images or videos when triggered by motion or heat, and AI algorithms then identify and classify the species in the images. This helps monitor the presence, behavior, and population trends of endangered species.
- Facial Recognition: For species with distinct markings or features, AI-driven facial recognition technology can identify individual animals. This is particularly useful in tracking animals over time, studying their social structures, and monitoring their health.

- **Drones and Aerial Surveys:** Drones equipped with AI-driven image recognition can survey large areas of habitat and identify endangered species from the air. This non-invasive method aids in estimating population sizes and identifying potential threats.

**Acoustic Monitoring:**

- **Bioacoustics:** AI processes audio recordings of natural sounds and animal calls in their habitats. By analyzing the patterns and frequencies of these sounds, AI can detect and identify specific species, even in dense forests or remote areas where visual tracking is challenging.
- **Identifying Mating Calls:** Acoustic monitoring helps identify mating calls and behaviors critical for breeding and population monitoring. It can also detect changes in vocalizations due to environmental stressors or human disturbances.

**GPS Tracking:**

- **Animal Collars and Tags:** Endangered animals are equipped with GPS-enabled collars or tags. These devices collect location data, movement patterns, and behavior, which is then, transmitted to data centers for analysis. AI algorithms process this data to map the animals' movements and habitat usage.
- **Geofencing:** AI can establish virtual geofences around protected areas, sending alerts when tagged animals approach potential danger zones (e.g., areas with high poaching risks). This allows rapid response and protection measures.
- **Migration Studies:** AI helps track the migratory patterns of endangered species, providing insights into their ecological needs and vulnerabilities along migration routes.

**The benefits of using AI in tracking and protecting endangered species are manifold:**

- **Real-time monitoring:** AI systems provide continuous, real-time data, enabling rapid responses to threats.
- **Non-invasiveness:** These techniques minimize human disturbances, reducing stress on the animals.
- **Data-driven conservation:** AI-generated data informs evidence-based conservation strategies, facilitating resource allocation and decision-making.
- **Cost-efficiency:** AI can cover large and remote areas more cost-effectively than traditional field methods.
- However, challenges include data privacy, ethical considerations, and the need for ongoing technology refinement. Nonetheless, the integration of AI into wildlife tracking and protection represents a significant advancement in our efforts to conserve endangered species and their habitats.

**VI. CASE STUDIES**

**Case Study: Bengal Tiger Protection in India**

**Background:**

India is home to one of the world's largest populations of Bengal tigers (*Panthera tigris tigris*), a critically endangered species due to habitat loss and poaching. Protecting these tigers and their habitats is vital for global biodiversity and conservation efforts.

**Problem:**

The Bengal tiger population in India faced significant threats from poaching for their body parts, especially tiger bones and skins.

Monitoring tiger populations across vast and remote landscapes was a complex and resource-intensive task for wildlife authorities.

**AI Solution:**

In recent years, India has deployed AI-powered camera traps in several national parks and wildlife sanctuaries as part of its conservation efforts.

These camera traps use AI-based image recognition technology to identify and track tigers and other wildlife.



**Implementation:**

- Deployment of Camera Traps: AI-equipped camera traps were strategically placed in known tiger habitats and wildlife corridors. These traps were motion and heat-sensitive, capturing images or videos when triggered.
- AI Image Recognition: The captured images and videos were then processed by AI algorithms capable of recognizing and classifying species based on patterns and features. Tigers were identified individually using their unique stripe patterns.
- Data Transmission: The identified tiger images, along with their location and timestamps, were transmitted in near real-time to wildlife authorities for analysis.

**Impact:**

- Enhanced Monitoring: AI-powered camera traps provided continuous and unobtrusive monitoring of tiger populations, allowing for more accurate population estimates and tracking individual tigers over time.
- Poaching Deterrence: The presence of these cameras acted as a deterrent to poachers, knowing they could be detected and apprehended.
- Data-Driven Conservation: The data collected from these camera traps played a crucial role in evidence-based conservation planning and decision-making.
- Population Increase: Over the years, the Bengal tiger population in India has shown signs of recovery, with an increase in numbers.

**Discussion:**

The Bengal Tiger Protection case study demonstrates the effectiveness of AI in wildlife conservation by providing non-invasive and continuous monitoring.

AI-equipped camera traps have not only improved our understanding of tiger behavior but also contributed to the reduction of poaching incidents.

Ethical considerations, such as data privacy and the potential disturbance caused by cameras, must be carefully managed in such conservation efforts.

**Future Directions:**

- a) Expanding the use of AI in wildlife conservation to include other endangered species and ecosystems.
- b) Developing AI models that can analyze camera trap data to detect potential threats or changes in tiger behavior.
- c) Integrating AI-driven wildlife monitoring into broader conservation strategies and policies.

This case study exemplifies how AI technologies can be leveraged to protect critically endangered species and underscores the potential for AI to contribute significantly to global conservation efforts.

**VII. RESULTS AND DISCUSSION**

**Results:**

**AI-Enabled Environmental Monitoring:**

Present the data and findings related to the successful use of AI in various environmental monitoring applications, such as remote sensing, wildlife tracking, and air quality assessment.

Include statistics, graphs, or examples of how AI has improved data accuracy, efficiency, or real-time monitoring.

**Predictive Modeling for Environmental Changes:**

Show how AI-powered predictive models have enhanced the accuracy of climate forecasts, natural disaster predictions, and disease outbreak modeling.

Present evidence of AI's role in providing early warnings and supporting mitigation and adaptation efforts.

**Discussion:**

Implications for Environmental Conservation:

Analyze the significance of AI's role in environmental conservation, emphasizing how it has improved monitoring, data analysis, and decision-making.

Discuss how AI contributes to proactive measures for mitigating climate change, protecting endangered species, and preserving ecosystems.

**Challenges and Ethical Considerations:**

Acknowledge the challenges and ethical concerns related to AI in environmental monitoring, such as data privacy, algorithmic bias, and the potential displacement of human expertise.

Offer insights into how these challenges can be addressed through responsible AI practices and regulatory frameworks.

**Future Directions:**

Explore potential future developments in AI for environmental protection, such as the integration of AI into policy-making, enhanced collaboration between AI and environmental science communities, and the use of AI in emerging fields like synthetic biology for conservation.

**Interdisciplinary Collaboration:**

Discuss the importance of interdisciplinary collaboration between AI experts, environmental scientists, policymakers, and conservationists in harnessing the full potential of AI for environmental protection.

**Sustainability and Long-Term Impact:**

Consider the sustainability of AI-driven solutions and their long-term environmental and societal impacts, including their carbon footprint and resource requirements.

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# Analytical and Dynamic analysis of a Prey-Predator Model

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**Abstract:** *Mathematical and dynamic analysis of the Prey-Predator model in the presence of Alternative prey with impulsive state feedback control, and Predator-Prey process extended their application and have given rise to system which represents more real different biological issues that appear in the context of interacting species. Our aim in this paper is to give a state of the art review of recent Predator-Prey models which include some more interesting properties such that Allee effect, fear effect, immigration etc. We generate the qualitative results obtained for each of them.*

**Keywords:** Mathematical and dynamic analysis

## I. INTRODUCTION

Predator-Prey models such as the Lotka-volterra model can be used in a homogeneous environment. However, more generally, the environment is heterogeneous and this can be represented using a set of discrete patches connected by migrations. Prey-Predator models with infected prey have already been analysed extensively. see Bairagi et al. (2007); Ghosh et al. (2007); Bhattacharya and Bhattacharya (2006); Xiao and Chen (2001); Chattopadhyay and Atino (1999); Venturino (1995, 1994). Very recently also more complex situations like the infection of Predators through the consumption of prey. see Hsieh and Hsiao (2008) and the references therein, as well as the influence of prey infection on the chaotic dynamics of a three-trophic food chain. see Das et al. (2009), were considered.

This paper is organized as follows: First we present the complete model. then we show that by use of aggregation methods, it is possible to build a global Predator-Prey model governing the total Prey and Predator densities, by total predator density we signify the Predator density obtained by summation over all individual Predator categories such as searching, handling hawk and dove sub-populations. there after, we present the result of the bifurcation analysis of the aggregated methods with respect to two relevant parameters, the carrying capacity and the costs for fight. The article ends with a general discussion on advantages of different tactics and their effects on the stability of the Predator-Prey system.

Predator-prey model is an autonomous model corresponding to the model was first proposed by Maynard Smith which accounts for the allelopathic interaction between two competing species. Preliminary stability analysis of the model with respect to the context of Phytoplankton allelopathy was proposed by Chattopadhyay and in here, the allelopathic interaction can strengthen the stability of coexistence steady-state is shown. In reality, the introduction of allelopathic interaction into the competition model can result in more complicated dynamics including the presence of two co-existing steady-state and their stability depends upon the magnitudes of the parameters. Interestingly,

The proposed model can exhibit the bi-stable scenario for a range of parameter values and the coexistence of the competing species depend upon the initial population densities. A thorough analysis of the model proposed by Maynard-Smith is recently investigated by Gupta et al with a few Modifications for a different context. Dynamics of model with discrete time delay and almost periodic coefficients are investigated by Abbas et al. In this work, the role of time delay and environmental quasi-periodicity on the bloom formation by two competing phytoplankton species are thoroughly investigated.

Several authors have considered the non –autonomous models of interacting species , which is capable to take care of seasonal variation in environmental

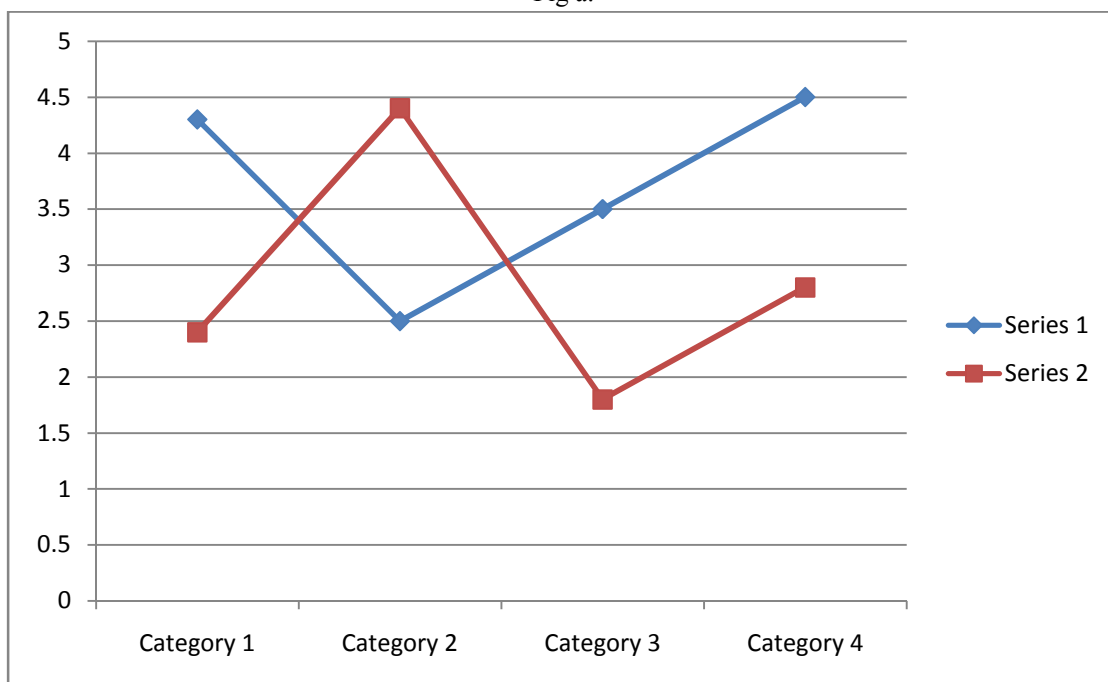
Conditions .The con- cerned models are of Lotka-Volterra type but without allelopathic interaction term various factors (intensity of sun light ,temperature ,salinity of water ,amount of soluble nutri-entsetc) in the environment varies seasonally ,in a periodic manner ,and affect the intrinsic parameters involved the mathematical models of interacting populations .A part from these ,the assumption behind periodic oscillation of the system parameters are justified due to other seasonal factors like mating habites ,availlability of food etc .hence its quite reason –able to study the non – autonomous models of ecological system driven by periodic external forces .Many researchers have studied the non – autonomous ecological models where intrinsic rates are considered as bounded periodic functions of time to model the seasonal variabil –ity .Motivated by this fact ,in this work we consider the deterministic model where the parameters of the system are periodic with common period ,the second assumption is due to the simplicity of mathematical calculations .

The main problem in the study of populations growth model with periodic coefficients is the existence of the positive periodic solution and its global stability .Hence its is reasonable to search for conditions under with the concerned non – autonomous system with periodic coefficients with have a positive periodic solution which is globally asymptotically stable .in this context ,we assume that the parameters in the system are periodic in ‘ t ’ with a fixed period  $t > 0$  and with derive the parametric restriction in terms of the bounds of the periodic coefficients for the existence of positive periodic solutions and its global asymptopic stability for the model .

**Numericals bifurcation analysis**

Predator –prey model going on non-linear system ,consider a forest where only foxes and rabbits are presents .Foxes eat rabbits and rabbits eat clover which is sufficient in the forest and the rabbits never run out of food .When the rabbits are abundant ,then the foxes flourish and their population increases .So they eat too many rabbits and then the rabbits and their populations decreases .As the rabbit population decreases ,there is a luck of food for foxes and hence their population begins to decline .As the population of foxes decreases ,the rabbits become relatively safe and then their population starts to increase again .In this way, we have an endlessly repeated cycles of interrelated increases and decreases in the populations of rabbit and fox ,which can be understood by the following graph :

Fig a:



Series -1=Rabbits (x)

Series-2=Foxes (y)

In from figure ,above zig-zag lines intersect each other and these are the all possible points when fox meet with rabbit.

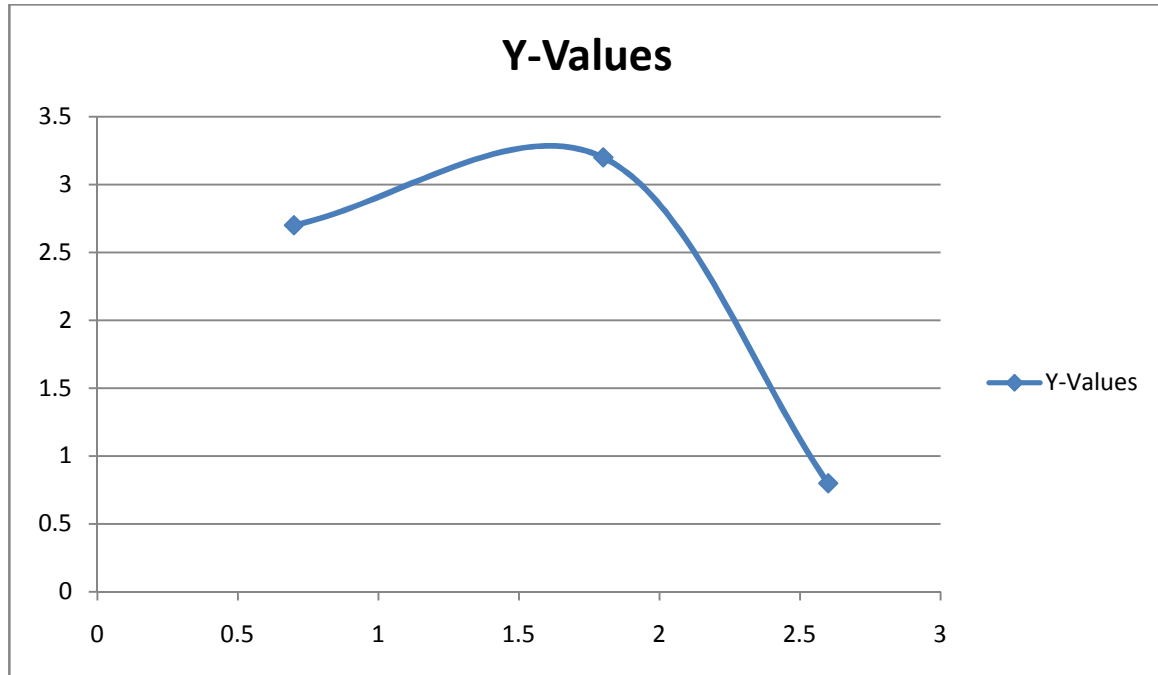


Fig b: Stable and unstable behavior of rabbit and Fox.

In Fig:b Vertical line Express the behavior of Fox and horizontal line expressed the behavior of rabbits. Here Stability regions y- show separated by a straight line with slope 2D and meets the abscissa after some time Graphical representation of above criterion .

Now if we seen Fig(a) ' t ' is the time and  $\bar{x}, \bar{y}$  are population of rabbits and foxes at any time ' t ' respectively .

If x is the number of rabbits at any time ' t ' and if there are no foxes , then the relation

$$dx/dt = ax, a > 0 .$$

should hold .this relation states that the rate of increase of number of rabbits is proportional to the number of rabbits present at that time .

In a similar way ,if y is the number of foxes at any time ' t ' then

$$dy/dt = -cy, c > 0 .$$

(Here negative sign is due to the fact that increases of population of fox results decreases of population of rabbit ).

Let the number of encounters between rabbits and foxes per unit of time is proportional to xy .if we further assume that a certain proportion of those encounters results in a rabbit being eaten, then we have

$$dx/dt = ax - bxy, a, b > 0 .$$

Similarly ,in the absence of rabbits, the fox population decreases and their increase depends on the number of encounters with rabbits ,then we have

$$dy/dt = -cy + dxy, c, d > 0 .$$

In this way we have following non-linear system of equations as :

$$dx/dt = x(a - by) \dots\dots\dots(i)$$

$$dy/dt = -y(c - dx) \dots\dots\dots(ii)$$

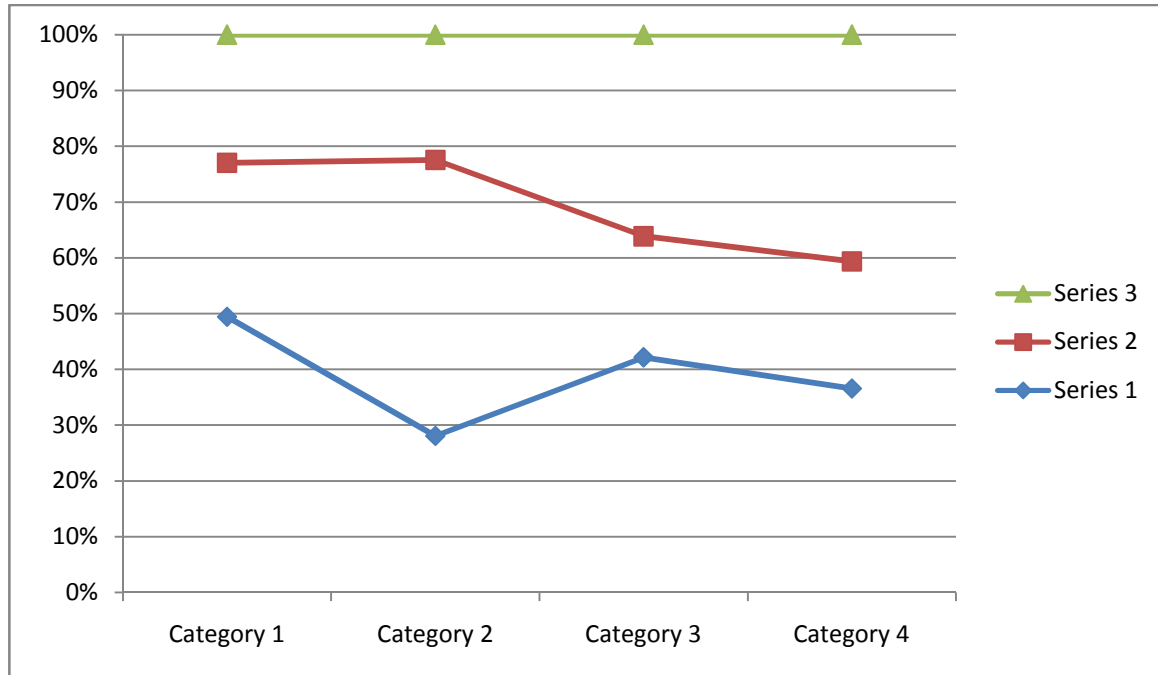
The equations in system ( i ) and ( ii ) Predator –prey equations .

**Example (i):** Now to solve above both equations ,eliminate ' t ' in equations ( i ) and ( ii ) and then separate the variables ,i-e,

Fig.(C) A bloom event is triggered by suppressing the initial zooplankton Concentration (middle Panel ) sufficiently ,far below the stationary value  $z_s$  (red



curved line ).The initial phytoplankton concentration (Top panel )is fixed in the stationary value  $p_s$ (red curved line ).In the bottom panel the event is illustrated in (P,Z) state space with relevant nullclines plotted using red curved lines.



$$dx/x(a-by) = dt$$

$$dy/-y(c-dx) = dt$$

hence  $dx/x(a-by) = dy/-y(c-dx)$

$$(a-by)dy/y = -(c-dx)dx/x$$

$$\left[ \frac{a}{y} - b \right] dy = - \left[ \frac{c}{x} - d \right] dx$$

On integrating, we get

$$a \log y - by = -c \log x + dx + \log C$$

$$\text{ory } a e^{-by} = C_1 x^{-c} \cdot e^{dx} \dots\dots\dots(2)$$

if we take  $x=x_0, y= y_0$  at  $t=0$ , then from equation (2)

$$C_1 = x_0^c y_0^a e^{-dx_0 - by_0} \dots\dots\dots(3)$$

For convenient ,let  $C_1 = K$ , then equation (2) takes the form

$$y^a e^{-by} = K x^{-c} e^{dx}$$

Which is the solution of the system (1) where  $K=C_1$  is given by (3).

Example-2. Formation non –linear second order equation satisfied by the function  $x(t)$  , with help of predator equations .

Since predator equations are given by

$$dx/dt = x(a-by) \dots\dots\dots(a)$$

$$dy/dt = -y(c-dx) \dots\dots\dots(b)$$

from (a) , we have

$$\frac{d^2x}{dt^2} = dx/dt(a-by) - bxdy/dt$$

$$= dx/dt \left( \frac{1}{x} \frac{dx}{dt} \right) - bx \left\{ -y(c-dx) \right\}$$

$$= \frac{1}{x} \left( \frac{dx}{dt} \right)^2 + bxy (c-dx)$$

$$= \frac{1}{x} \left( \frac{dx}{dt} \right)^2 + bx(c-dx) \left\{ \frac{1}{b} \left( a - \frac{1}{x} \frac{dx}{dt} \right) \right\}$$

$$= \frac{1}{x} \left( \frac{dx}{dt} \right)^2 + ax (c-dx) - (c-dx) \frac{dx}{dt}$$

$$\text{Or } x \frac{d^2x}{dt^2} - \left( \frac{dx}{dt} \right)^2 + x(c-dx) \frac{dx}{dt} - ax^2(c-dx) = 0.$$

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## II. DISCUSSION AND RESULT

As far as observability of chaos in nature is concerned it can be divided into two distinct categories (i) Robust chaos, and (ii) Short-term recurrent chaos. We give precise definitions for both of them and present results which suggest that robust chaos should be rarely found in nature.

(i) Robust chaos: If chaotic dynamics exists in a region  $2D$  parameter space spanned by two crucial parameters of a model systems and also if the basin of attraction for the associated attractor is large; one understands that the chaotic dynamics displayed by the system is Robust. If this is the case, chaos would be dominant dynamical mode of the corresponding real system.

(ii) Short-term recurrent chaos: There exist two mechanism which generate this kind of chaotic behaviour. If chaotic dynamics is display region in  $2D$  parameter space of a model system. It can still support short-term recurrent chaos (strc) provided the form of chaotic behaviour, where in is interrupted by other kind of dynamic at irregular and unpredictable intervals. Therefore we see that short-term recurrent chaos can be caused either by deterministic changes in the system parameters or by exogenous stochastic influences. In the former, chaotic dynamic is interrupted by smooth changes in system's parameters where as stochastic influences affect such interruptions in the parameter.

## III. CONCLUSIONS

Thus it is clear that robust chaos is less likely to be found in nature. Instead, what nature seems to abound in has recently been called strc. The strc can occur through two mechanism. The first mechanism involve deterministic changes in the system parameters. The other invokes exclusive role of abrupt change in initial condition. The only systems, where in robust chaos has been observed so far, are diffusively coupled predator-prey systems. Diffusion couples stable limit cycles oscillators on a special gradient. These couples oscillators force each other at "incommensurate" frequencies to generate chaos. The chaotic dynamics exist in a region of non zero measure  $2D$  parameters space and there is no other competing attractor in the initial condition space. Thus, there is no intermixing of the attractor basins. On the contrary, those with generalist top-predator are governed by deterministic change in system parameters we opine that the natural system with first kind of food chain would present difficult challenges as far as program of quantification of their dynamical complexity is concerned. The other kind of systems seems to allow such a program to be implemented smoothly. This conjecture is to be tested in the laboratory and in the field.

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# A Study on Tax Savings Schemes Adopted by Salaried Assesses in Mumbai City

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**Abstract:** *The act of organising one's finances in such a way as to take full advantage of all exemptions, deductions, concessions, rebates, allowances, and other tax-related benefits while remaining within the bounds of the law in order to reduce one's tax liability is known as tax planning. The exclusions, deductions, refunds, and relief provisions have been established by legislation to achieve particular social and economic objectives as well as to encourage saving and investments for the growth of the country's economy. The assesses' investment practices are proper and reasonable for their income. Assesses can reduce their tax liabilities by investing their money wisely and taking advantage of the several tax-saving investment initiatives put forth by the government. Salary people face problems with tax planning, and factors influencing investment behaviour are identified.*

**Keywords:** Tax

## I. INTRODUCTION

Planning your taxes in a way that the assessors benefit is an important financial decision. Tax planning is the legal arrangement of one's financial affairs in such a way as to best utilise exemptions, deductions, and other tax breaks in order to minimise one's tax liability. Tax planning requires a thorough understanding of tax legislation in order to come up with the best solution to lower tax payments.

The act of organising one's finances in such a way as to take full advantage of all exemptions, deductions, concessions, rebates, allowances, and other tax-related benefits while remaining within the bounds of the law in order to reduce one's tax liability is known as tax planning. As a result, tax planning may be understood as a method of judiciously putting professional knowledge to use when organising one's operations in order to obtain the tax benefits that are specifically provided based on national priorities and in accordance with legislative and judicial opinion.

## II. REVIEW OF LITERATURE

**Dr. Dhakshayini KN and Mr. Chittibabu (2023)** Tax planning involves looking at a scenario or financial strategy from a tax standpoint. The ability of a salaried person to accept risk affects the choice of investment strategy. Salaried workers are frequently perplexed while choosing the best savings plan. A salaried worker needs to be guided by appropriate authorities so they may make the right decision at the right moment.

**Dr. Harish Kumar (2022)** The study focuses on how each assesses behaves when making tax payments and choosing appropriate tax-saving strategies. Effective financial planning enables the assesses to lower their tax obligation and utilise the exclusions, rebates, and deductions the income tax department has to offer. In this study, the researcher sought to identify numerous widely used saving plans that assesses consistently adopted.

**Dr. Sahail Imran Khan (2021)** Financial planning is to create a roadmap to save tax and derived benefits from that for long period. Proper financial planning guide the salaried person at the time of decisions about finance. Assesses must study the all available options to save tax and generate savings.

**Ana Brochado And Victor Mendes (2021)** Financial education is a prerequisite for financial literacy, including its assessment, correlations, types of saving, and related behaviours. Savings and financial awareness go hand in hand for people who have jobs. Financial education is influenced by the investors' psychographic makeup and financial literacy.

**Sidharth Dhongde (2020)** Tax management is a process used by tax payers to minimise their tax obligations and make the best use of all available credits and deductions. Financial planning is the best method to employ when making long-term financial plans. According to the findings of this study, employees priorities PPF as their primary investment, followed by children's education, LIC, home loans, NPS, medical insurance, national savings certificates, fixed deposits, and ELSS.

**2.1 Scope of the study**

Savings in a various schemes is a necessary to generate finance. Finance plays an important role for individual growth as well as economic growth of a country. In our country various schemes utilized for saving. This study help to salaried assesses to increase saving.

**2.2 Objectives of the study**

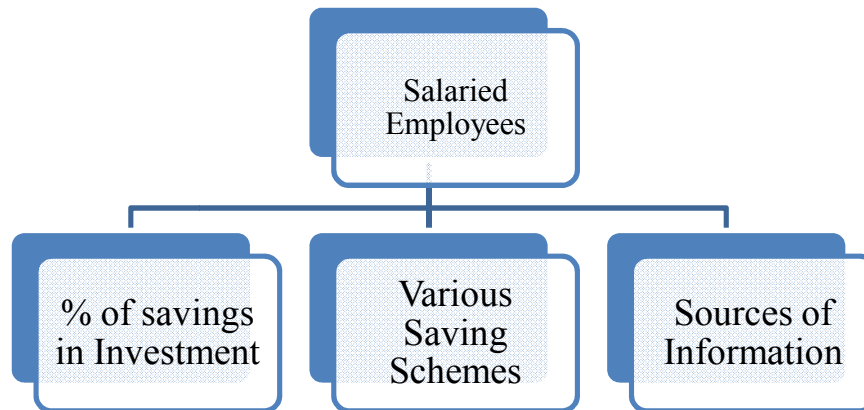
The objectives of study are as under

- To Study the ratio of saving in Investment of salaried employees in Mumbai city.
- To Study the various schemes of savings adopted by salaried assesses in Mumbai city
- To Study the sources of various schemes recommendation to aware the salaried assesses in Mumbai city.

**III. RESEARCH METHODOLOGY**

The study combines analytical and descriptive components. It makes use of both primary and secondary data. To collect primary information on the tax planning techniques and saving practices of the salaried class of income tax assesses, a structured questionnaire will be used. The study period for collecting primary data has been determined to be Assessment 2020–2021.

In order to gather secondary data, a variety of sources will be used, including the Reserve Bank of India Bulletin, books, journals, news paper reports, magazines, research papers published in national and international journals, reports from the departments of revenue and commerce and finance, reports from international financial organisations, websites, newspapers, and more. Sample Design



**IV. DATA ANALYSIS & INTERPRETATION**

**Age of Respondent**

Age of Resppndent	Frequency
18-30	10
31-40	30
41-50	25
51-60	35
Total	100

Table No.1

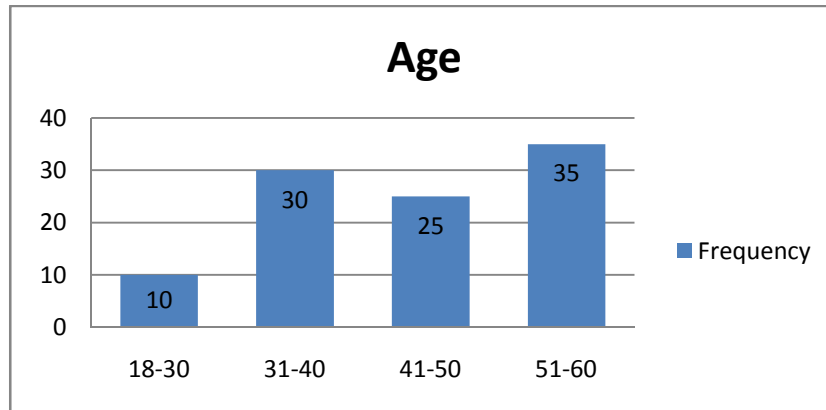


Fig. No. 1

There is total respondent is 100. In that has there are some types of Age of respondent such as 18-30 was having 10 frequencies. Secondly for the 31-40 was having 30 frequencies, then 41-50 was having 25 frequencies. After that 51-60 that was having 35 frequencies.

**2. Gender**

Gender	Frequency
Male	70
Female	30
Total	100

Table No.2

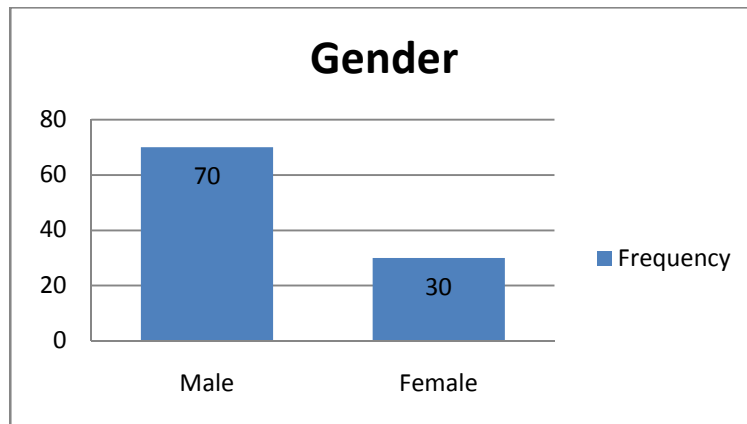


Fig. No.2

**Interpretation**

Total responded are the 100, that the responded are from the Gender females are 30 frequencies then males 70 frequencies.

**3. Marital status**

Marital status	Frequency
Unmarried	26
Married	74
Total	100

Table No.3



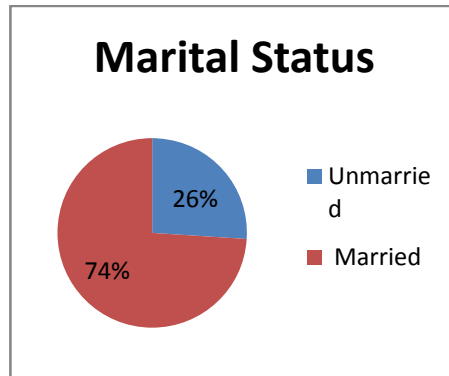


Fig. No. 3

**Interpretation**

Total responded are the 100, that the responded are from the unmarried they are 26 frequencies then married 74 frequencies.

**4. Service in completed years:**

Service in completed years	Frequency
1-10	10
11-20	30
21-30	40
Above 30 years	20
Total	100

Table No. 4

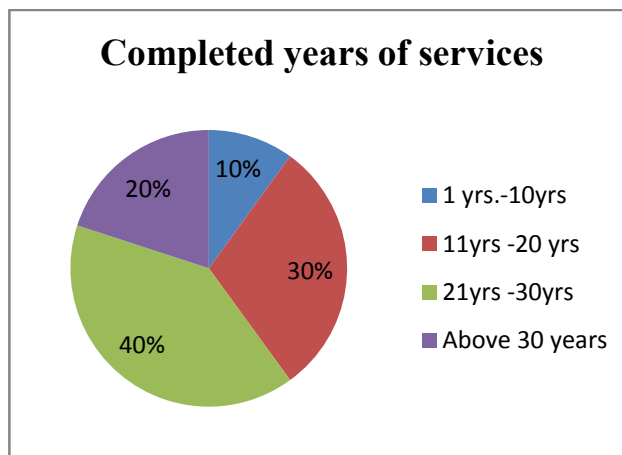


Fig. No. 4

**Interpretation**

Total responded is 100, we need to describe firstly the 1-10 they have 10 Frequency. Secondly 11-20 they have 30 Frequency. After that 21-30 they have 40 Frequency. Finally, above 30 years they have 20 Frequencies.

**5. Annual Salary Income for the Financial Year 2022-23**

Annual Salary Income	Frequency
Above 10,00,000	30
Below Rs. 250,000	5
Rs. 250,000 to Rs. 500,000	25
Rs. 500,000 to Rs. 10,00,000	40
Total	100

Table No. 5

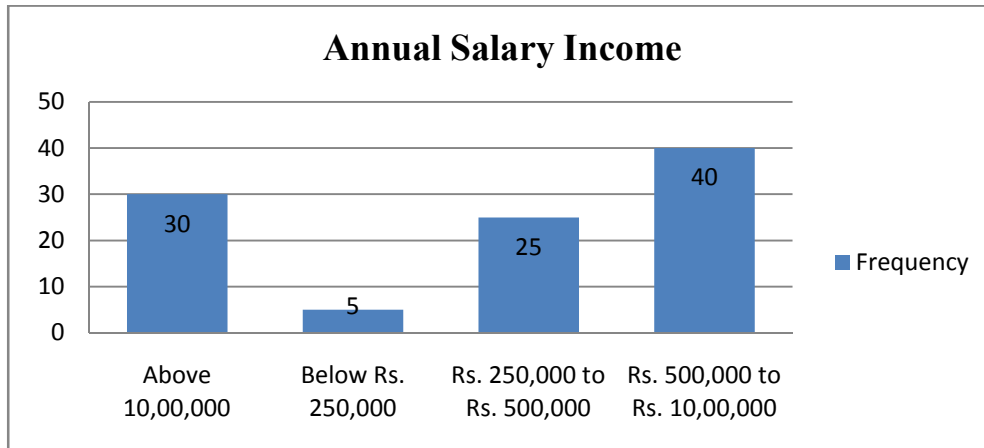


Fig. No. 5

**Interpretation**

Annual Salary is mentioned in the table. To begin with the Above 10,00,000, they have 30 Frequency. Then secondly Below Rs. 250,000 they have 5 Frequency. Then Rs. 250,000 to Rs. 500,000 they have 25 Frequency. Rs. 500,000 to Rs. 10,00,000 they have 40 Frequency.

**6. How much of your income in a year is saved in investments?**

Income saved in a year	Frequency
Up to 10%	35
10-20%	30
20-30%	20
30-40%	10
Above 40%	5
Total	100

Table No.6

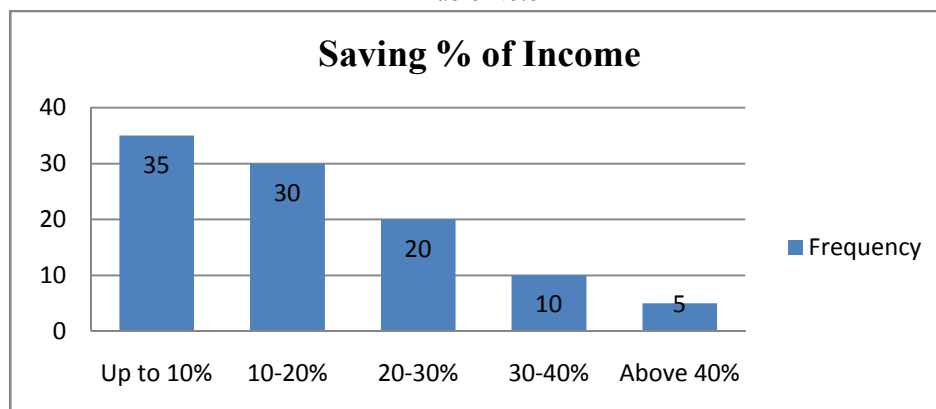


Fig. No. 6

**Interpretation**

There is total respondent is 100. In that has there are some types of How much of your income in a year is saved in investments of respondent such as 10-20% was having 35 frequencies. Secondly for the 20-30% was having 20 frequencies, then 30-40% was having 10 frequencies. After that Above 40% that was having 5 frequencies, and lastly Up to 10% was having 35 frequencies.

**7. What is the tax planning for salaried person?**

Tax planning for salaried person	Frequency
Employees' Provident Fund (EPF)	19
Public Provident Fund (PPF)	15
ELSS	37
Tax Saving FD	29
Total	100

Table No.7

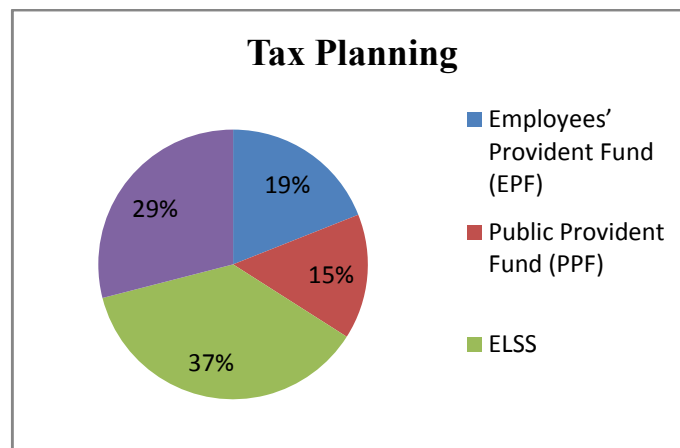


Fig. No.7

**Interpretation**

There is total respondent is 100. Listed as Employees' Provident Fund (EPF), Public Provident Fund (PPF), ELSS, Tax Saving FD. To begin Employees' Provident Fund (EPF) was having 19 Frequency. Then Public Provident Fund (PPF) was having 15 Frequency. After ELSS was having 37 Frequency. and lastly Tax Saving FD was having 29 Frequency

**8. Source of income tax information**

Source of income tax information	Frequency
Newspaper	39
Business Journals	17
Internet	12
Tax Consultants	13
Friends And Relatives	19
Total	100

Table No. 8

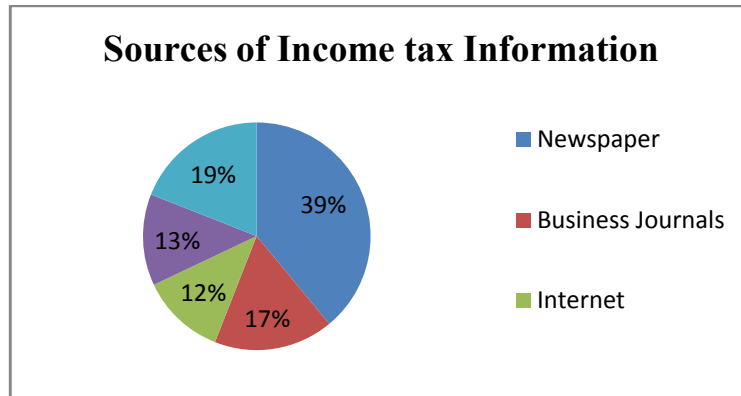


Fig. No.8

**Interpretation**

There are total respondents is 100. Firstly the Newspaper they have 39 Frequency. Then Business Journals they have 17 frequencies. Form Internet they are having 12 Frequency. For Tax Consultants they are having 13 Frequency. Finally, Friends and Relatives 19 frequency.

**9. Professional Advice for Making Tax Saving Investments**

Professional Advice for Making Tax Saving Investments	Frequency
Always	10
Occasionally	42
Rarely	16
Never	32
Total	100

Table No.9

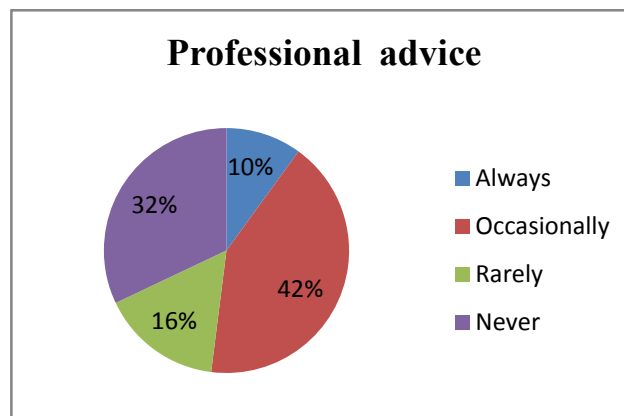


Fig. No. 9

**Interpretation**

To describe the survey of Professional Advice for Making Tax Saving Investments. There is total respondent is 100.. To begin Always they have 10 Frequency. Then occasionally they have 42 Frequency. Then Rarely was having 16 Frequency. For Never was having 32 Frequency.

**V. CONCLUSION**

1. The assesses' investment habits are appropriate for their income and proper.
2. The assesses' select the options of saving schemes are EPF, PPF, ELSS and tax saving FD.

3. The assesses' still use the sources of awareness is newspaper on majority basis after that they depends upon the suggestions given by the friends and relatives which unprofessional.

#### **VI. SUGGESTIONS**

This study's objective is to examine the impact that tax planning has had on the saving and investing habits of salaried people who have been selected for the study's evaluation. The assesses' not taken professional advice while making investment which effect their tax saving planning. The assesses' must guide by proper authority for how much amount they inest, when they get benefits and various tax saving schemes available for them.

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# Financial Quotient In Financial Statements, Accounts, Business Administration in Development Authority of Rajasthan (ADA)

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**Abstract:** *This study is done with the aim to indicate the value of Financial Intelligence in Government departments and Development Authorities with specific reference to Ajmer Development Authorities situated in Ajmer Rajasthan. This is totally a new and creative concept for government sector in Rajasthan to combine financial quotient approach with traditional approach. In it we tried to find out the awareness of FQ in the employees and officials working in the organization. We also tried to indicate that employees can use the financial intelligence as a tool to enhance their working capacity. For leaders and senior officials in the department it's very important to connect with their employees in fair psychological manner in order to utilize their working capacity, productivity in favorable manner for the organization. We also tried to connect the effect of financial quotient on financial accounts and business administration process of the organization. It is generally seen that most of the government departments are still working with old traditional approach as a result they are lagging behind in modern business scenario. As a result government is moving towards privatization of various PSU. Hence modern business administration concepts with quotient approach need to be studied in depth by the government sector officials.*

*In this organization we find that Majority of the worker was aware of their financial strength but no additional training was provided to them to enhance their outcomes by utilizing this approach. They were also in favor of the view which represents that leaders with good FQ can provide much better results by doing maximum utilization of concept in comparison to normal leader. Knowledge about Financial quotient not only affects individual capacity but also affects the financial reports, records and outcomes of organization as it is directly based on the mindset of the employee who is preparing them. An financially motivated employee can do much better in comparison to employee with low financial quotient approach and not aware of financial goals which are favourable for the organization .*

**Keywords:** Financial Statement, Accounts, Business Administration, Financial Intelligence, financial Quotient (FQ).

## I. INTRODUCTION

### Financial Quotient (FQ)

Financial Quotient (FQ), sometimes also referred as financial intelligence (FI), financial intelligence quotient (FiQ) or financial IQ, is the ability to obtain and manage one's wealth by understanding how money works. Like financial quotient (FQ), FQ derived its name from IQ (intelligence quotient).

Expert perspectives on why financial literacy is important

Paul Goebel, Director, Student Money Management Center at the University of North Texas

“I think if people truly understand the way that financial systems work at an early age, or even later on in life—if they’ve made poor decisions but learn how they can go back and fix them and start planning for the future—they can then encompass that and take the steps to make a better life for themselves.”

Cherry Dale, Director of Financial Education, Virginia Credit Union

“Finances inherently—whether or not it’s incredibly short-term in just buying lunch for that day or long-term saving for retirement—help you accomplish whatever your goals are. And financial literacy is important because if you learn about it, it’s going to teach you how to be efficient with your finances in such a way that you can accomplish more goals, and the goals that you do have, faster.

## II. OBJECTIVES OF THE STUDY

To study the contribution of Financial Quotient in Accounts, Financial Statement, Business administration of Ajmer Development Authority in Rajasthan Government.

## III. LITERATURE REVIEW

A study of financial quotient among information technology professionals in India-2017 by Rajput Gaurav  
Antecedents of financial intelligence and its impact on financial stress among the managerial executives in selected sectors of Tamil Nadu.-2020 by Aiswrya E.

## IV. FINANCIAL INTELLIGENCE

Financial intelligence (otherwise known as Financial quotient or FQ) is the ability to understand, use, and manage own wealth in a positive way to get maximum return. It works as a tool of wealth creation. It helps an individual or an entity in ascertaining maximum possible level of earning which can be generated by roer lanning.

Role of Financial Intelligence

Financial intelligence can lead us on the path to a fulfilled and happy life by providing a framework through which to apply standards of intelligence to the field of finance and understand that these responses may be logically consistent or inconsistent with particular beliefs about Finance.

### Six Categories & factors affecting Financial Intelligence (FI/FQ)



Image 1.1

- **SAVING HABBITS** : the ability to save the money plays most important role in raising financial quotient of any individual. Saving not only works as a contingent fund for future liability but also provide safety from future risk.

- **FINANCIAL PLANNING:** Setting future targets in relation to financial requirement by any individual or organization plays an important role in wealth creation of any entity.
- **LOAN AND ADVANCES:** the ability to take loan and advances and habit of repaying it directly affects the financial quotient. It also affects CIBIL score of any entity. Loan and its interest factor must be calculated separately then it shall be compared with the expected return to find out plan was favorable or unfavorable.
- **INVESTMENT:** the ability to recognize and understand how others are feeling and consider those feelings before responding in social situations. Empathy also allows an individual to understand the dynamics that influence relationships, both personal and in the workplace.
- **RISK TAKING HABBITS:** the ability to take and manage various risk factors related to the finance plays an important role in financial quotient. Higher the risk higher the reward but actually it higher risk without proper planning and back up plan brings only destruction. So taking limited risk with well planned financial objective is very important for financial quotient.
- **SPENDING HABBITS:** the ability to spend money in proper ratio to the income creates an impact on financial planning and quotient. If one is making expenses in higher ratio with no saving it simply will create a negative impact on the networth of that person in future. So its very important to plan and then make expenses.

### **Benefits of financial intelligence at workplace**

It's common for some workplaces to give employees personality tests to help determine what roles they might be best suited for. But personality tests don't measure FQ. Knowing the financial intelligence of employees can help organizations understand, to some degree, how an employee might manage their finance and stress, as well as interact with co-workers and clients and how an employee can provide maximum output to the organization.

### **Financial intelligence and leadership**

Similarly to success, there are many positive traits that might be attributed to effective leadership, like clear communication and confidence. A high FQ may also be beneficial in leadership roles, especially when working with others or on teams. For senior officials, leaders and managers, FQ can be essential for:

- Understanding communicating with co-workers by providing them accurate measure for financial target of the organisations.
- motivating employees and teammates to achieve financial goals.
- ensuring co-workers and employees are engaged and interested in the work

### **How to cultivate financial intelligence**

Financial intelligence might come naturally to some people, but that isn't always the case for every personality type. There are many strategies that can help strengthen FQ. With work and knowledge of finance, cultivating a higher FQ may be possible. You may have to try different things before you notice a change in yourself. For many people, a combination of several methods can be most effective in improving FQ. When upsetting or stressful situations arise, pay attention and recognize the financial up and down you are facing.

Be aware of how you typically react in financial situations. No matter how upset you may be, it's often helpful to wait before immediately reacting.

### **Does Financial Intelligence Matter More Than IQ?**

Whatever official activity we human do its final outcome is directly or indirectly related with finance. Without finance no activity and achievement is possible. Human need IQ to enhance their networth and understand financial matters. The IQ which can not generate proper financial quotient are limited to certain aspect. IQ which leads to enhancement of FQ is highly beneficial for any organisation or individual in achieving their mission, vision or objectives.

**Benefit of applying these concepts in the office-**

There are many benefits to Financial intelligence, but here are just a few.

**It allows for better team work**

Teams with members who are having high financial quotient are great at working together. They have good communication, trust each other, and value each other's input. When someone makes a suggestion, they're able to respond in a positive and productive way.

**You can deal with change**

Not many people like change, but Financial intelligence gives you the tools you need to deal with any change that comes your way. In the workplace, many people often face change with a negative attitude and crossed arms; but a financially intelligent person will be much more positive and can inspire other team members to feel the same way.

**You can handle those tough conversations**

Whether it's an angry customer or an upset employee, difficult conversations can stir up all sorts of finance. If you have the right skills, you can handle those conversations by financially connecting with the other person before finding a resolution.

**It's an essential people skill**

Financial intelligence allows you to quickly build trust with people, as well as a rapport. You'll be able to understand their feelings and empathise with them – fantastic for any role that involves working in teams!

**It's a key feature of a strong leader**

Great leaders understand people; they know how they work, how to influence them, and how to inspire them. Financial intelligence will help you to achieve this understanding in order to be a brilliant leader and guide your team in the right direction

**Various key points regarding Financial Intelligence are as follows-**

- Financial intelligence works as a tool, it depends on any individual how his instinct provide anyone a particular direction for their progress.
- It increases the intensity of work or task performed by any individual employee hence, it works as a key tool in performing any activity or task if an employee is aware of financial benefit of his act then he can focus better and provide favorable outcome.
- Its various effects on employee working has been several times. If any employee is positively happy then the happiness will be indicated in his working style.

**Financial Quotient for leaders and employees in Development Authority**

Financial Quotient is an important tool for leaders in order to enhance productivity of employees. It assists them not only in generating interest and dedication of employees towards work but also it increases the positive outcomes. It helps in fulfilling managerial expectation from subordinate staff.

It helps in reduction of conflicts in financial goals in the office. It converts workforce mindset as per financial mission, vision and objectives of the organization as employee's starts taking more interest in their work. Employee's starts thinking that they have an important role and value for the organization. Their concern and issued is listen and resolve by the top management, it generate a feeling in the employee that they have safe future and growth opportunities in the organization as a result they put more effort in achieving their individual goals and task allotted to him by their leaders as the financial goals of the organisation are clear so it creates a favorable impact on employee. If leader is paying appropriate attention on various financial issues of the employee clarify their financial dilemma if any then he will be having stronger bonding with his subordinate in comparison to the leader those are not financially connected with their subordinates. Those employees who are having higher age in comparison to their co employees or having a senior or team leader younger in comparison to them generally suffers from various psychological factors and mindset related to finance. It has been seen that those leaders who are directly connected with their employees making them understand the financial goals of the organisation comparatively have more influence and control over their employees in comparison to other leader who communicate lesser with their subordinates. The case in which employees are more connected with their leaders or senior as they trust them that their leader is leading them in correct direction having deep knowledge and understanding of financial goals. Employees with good work experience related to finance not only

save time and effort but also provide favorable measures and support in achieving goals for the organization. A leader who is not equipped with the core competencies of financial intelligence is just like a leader without goal. Hence we can understand the requirement of financial quotient knowledge in office.

**V. METHODOLOGY**

Employees were asked various questions over financial quotient and its effect on preparation of financial statement ,business administration procedure ,and human resource in the organisation. With close ended questionnaire it was asked from 396 current and Ex employees worked in development authorities specially in Ajmer on govt./contract basis that in which manner the importance of financial quotient inoffice affect their working , following responses received:-

SR. No.	Particular	% BASED ON RESPONSE RECEIVED		
		Favorable	Unfavorable	Neutral
1	Leaders in Development Authorities are well equippedwith FQ	70.4	25.1	4.5
2	FQ works as a outcome booster in my work	95.2	4.8	nil
3	Human resource management is indirectly affected byaspects of financial quotient.	69.6	20.1	10.3
4	FQ affects the mindset and outcomes of an employee who is working on preparation of any financial report and statement.	72.2	19.6	8.2
5	Are you aware of importance of financial quotient inoffice work.	55.3	34.4	10.3
6	Senior officials with good financial knowledge caneasily get connected with the employees.	75.7	14.6	9.8
7	I am aware of financial aspects of office.	70.4	23.0	6.6
8	I can easily do self management in the office.	90.5	5.0	4.5
9	I am financially aware and participants various FQ booster activity nearby me.	65.1	25.1	9.8
10	I know how to utilize my financial knowledge in business administration.	60.1	39.9	nil

**VI. DISCUSSION, ANALYSIS AND FINDINGS**

It was seen that in Rajasthan Development Authorities most of the participants in above analysis were aware of financial quotient and their affect on various reports in the organization. Approx seventy percentof employees think that their leader are aware about FQ and remaining employee were not clear about the concept connectivity with leader. Most of them were agree with the fact that they can do Self financial Management in the office and they need not the efforts of others. Approx ninety five percent participant were agree that FQ works as outcome booster and they like to make contribution in various activities around them these types of employee are contributor to office as they are financially aware of their act, they can contribute more than other. Some of them were not in favor of the concept that FQ work as outcome booster. This category of employees generally restricts their surroundings, they easily don't accept the changes in the office and they often feel difficulty in their work management. Approx sixty ninepercent were in the favor that FQ not only affect direct financial activities but also affect human resource activities in indirect manner. Maximum of them accepted the fact that financial knowledge affect the financial statement preparation process. Fifety five percent was aware of the use of FQ at workplace

while other was not able to connect financial intelligence with their office work. Financial intelligence can be used as self motivator in the work., seventy five percent told that seniors with good financial knowledge creates a better impact on employee and can get easily connected with them. They also told that no additional training has been provided to them about the use of financial intelligence in the office. Ninety percent agreed that they can easily do self management at workplace. sixty five percent were agree that they are aware of the concept and also participate the FQ booster activities around them but only sixty percent told that they are aware of the manner in which their financial knowledge



can be used in business administration.. Most of the employee was agree that financial outbreak directly affects their working. Hence we can understand that financial quotient is an effective tool to provide favorable working condition in the office. When employee is given with financial support than that employee can provide better results and outcomes. It was also seen that employee who did not get any support from seniors comparatively perform lesser than those employee who get financial support from there seniors. Senior authority dealing plays an important role how they are tackling their subordinates.

**VII. RESULTS**

correlation coefficient between favorable, unfavorable and neutral FQ response		
favorable and unfavorable FQ	favorable and neutral FQ	unfavorable and neutral FQ
-0.945995184	-0.42466241	0.108231

A correlation coefficient of zero indicates that no linear relationship exists between two continuous variables, and a correlation coefficient of -1 or +1 indicates a perfect linear relationship. Coefficient of correlation was found between favorable, unfavorable and neutral FQ response is correlated with each other.

**Case Processing Summary**

		N	%
Cases	Valid	386	97.5
	Excluded <sup>a</sup>	10	2.5
	Total	396	100.0

**Reliability Statistics**

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.832	.836	10

**Scale Statistics**

Mean	Variance	Std. Deviation	N of Items
37.70	32.808	5.728	10

In the above stake we can analyses the line trends for various favorable and unfavorable response of the employees. Favorableness of financial quotient row in above linear presentation indicates that financial quotient not only beneficial for employee in person but also it gives advantage to employees in preparation of their records and official work.

**VIII. RECOMMEDATIONS**

Above research analysis is limited to development authorities of Rajasthan government so analysis can be done in other sectors including private and public sectors.

Above analysis can be done on larger scale in other type of organization using survey method.

**IX. CONCLUSION AND SUMMARY**

In above study we find that Financial quotient is directly associated with preparation of the financial statement and any other type of record, file etc. Humans are directly associated with the finance and mindset, so when an employee is working his working manner will be decided by his own mood finance and mindset. In preparation of budget employee needs to be focused about various circular, if mindset is not focused he will not be able to create error free accounts

which comply with all type of legal requirements. As a result in future many defaults may occur in the records. Any official while doing business administration can easily get affected by his own finance or by the finance of various workers and trade unions in the office. Financially well equipped and financially balanced leader can face any difficulty with easy approach, which provides stability to the organization. Above study states that if employee will be trained about the value of financial quotient they can perform in better manner and can provide better outcome to their organization. Financially equipped and balance employee are stable and more focused to the work allotted to them. If they are trained in proper manner about the importance of financial quotient in the work they can do much better. On behalf of these response we can conclude that leaders and seniors officials must handle their subordinated with positive approach. Rather than discussing the financial matter at top level an organization needs to inform their subordinates about their financial goals clearly so that they can evaluate themselves that they are moving in favorable direction to achieve their financial goals. Without a strong team even a leader can't get positive results. Each and every employee is importance adverse performance of one directly affects other. Financially equipped leader can utilize their employee in much better manner in comparison to other normal leader. Hence financial quotient not only affects leaders, financial statement preparation procedure in ADA but also the business administration of this organization so it must be utilized in fair manner to provide maximum outcomes and desired results.

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# Synthesis of Methane Gas from the Different Type of Domestic Wastes and Animal Dung

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**Abstract:** *Biogas is one of the reliable alternative fuels. Nowadays, it is widely used in all over the world. It is a renewable type of energy. The biogas can be produced by anaerobic digestion of biodegradable elements. Many research works focused on the biogas preparation from the bio wastes. Vegetable wastes, food wastes, kitchen waste, animal waste are some of the bio wastes. Mostly, in urban areas, the cooking has been carried out by the use of biogas. Biogas can be used as the alternative fuel for the following sectors in industries for boilers and power plants, in transports for buses. Water hyacinths are naturally available in ponds and lakes. Since, Plants such as Milkweed are of no use can be used for the extraction of biogas. Food wastes and kitchen waste also a good biogas producer. This paper investigates the possibility of producing biogas from a mixture of water hyacinth and cow dung, milk weed, food waste and analysing the methane concentration. The biogas consists of methane as a major constituents and traces of other gases which includes CO, H<sub>2</sub>S, and NH<sub>3</sub>. To increase the yield of methane gas cow dung is mixed with water hyacinths.*

**Keywords:** Biogas

## I. INTRODUCTION

Biogas is a renewable energy source produced by the breakdown of organic matter by certain bacteria under anaerobic conditions. It is a mixture of methane, hydrogen, and carbon dioxide. It can be produced by agricultural waste, food waste, animal dung, manure, and sewage. The process of biogas production is also known as anaerobic digestion. Biogas recycles the waste products naturally and converts them into useful energy, thereby, preventing any pollution caused by the waste in the landfills, and cutting down the effect of the toxic chemicals released from the plants. Biogas converts the harmful methane gas produced during decomposition, into less harmful carbon dioxide gas. The organic material decomposes only in a wet environment. The organic matter or the waste dissolves in water and forms a sludge which is rich in nutrients and used as a fertilizer.



Fig. 1. Kitchen Waste

## II. GENERAL WASTE FROM KITCHEN

Kitchen waste like leftover organic matter from household kitchens, restaurants, etc. and food waste, also termed as plate waste, that is the food which has been served but has not been eaten completely, stale food, etc. are ubiquitous in all communities. They contain a high amount of organic matter and hence should be considered a major source for producing value-added products. Biogas generation for harnessing energy and bioconversion for producing fertilizers are specific examples of value-added products. They are faced with issues including the heterogeneous nature of waste and an increased level of moisture, which are essential to be addressed.

## III. BIOGAS

Biogas production is a well-established technology primarily for the generation of renewable energy and also for the valorisation of organic residues. Biogas is the end product of a biological mediated process, the so-called anaerobic digestion, in which different microorganisms, follow diverse metabolic pathways to decompose the organic matter. The process has been known since ancient times and was widely applied at domestic households providing heat and power for hundreds of years. Nowadays, the biogas sector is rapidly growing and novel achievements create the foundation for constituting biogas plants as advanced bioenergy factories. In this context, the biogas plants are the basis of a circular economy concept targeting nutrients recycling, reduction of greenhouse gas emissions and biorefinery purposes. This review summarizes the current state-of-the-art and presents future perspectives related to the anaerobic digestion process for biogas production. Moreover, a historical retrospective of biogas sector from the early years of its development till its recent advancements gives an outlook of the opportunities that are opening up for process optimisation.

**Table-1: Typical composition of Biogas**

### Composition of Biogas

• Methane	50-70%
• Carbon dioxide	30-45%
• Hydrogen	0-1%
• Nitrogen	0-1%
• Water	0.1%
• Hydrogen sulphide	0-1%
• Oxygen	0-1%

## IV. PROPERTIES OF BIOGAS

methane, colourless, odourless gas that occurs abundantly in nature and as a product of certain human activities. Methane is the simplest member of the paraffin series of hydrocarbons and is among the most potent of the greenhouse gases. Its chemical formula is CH<sub>4</sub>.

Methane is lighter than air, having a density of 0.554. It is only slightly soluble in water. It burns readily in air, forming CO<sub>2</sub> and water vapour; the flame is pale, slightly luminous, and very hot. The boiling point of methane is -162 °C (-259.6 °F) and the melting point is -182.5 °C (-296.5 °F). Methane in general is very stable, but mixtures of methane and air, with the methane content between 5 and 14 percent by volume, are explosive. Explosions of such mixtures have been frequent in coal mines and collieries and have been the cause of many mine disasters.

## V. MICROBIOLOGY OF BIOGAS PRODUCTION

Microbiology of biogas production is the study of microorganisms involved in the anaerobic fermentation of biodegradable materials that produce a mixture of gases, primarily methane and carbon dioxide, along with traces of other gases. The process of biogas production is known as methane fermentation and consists of four stages of anaerobic decomposition. The production of biogas from organic material under anaerobic conditions involves a

sequence of microbial reactions. During the process, complex organic molecules present in the biomass are broken down to sugar, alcohols, pesticides, and amino acids by acid-producing bacteria. The resultant products are then used to produce methane by another category of bacteria 2. The efficiency of the digestion depends on how far the digestion happens in these three stages. Better the digestion, shorter the retention time and efficient gas production.

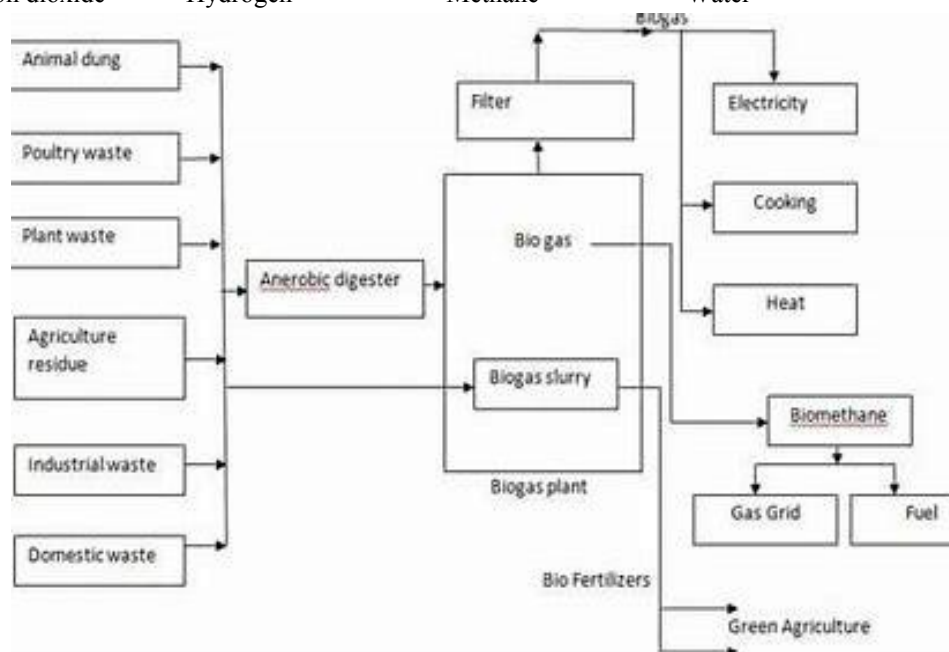
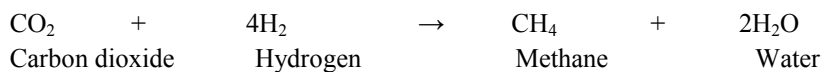


Fig. 2. Biogas Plant

## VI. KITCHEN WASTE

Kitchen waste is defined as left-over organic matter from restaurants, hotels and households. Tons of kitchen wastes are produced daily in highly populated areas. Kitchen wastes entering the mixed-municipal waste system are difficult to process by standard means, such as incineration, due to the high moisture content. Furthermore, organic matter can be transformed into useful fertilizer and biofuel. New disposal methods that are both environmentally and economically efficient are being developed which rely on various forms of microbial decomposition.

Kitchen waste is a nutrient rich, or eutrophic, environment containing high levels of carbohydrates, lipids, proteins, and other organic molecules which can support abundant populations of microorganisms. The anaerobic nature of kitchen wastes is typical for a eutrophic environment, because aerobic bacteria deplete oxygen through respiration at a faster rate than oxygen can be replenished by diffusion. Although the presence of water is essential for bacteria growth, the high moisture content in kitchen waste exacerbates the anaerobic condition as oxygen is insoluble in water and it is hard for oxygen to diffuse through water. Kitchen waste is usually acidic due to the action of acid fermentation bacteria such as lactic acid bacteria. As lactic acid can act as an uncoupler in acidic environment, it is toxic to other bacteria, thus a buffer is usually added into kitchen wastes to make the environment less acidic. Overall, the high moisture and nutrient level make kitchen waste an ideal environment for anaerobic biodegradation.





**Fig. 3. Other Kitchen Waste**

### VII. KITCHEN WASTE BASED BIOGAS PLANT

The main objectives of this research work is to set-up biogas digester to produce huge amount of biogas by using Kitchen waste, food waste and Vegetable market waste dropping as biomass and monitoring characteristics of influent, effluent, gas production and utilizing this data for biogas digester design.



**Fig. 4. Set up Biogas Plant in Laboratory**

Process of biogas generation from kitchen waste is given below: An amalgam of finely ground Domestic waste and water is made in 1:1 proportion. For 1 liter of solid organic waste (800 gm kitchen waste and 200 gm other waste), 1 liter of water is used as feed to the mesophilic tank. Adding sufficient amount of water to the organic matter is essential as it creates a suitable environment for easy degradation and provides the substrate with fluid properties. A constant temperature of 36 degree Celsius is maintained using a solar heater. Production of biogas due to bacterial action will occur within 45-50 days with the complete decomposition of the substrate. Furthermore, to improve degradation and improve gas production regular stirring is done. The gas gets collected in the dome while the substrate commences to move towards the balancing tank due to the pressure difference. The substrate is directed through the outlet pipe

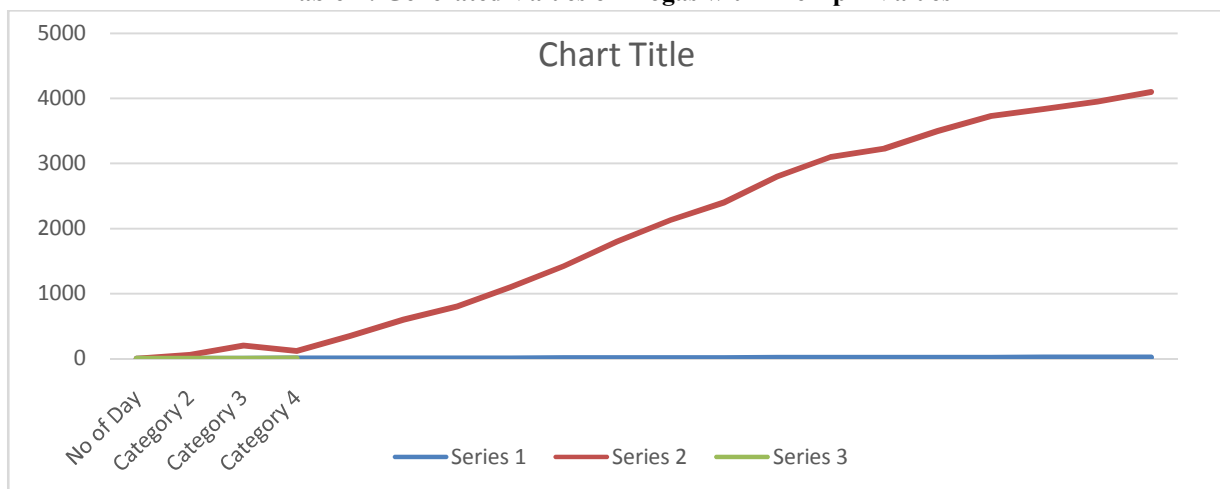
towards the second tank where it undergoes thermophilic reaction. Thus, remaining gas production takes place which is drawn through the gas valve. Slurry is then taken out from the draining pipe from the bottom of the tank.

**VIII. EXPERIMENTAL PROCESS**

Fresh 200 gm Hen dung, 800 gm kitchen waste and rest water is collected and mixed by hand and poured into 2 lit. bottle digester. As it contains the required microorganism for anaerobic digestion. After the inoculation digester is kept for some days and gas production and ph value is checked. During checking the production of biogas, we found that generation is increased with the day and when the slurry become dry the generation also reduced so increase the generation of biogas we mixed the water with the slurry.

Day	ph	Temperature	Gas(ml)
1	6.5	40	0
2	7.1	42	60
3	6.4	41	200
4	6.6	43	120
5	6.5	39	350
6	6.3	44	600
7	6.9	42	800
8	6.7	45	1100
9	7.1	44	1420
10	6.3	43	1800
11	6.6	44	2130
12	6.7	42	2400
13	6.5	44	2800
14	6.4	43	3100
15	6.8	42	3230
16	6.3	44	3500
17	6.5	43	3730
18	6.9	45	3840
19	6.5	44	3950
20	6.2	45	4100

**Table-2: Generated Values of Biogas with Their pH Values**



**Fig. 4. Gas Production V/S Day**

### IX. RESULTS

The conversion of Domestic waste into biogas reduces production of the greenhouse gas methane, as efficient combustion replaces methane with carbon dioxide. Given that methane is nearly 25 times more effective in trapping heat in the atmosphere than carbon dioxide, biogas combustion results in a\_\_\_\_\_.

### X. FACTORS AFFECTING THE PRODUCTION OF BIOGAS

Biogas is environmentally friendly, relatively cheap and a renewable energy source which occurs as a result of anaerobic fermentation of wastes and organic wastes. Temperature has a very large impact on biological systems. The metabolic activities of methane bacteria changes in regard to carbon / nitrogen so this ratio is important in producing biogas. The C / N ratio should be less than 10/1 or more than 23/1. In the process of producing biogas is essential to mix slurry and wastes to react with each other. In this study, factors affecting biogas, loading rate, retention time, the C / N ratio of the ambient operating temperature, pH, mixing are discussed. The proportion of these factors, speed and operating conditions have been examined and advantages and disadvantages of biogas production have also been demonstrated. Most of the data are shown in tables and graphs. In this work, emphasize on the importance of biogas and the biogas production factors, is intended to contribute public awareness about biogas.

### XI. USES AND ADVANTAGES OF BIOGAS

Biogas is safe and cheap; hence, it is used for cooking, lighting, etc. Biogas cooking burns with blue flame without any odour or soot, which is considered a vital advantage compared to old cooking fuel like firewood and cow dung cakes.

Biogas mantle lamps consume 2-3 cft per hour, having a lighting capacity equivalent to 40 W electric bulbs at 220 volts.

Biogas can be used as engine fuel.

It is easy to generate since the technology used is cost-effective (low cost).

Biogas is an eco-friendly and renewable source of energy.

It reduces pollution.

The waste left after the biogas production can be used as natural or organic fertilizer for plants.

### XII. CONCLUSION

The study evaluates biogas production from the kitchen waste through anaerobic digestion of 2L capacity designed and built in lab. In the duration of 20 days, biogas production started from the 2nd day. The total amount of gas production recorded up to 45 days. Kitchen waste getting converted in the biogas not only becomes an alternative source of energy but also burning the biogas help in reducing the methane production from organic waste which is one of the green house gases. From our study it is kitchen waste can become a good feedstock for the biogas production. Kitchen waste contain more biodegradable solid (9.5%), with higher volatile solid (95.6%) than cow dung. Thus biogas production from kitchen waste higher than the biogas produced from cow dung and other waste.

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# Design and Optimization of Radiator for Liquid Cooling using Micro Channels

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**Abstract:** The need to use micro channel in such radiator arise as need to increase the heat transfer rate from the radiator to better cool down the working fluid. The current radiator are not efficient in this process and thus hamper the performance of CPU, solution employed currently include increase the length of radiators and to accommodate multiple fans over it. The method we employed to tackle the issue was to introduce micro channels in the tube of the radiator. Use of micro channels increases the surface area of the passage through which the fluid passes, the increase in surface area leads to increased heat transfer rate which causes more heat loss through the system. Thus, increasing the efficiency of the radiator.

**Keywords:** Micro channel, radiator, heat transfer rate, efficiency, surface area, temperature drop, pressure drop

## I. INTRODUCTION

Heat Exchangers are devices designed to transfer heat between two or more fluids i.e., liquids, Vapours, or gases of different temperatures. Depending on the type of heat exchanger employed, the heat transferring process can be gas-to-gas, liquid-to-gas, or liquid-to liquid and occur through a solid separator, which prevents mixing of the fluids, or direct fluid contact. Regardless of the type and design, all heat exchangers operate under the same fundamental principles namely the Zeroth, First, and Second Laws of Thermodynamics which describe and dictate the transference or exchange" of heat from one fluid to another [3].

The flow configuration, also referred to as the flow arrangement, of a heat exchanger refers to the direction of movement of the fluids within the heat exchanger in relation to each other. There are four principal flow configurations employed by heat exchangers [4].

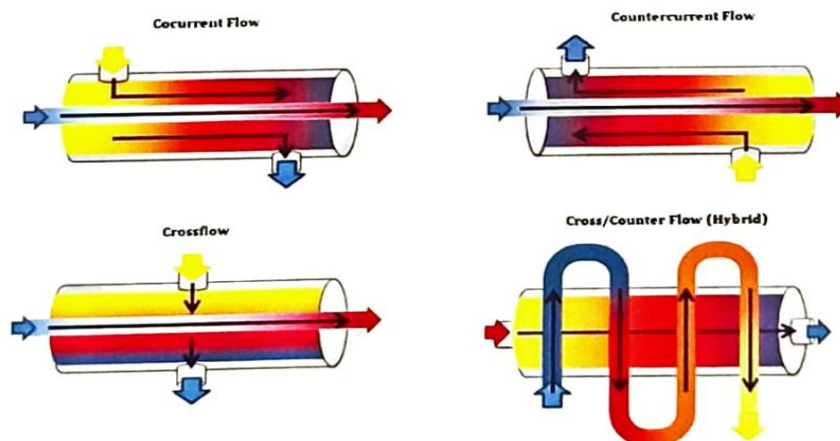


Figure 1: Heat Exchanger Flow Configurations

### Micro Channel Heat Exchanger

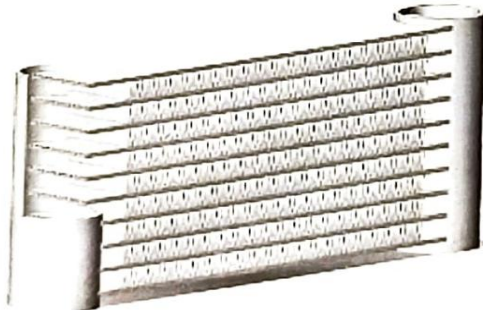
Micro channel technology is being increasingly adopted by manufacturers in heating, air conditioning and refrigeration products, both for their enhanced energy efficiency, cost and reduced refrigerant charge. The goal with micro channel

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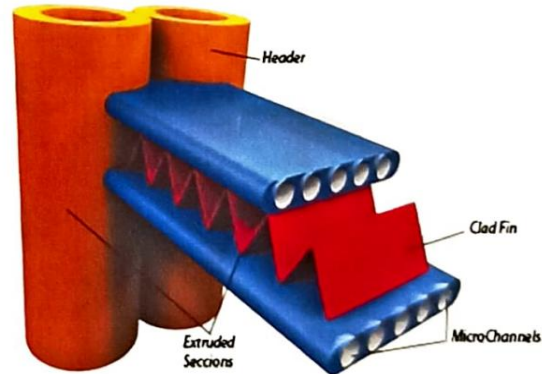
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heat exchangers is to improve overall heat transfer, which could potentially reduce the temperature difference between the air and a refrigerant. Additionally, the heat exchangers minimise airside pressure drop, which results in more energy savings gained from the fan energy consumption.



**Figure 2:** Micro Channel Heat Exchanger



**Figure 3:** C/S View of Micro Channel H.X.

**Radiators**

Radiators are heat exchangers used to transfer thermal energy from one medium to another for the purpose of cooling and heating. Automobile radiators are constructed of a pair of metal or plastic header tanks, linked by a core with many narrow passageways, giving a high surface area relative to volume. This core is usually made of stacked layers of metal sheet, pressed to form channels and soldered or brazed together. For many years radiators were made from brass or copper cores soldered to brass headers.

**CPUs**

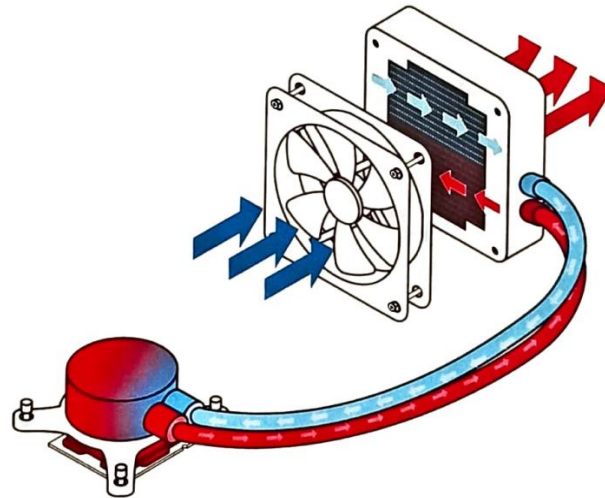
Alternately referred to as a processor, central processor, or microprocessor, the CPU (pronounced sea-pea-you) is the central processing unit of the computer. A computer's CPU handles all instructions it receives from hardware and software running on the computer. Computer processors are designed to run at high temperatures and it's completely normal for a CPU to heat up and to actually get very warm. In fact, temperatures of over 200 degrees Fahrenheit are frequently acceptable. If an efficient path for that heat doesn't exist, then the CPU will exceed its safe operating temperature.



**Figure 4:** CPU Radiator

**PC Liquid Cooling Systems**

The process starts with a baseplate that is connected to the IHS of the CPU with a layer of thermal paste. This allows for better heat transfer between the two surfaces. The metal surface of the baseplate is part of the water block, which is designed to be filled with coolant. The coolant absorbs heat from the baseplate as it moves through the water block. It then continues to move through the system and upward through one of two tubes to a radiator. The radiator exposes the liquid to air, which helps it cool, and fans attached to the radiator then move the heat away from the cooler. The coolant then re-enters the water block, and the cycle begins again.



**Figure 5:** AIO Liquid Cooling System

**Problem Statement**

The existing pc (AIO) cooling system rely on radiator with wide tubes to cool down the working fluid in the closed loop. The radiators used are not very efficient and thus for better performance bigger radiators are used. Cooling is required for CPU to give consistent performance. Using a Micro channels in radiator increases the surface area for heat transfer, thus providing better cooling effect at smaller size. Which will help in getting consistent performance from CPU.

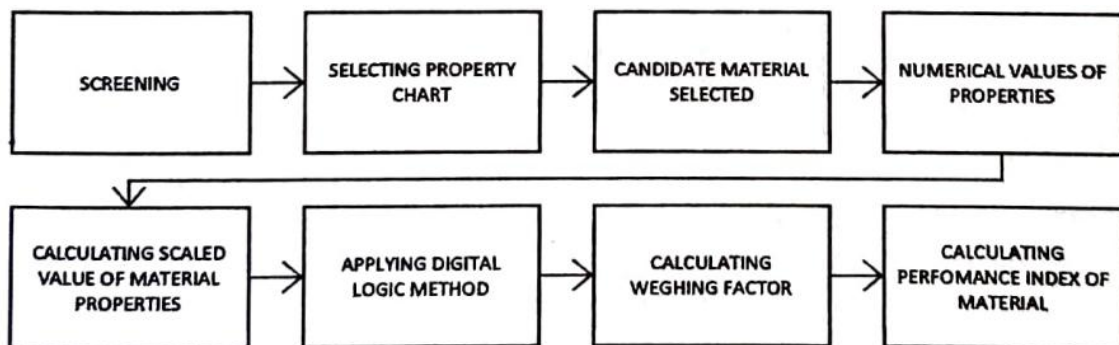
**Objective**

- To increase the heat transfer rate to achieve higher temperature drop.
- To design micro channels of optimal diameter.

**II. MATERIAL SELECTION**

As there are many methods for selecting optimized materials, such as: Cost per unit property method, weighted property method, Digital logic method. The radiator has a unibody design, those it can be divided in critical segments such as - Tubes, Fins, Main body.

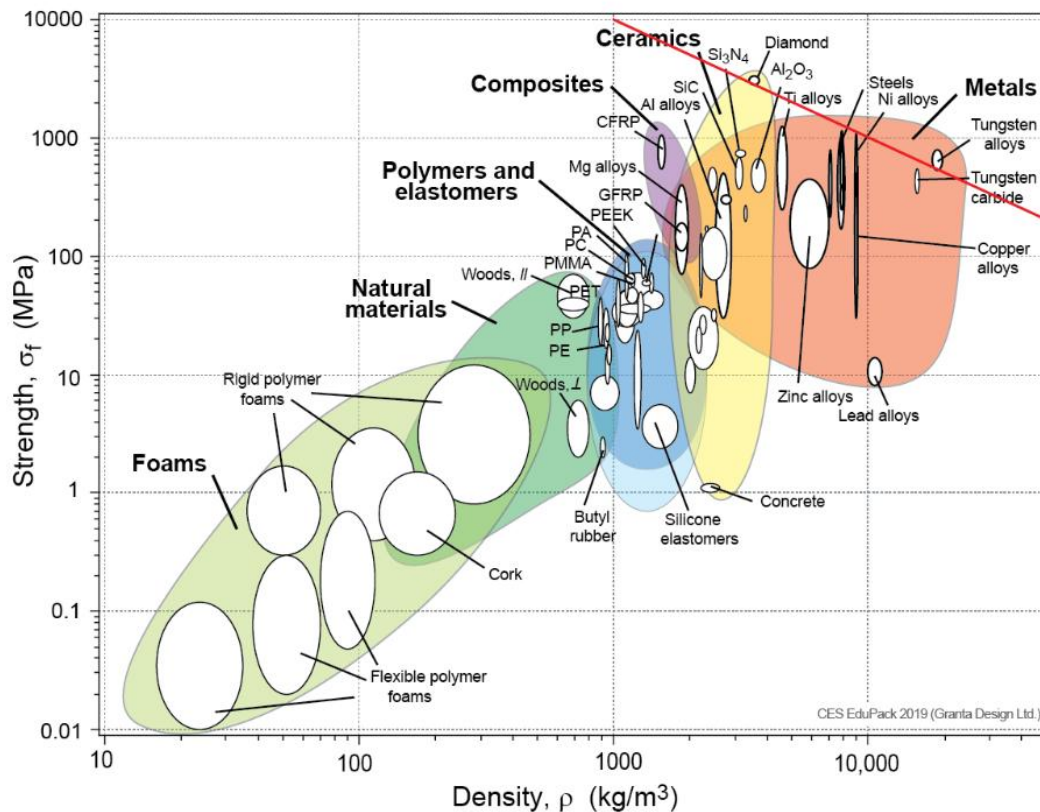
For these critical parts of radiator, we have used DIGITAL LOGIC METHOD. In which numerous material properties are specified and the relative importance of each property is not clear, determinations of the weighting factors, can be largely intuitive, which reduces the reliability of selection. The digital logic approach can be used as a systematic tool to determine. In this procedure evaluations are arranged such that only two properties are considered at a time. Every possible combination of properties or goals is compared and no shades of choice are required, only a yes or no decision for each evaluation.



**Figure 6:** Digital Logic Method

**2.1 Selecting property chart.**

The chart guides selection of materials for light, stiff, components. The moduli of engineering materials span a range of 107; the densities span a range of 3000. The contours show the longitudinal wave speed in m/s; natural vibration frequencies are proportional to this quantity. The guide lines show the loci of points for which  $E/p = C$  , (minimum weight design of stiff ties; minimum deflection in centrifugal loading, etc),  $EI/2p=C$  (minimum weight design of stiff beams, shafts and columns),  $EI/3p =C$  (minimum weight design of stiff plates)



**Figure 7:** Performance Index Chart 1

**2.2 Screening**

- **Function-** To enable heat transfer
- **Objective** - Increase in heat transfer rate
- **Variable** - Wall thickness, tube diameter
- **Constraint** - Shape and dimensions

**2.3 Candidate material selected**

- Aluminium Alloy 3102
- Aluminium Alloy 3003
- Stainless Steel 304
- Monel 400

**2.4 Numerical values of properties**

**Table1:** Numerical values of properties

Material Property	Tensile Strength (MPA)	Young's Modulus (GPA)	Thermal Conductivity (W/m-K)	Density (g/cm <sup>3</sup> )
Al 3102	92	69	230	2.71
Al 3003	110	70	180	2.8
SS 304	580	200	16	7.8
Monel 400	540	160	23	8.8

**2.4.1 Calculating scaled value of material properties**

Scale property for friction co-efficient = (numerical value x 100 / max value in the list)

**Table 2:**The scaled value of material properties

Material Property	Tensile Strength (MPA)	Young's Modulus (GPA)	Thermal Conductivity (W/m-K)	Density (g/cm <sup>3</sup> )
Al 3102	15.86	34.5	100	30.79
Al 3003	18.96	35	78.26	31.81
SS 304	100	100	6.95	88.63
Monel 400	93.1	80	10	100

**2.4.2 Applying digital logic method**

In comparing two properties or goals, the more important goal is given numerical one (1) and the less important is given zero (0). The total number of possible decisions  $N = n(n-1)/2$ , where n is the number of properties or goals under consideration.

**Table 3:**The digital logic method

Iteration Property	1	2	3	4	5	6	Total
Tensile Strength	1	0	0				1
Young's Modulus	0			0	0		0
Thermal Conductivity		1		1		1	3
Density			1		1	0	2

**2.4.3 Calculating weighing factor**

A relative emphasis coefficient or weighting factor, for each goal is obtained by dividing the number of positive decisions for each goal (m) into the total number of possible decisions (N).

Weighting Factor = Positive Decision /Total

**Table 4:**The weighing factor

Property	Positive Decision	Weighing Index
Tensile Strength	1	0.167
Young's Modulus	0	0
Thermal Conductivity	3	0.5
Density	2	0.33
Total	6	1



**2.4.4 Calculating performance index of material**

**Table 5:** The performance index of material

Material	Performance Index
Al 3102	62.8
Al 3003	52.79
SS 304	49.423
Monel 400	53.54

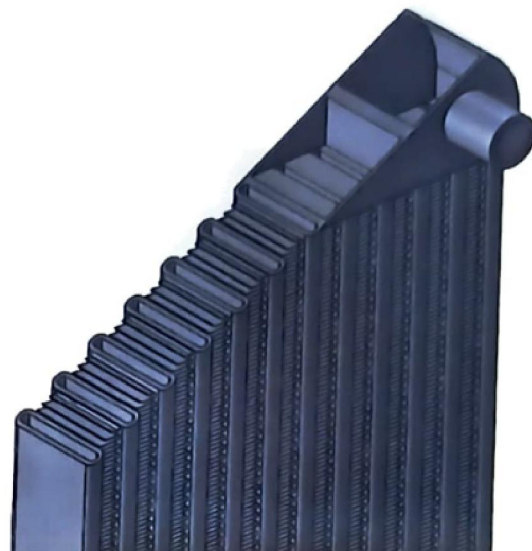
**III. ANALYSIS**

**3.1 Antec Radiator**

Radiator used in the Antec ecosystem of liquid cooling peripherals. The dimensions of the design are based off of the radiator available in the market from Antec company.



**Figure 8:**Antec Radiator



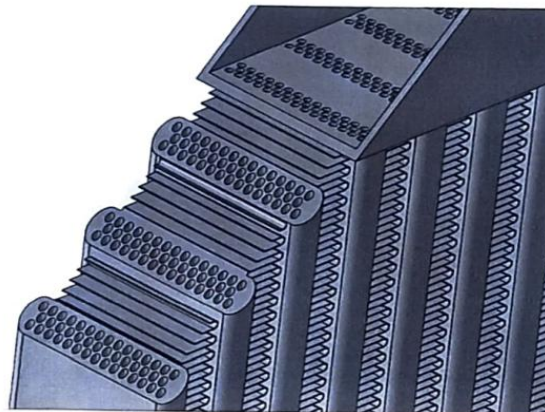
**Figure 9:**C/S view Antec Radiator

**3.2 Micro Channel Radiator**

Radiator designed with micro channels to increase heat transfer. The dimensions of the design were based on the radiators available in the Industry (antec). The constraint involved in the process were to mount the standard 120x120mm fans which are standard in the industry.



**Figure 10:**Micro channel Radiator



**Figure 11:**C/S view of Micro Channel Radiator



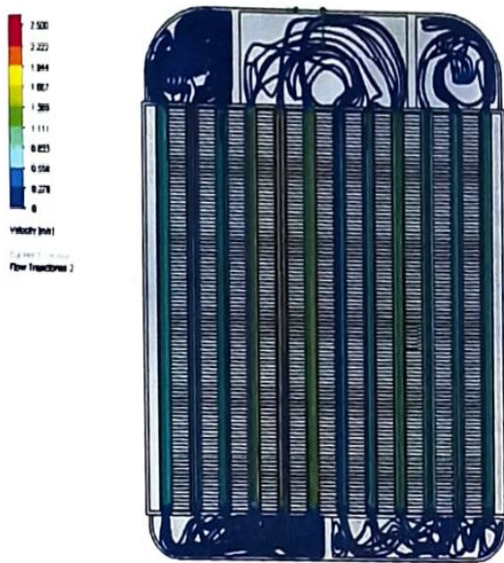
### 3.3 Properties

**Table 6: Properties**

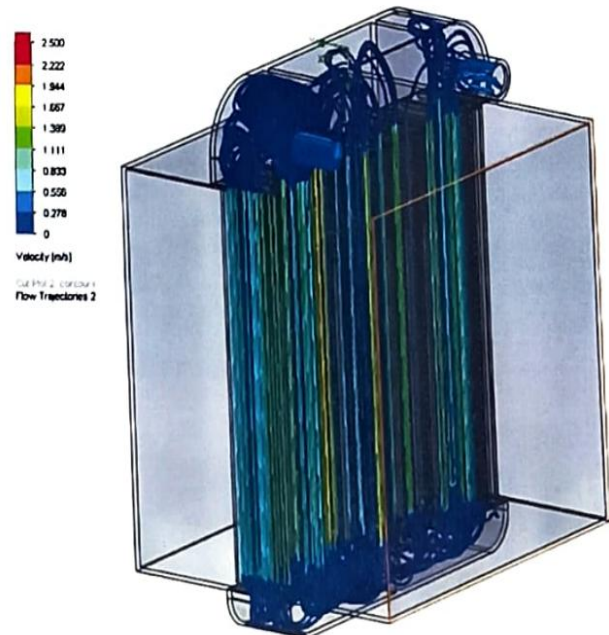
Properties	Antec Radiator	Micro Channel Radiator
Material	Aluminium	Aluminium
Micro Channel diameter /Wall Thickness	0.28 (Wall Thickness)	1 mm (Micro Channel diameter)
Dimensions	169 x 120 x 27mm	169 x 120 x 25.4mm
Speed	(900 - 1600rpm) ± 100	(900- 1600rpm) ± 100
Airflow	77 CFM	77CFM
Net Weight	0.68 KG	0.68 KG
Gross Weight	1.5 KG (max.)	1.5 KG (max.)
Water Pressure	1m ± 0.2m	1m ± 0.2m
Flow rate	1.5 L/min	1.5 L/min

### 3.4 Velocity

The flow trajectories represent the velocity flowing through the tubes/channel. When the fluid enters the tubes the pressure decreases and hence the velocity increases. This is in accordance with the Bernoulli's principle.



**Figure 12: Velocity Cut-Plot**



**Figure 13: Velocity Flow Trajectory**

### 3.5 Temperature

The flow trajectories represent the temperature of fluid flowing through the tubes/ channel. So as we can see the initial inlet temperature is 75 degree Celsius and as it passes through the tubes, the forced flow of the cold air around the tubes causes convection which leads to gradual fall in temperature throughout the tube. As, there is the temperature drop of 12-18 degree Celsius is obtained at the outlet.

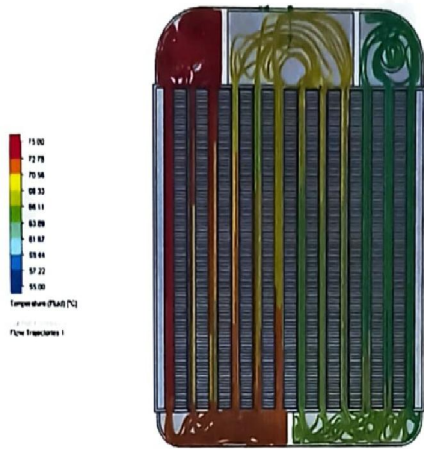


Figure 14: Temperature Cut-Plot

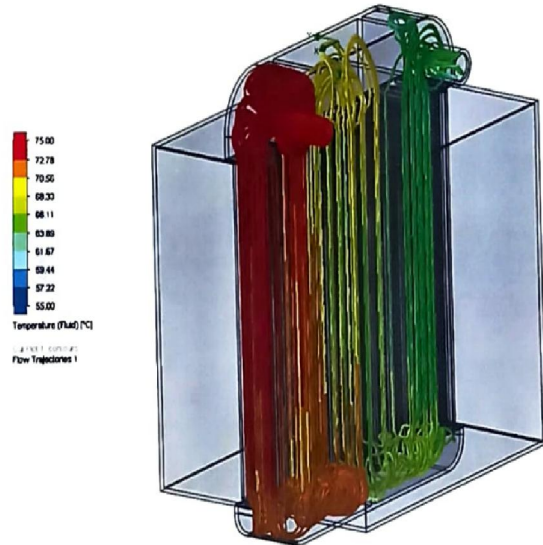


Figure 15: Temperature Flow Trajectory

### 3.6 Pressure

The flow trajectories represent the pressure throughout the tubes/channels. When the fluid enters the tube the velocity and hence the pressure decreases.

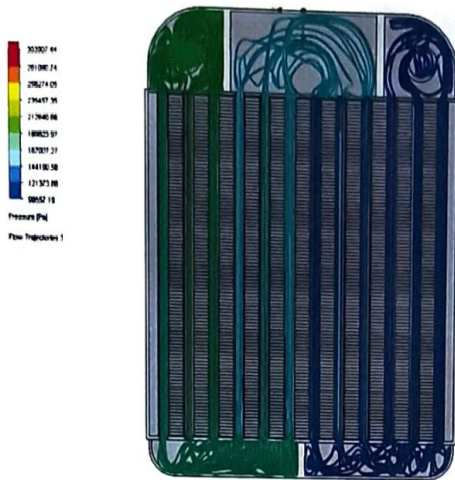


Figure 16: Pressure Cut-Plot

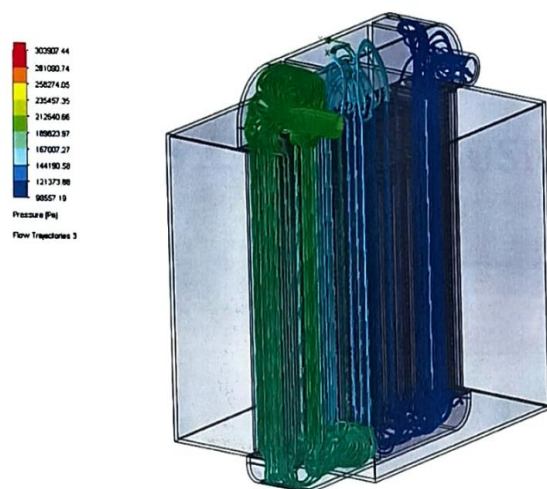


Figure 17: Pressure Flow Trajectory

## IV. RESULTS

Different values of air flowing around the tubes were kept constant and the inlet velocity of the fluid entering the tubes constant and also determined the inlet temperature as 75 and 80 degree Celsius and then after running the simulation we get the outlet temperature as follows.

Table7: Results

Iteration	Radiator			Antec Radiator		Micro Channel Radiator	
	Air flow rate (m <sup>3</sup> /s)	Flow rate (m <sup>3</sup> /s)	Inlet Temperature ( Celsius)	Outlet Temperature ( Celsius)	Temperature drop	Outlet Temperature ( Celsius)	Temperature drop
1	0.025	0.01	80	61.32	18.68	60.12	19.88
2	0.025	0.005	80	50.6	29.4	49.35	30.65
3	0.025	0.001	80	45	35	34.57	45.43
4	0.1	0.005	80	42.5	37.5	32.19	47.81
5	0.05	0.005	80	45.74	34.26	44.41	35.59
6	0.0363	0.00025	75			63.87	11.13
7	0.0363	0.00033	75			65.32	9.68

## V. CONCLUSION

It was observed that introduction on micro channels in the radiator tubes, the rate of heat transfer increased. The cause of increase in heat transfer rate is the increase in surface area due to the introduction of multiple small/micro channels. But along with the increase in heat transfer rate which lead to greater drop of temperature at the outlet of Radiator. There was also observed a significant amount of pressure drop along the micro channels. Thus, there is an increase the efficiency of the radiator, the increase in temperature drop was in the range of 1-5°C, this concluded that the use of using micro channels lead to increased heat transfer rate.

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