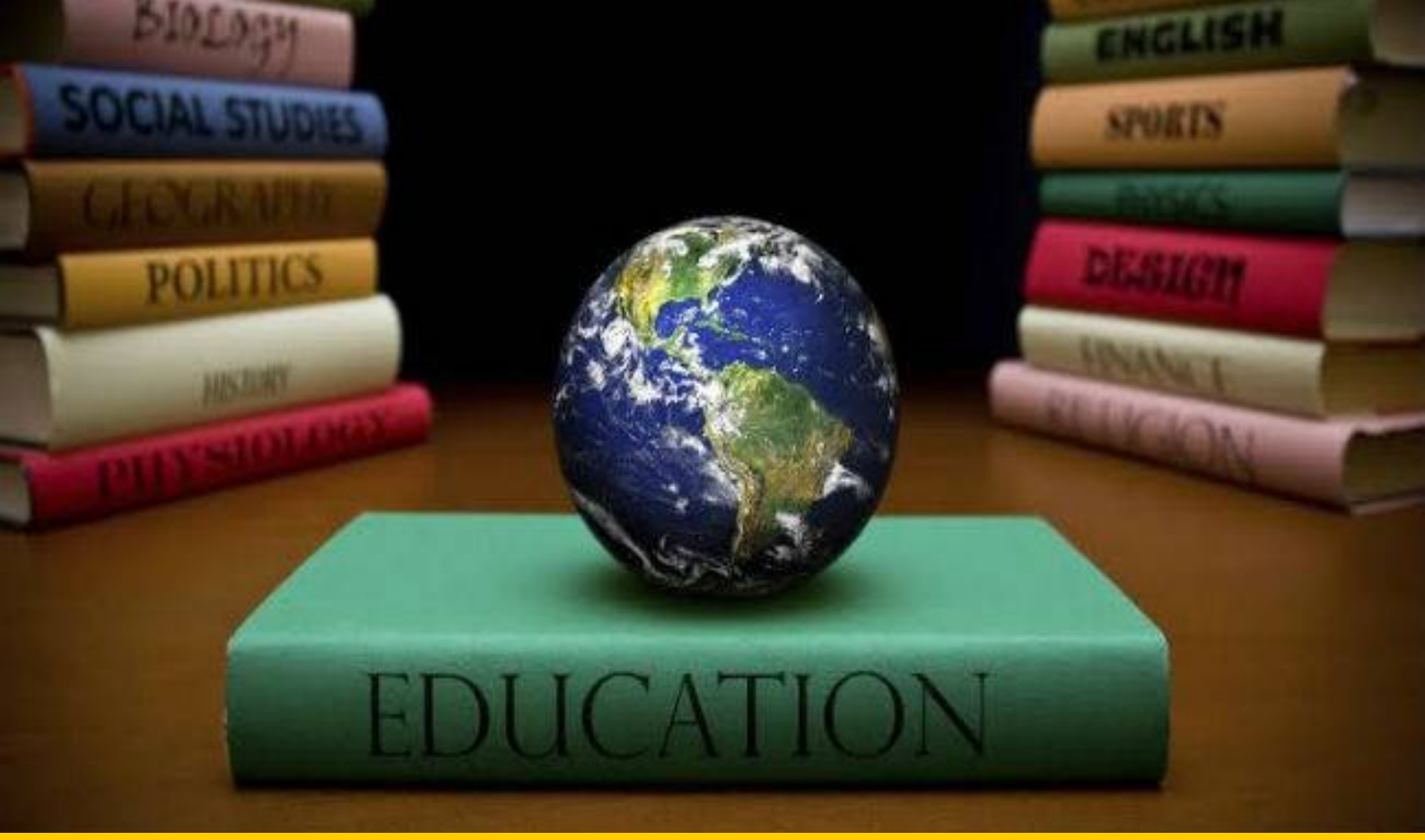


Indian Knowledge System: NEP- 2020 Sustainable Development

S. K. Mishra
Rashmi Gujrati
Asena Boztas
Naresh Sachdev

NATIONAL PRESS ASSOCIATES

INDIAN KNOWLEDGE SYSTEM:
NEP- 2020 SUSTAINABLE DEVELOPMENT

EDITORS

S. K. Mishra
Rashmi Gujrati
Asena Boztas
Naresh Sachdev

ISBN: 978-93-5680-531-6

Published By:

PCTE Group :

Puniab College of Technical Education

PCTE Group of Institutes

PCTE Institute of Engineering and Technology

Ludhiana, Punjab

Printed by : National Press Associates, New Delhi

INDIAN KNOWLEDGE SYSTEM: NEP- 2020
SUSTAINABLE DEVELOPMENT

Editors

S. K. Mishra
Registrar, IKG Punjab Technical University, Kapurthala, Punjab, India

Rashmi Gujrati
Director-IQAC, Punjab College of Technical Education, Ludhiana, India

Asena Boztas
Associate Professor, Sakarya University of Applied Sciences, Sakarya Türkiye

Naresh Sachdev
Director, Punjab College of Technical Education, Ludhiana, India

ISBN: 978-93-5680-531-6

Price: 800.00 INR

Published by :

PCTE Group :

Puniab College of Technical Education
PCTE Group of Institutes
PCTE Institute of Engineering and Technology
Ludhiana, Punjab

Printed By:

National Press Associates

Head Office: *C-24, Ground Floor, Panchsheel Vihar, Malviya Nagar, New Delhi-110017, India*
Regional Office: *79, GAD Nagar, Flower Enclave, Dugri, Ludhiana, Punjab-141013, India*
Branch Office: *G-1003,Prakriti Society, Baner-Balewadi Road, Balewadi Pune, 411045 Maharashtra, India*
Email: *npapublishing@gmail.com www.npapublishing.in*
Helpline: *+91-9888934889, 7986925354*

PREFACE

The National Education Policy (NEP) 2020, a landmark initiative in Indian education, envisions a transformative shift towards a holistic and student-centric learning experience. At its core lies a profound recognition of the invaluable contributions of the Indian Knowledge System (IKS) – a rich tapestry of ancient wisdom, traditional practices, and indigenous knowledge that has sustained and enriched human civilization for millennia.

This book explores the crucial role of IKS in achieving the ambitious goals of NEP 2020, particularly in the context of sustainable development. We delve into how IKS principles, such as environmental consciousness, social responsibility, and holistic well-being, can be seamlessly integrated into the modern education system.

Through insightful analysis, case studies, and expert perspectives, we examine how IKS can:

- **Foster environmental stewardship:** By incorporating traditional ecological knowledge, promoting sustainable practices, and cultivating a deep respect for nature.
- **Cultivate social equity and inclusivity:** By emphasizing values like compassion, cooperation, and social justice, and by ensuring equitable access to quality education for all.
- **Promote holistic well-being:** By integrating traditional practices like yoga, meditation, and Ayurveda, which promote physical, mental, and emotional well-being.
- **Develop critical thinking and innovation:** By encouraging students to engage with diverse perspectives, question assumptions, and develop creative solutions to complex challenges.

This book is a valuable resource for educators, policymakers, researchers, and anyone interested in exploring the transformative potential of IKS in shaping a sustainable future for India and the world. We believe that by embracing the wisdom of the past and integrating it with contemporary knowledge, we can create a truly holistic and transformative education system that empowers individuals and fosters a sustainable and equitable society.

S. K. Mishra
Rashmi Gujrati
Naresh Sachdev
Asena Boztas

CONTENT

1. **Traditional Knowledge Systems and Modern Computing: A Comprehensive Review of Indian Philosophical Contributions to AIEthics**
   Gourav, Navkiran Kaur Gill 1

2. **Indian Knowledge System: Innovation Practices & Challenges**
   Kapil Prashar, Arti Lakhanpal Malhotra 8

3. **Behavioral Finance Unveiled: Exploring Emotional Biases in Investment Choices**
   Roshanpreet Kaur 15

4. **A Pathway to Holistic Development: The Integration of Indian Knowledge Systems in Secondary Education**
   Naresh Sachdev, Rashmi Gujarati 22

5. **The Future of Food: Predictions and Trends for The Next Decade**
   Gagandeep Kaur, Swastika Jain, Naresh Sachdev 29

6. **Education in 21st Century**
   Monica 41

7. **Navigating The Interface of Data Privacy Laws and Fintech: Challenges, Opportunities, and Ethical Innovations**
   Mehak Goyal, Naresh Sachdev, Tanya Mohan, Kawalpreet Sharma 45

8. **A Comparative Study Between E-Recruitment and Traditional Recruitment Among Private Employees in Ludhiana City**
   Tanya Mohan, Dr. Naresh Sachdev , Mehak Goyal and Kawalpreet Sharma 51

9. **Sustainable Development in Hotel Management: A Review**
   Tulika Tuli, Manisha Sood, Shubhika Batra 62

10. **An Exploration into Traditional Innovative Practices in Indian Knowledge System**
    Arti Lakhanpal Malhotra, Kapil Prashar 69

11. **IKS as A Framework for Ethical Decision-Making in Leadership And Governance**
    Gurleen 76

12. **The Emergence of The Indian Knowledge System in Computer Science Engineering**
    Harjit Kaur, Sarbjeet Kaur, Sahil Gupta 84

13. **Impact of New Education Policy -2020 on Higher Education**
    Rashmi Gujrati, Ameet Sao 88

14. **Impact of Blended Learning on Aspirants: A Study in Ludhiana**
    Khushboo Singh and Prabhneet Kaur 94

15. **A Study on The Impact of Financial Inclusion Policy on BPL Families of Ludhiana District of Punjab**
    Prabhneet Kaur and Khushboo Singh 103

16. **Indian Knowledge System in Pharmaceutical Sciences**
    Yashima Jain, Harmeet Singh 115

17. **Indian Knowledge System: Based Approaches to Leadership: Ethical and Holistic Perspectives**
Amit Sethi 118

18. **Indian Sports and Martial Arts: A Legacy of Culture and Strength**
Navkiran Kaur Gill 127

19. **Paninian Grammar and Natural Language Processing (NLP): A Comprehensive Review**
Kamalpreet Kaur, Amanpreet Kaur & Pratibha Soram 130

20. **The Role of Teenagers in Buying Decision of Cars in The Family: A Study in Ludhiana City**
Kawalpreet Sharma, Tanya Mohan, Mehak Goyal 134

21. **Comparing Green Purchase Intentions and The Green Attitude: Behaviour Gap Between Generation Z and Millennials**
Manisha Sood 143

22. **Spending Patterns of Household: A Study in Ludhiana**
Mohit Kamboj, Damandeep Singh and Sakshi Singla 150

23. **Embracing Indigenous Wisdom: Transforming Leadership and Management Through Indigenous Knowledge Systems (IKS)**
Ginni Syal, Naresh Sachdev 162

24. **A Glimpse of Ayurveda: The Forgotten History and Principles of Indian Traditional Medicine**
Sadam Hussain Shah, Javeed Ahmad Khan, Gagandeep Singh Cheema, Manjot Singh 168

25. **The Role of Indian Logic Systems in Shaping Modern Computational Thinking**
Punita Kumari 172

26. **The Relevance of Ancient Indian Knowledge in Modern Computer Science: A Review**
Shairy 175

27. **Tarka Shastra and Ethical AI Decision-Making: A Comprehensive Exploration**
Simranjeet Kaur, Harpreet Singh Dhanoa, Pratiksha 178

28. **Ripple Effect of Technology in Empowering Women in India**
Ameet Sao, Sarika Kapoor, Rashmi Gujrati, Sakshee Singh, Asena Boztas 182

29. **Consumer Attitudes and Sustainable Adoption of Telemedicine: A Path to Ethical and Equitable Healthcare**
Muskan Manchanda, Rimpy Chhabra 191

TRADITIONAL KNOWLEDGE SYSTEMS AND MODERN COMPUTING: A COMPREHENSIVE REVIEW OF INDIAN PHILOSOPHICAL CONTRIBUTIONS TO AI ETHICS

[1]Gourav [2]Navkiran Kaur Gill

[1]Assistant Professor, PCTE Institute of Engineering & Technology

[2]Assistant Professor, PCTE Institute of Engineering & Technology

ABSTRACT

Artificial Intelligence (AI) is transforming every aspect of human life, from healthcare and finance to education and governance. As AI systems evolve, ethical challenges such as bias, fairness, accountability, and transparency have gained critical importance. In addressing these concerns, traditional Indian philosophical systems offer a rich ethical framework that can guide AI's development. This paper explores the application of Indian Knowledge Systems (IKS), particularly the philosophies of Nyaya, Tarka Shastra, and Dharma, in modern AI ethics. By integrating ancient Indian ethical principles, we aim to provide insights into the development of responsible and human-centric AI systems.

Keywords: Artificial Intelligence, Ethics, Indian Knowledge Systems, Nyaya, Tarka Shastra, Dharma, AI Bias, Fairness, Accountability

1. INTRODUCTION

The rise of Artificial Intelligence (AI) has prompted critical discussions about the ethical implications of autonomous systems, machine learning algorithms, and data-driven technologies. Issues such as bias in algorithms, lack of transparency, and the erosion of privacy have become central concerns. While much of the discourse on AI ethics has been shaped by Western philosophies, there is a growing recognition of the value of non-Western traditions, including the Indian Knowledge System (IKS), in addressing these ethical dilemmas.

India's philosophical heritage is rich in ethical thought, with a focus on reasoning, logic, and moral principles. Among the various traditional systems, Nyaya (logic), Tarka Shastra (debate and reasoning), and Dharma (moral law) stand out as providing frameworks that can contribute valuable insights into AI ethics. Nyaya, for instance, emphasizes the need for sound reasoning and logical inquiry, which can inform AI systems' decision-making processes, ensuring that these systems operate based on rationality and fairness. The emphasis on critical analysis within Nyaya can help identify and address biases in AI models, ensuring that decisions made by AI systems are well-grounded and impartial.

Tarka Shastra, with its focus on structured debates and argumentation, promotes an approach where diverse perspectives are considered. This can be vital in the context of AI ethics, where the development and deployment of technology must take into account the values and concerns of diverse communities. By fostering a culture of dialogue, Tarka Shastra can guide AI practitioners to create systems that are inclusive and responsive to different viewpoints.

Dharma, the Indian concept of moral law, offers a holistic approach to ethics, balancing individual rights with collective well-being. The principles of Dharma can help shape AI governance frameworks that prioritize the common good, ensuring that AI technologies are used responsibly and do not undermine social justice or human dignity.

Incorporating these traditional Indian philosophical frameworks into AI ethics can provide novel solutions to the challenges of bias, transparency, and privacy, ensuring that AI is developed and deployed in ways that align with broader moral and social values.

2. LITERATURE REVIEW

2.1 Nyaya Philosophy: Nyaya, one of the six traditional schools of Indian philosophy, focuses on logic and epistemology. This system emphasizes the significance of logical thinking and the search of truth, which are critical in the creation of AI systems that make fair and reasonable judgments (Ruan et al., 2019). Nyaya principles can help AI developers create algorithms that reduce biases and improve accountability by ensuring that the logic for AI decisions is visible and defensible. The use of Nyaya's logical frameworks can give a foundation for examining AI decision-making processes and verifying that they meet ethical norms.

2.2 Tarka shastra: Tarka Shastra emphasizes logic and debate, promoting critical debates about knowledge and understanding. Tarka Shastra can help with ethical discussions on technology usage and the consequences of AI judgments (Bhatti et al., 2023). Tarka Shastra invites developers to explore the larger social implications of AI systems by creating an atmosphere conducive to inquiry and critical thought. This philosophical approach can facilitate interaction between engineers and ethicists, resulting in more sophisticated and responsible AI applications.

2.3 Dharma: Dharma, which is sometimes translated as "duty" or "righteousness," provides a moral framework emphasizing the value of ethical behavior (Chaccour et al., 2022). Integrating Dharma into AI ethics entails ensuring that AI systems behave in ways that benefit society and are consistent with universal ethical norms. This strategy may result in the creation of AI technologies that emphasize human wellbeing and social justice. Furthermore, Dharma instils a feeling of responsibility among developers, forcing them to contemplate the long-term consequences of their work for future generations.

3. OBJECTS AND GAPS

The Objective & Gaps of Literature are:

1. **Practical Integration of IKS into AI Systems:** While theoretical underpinnings of Indian philosophies are presented, practical techniques for integrating them into AI design and governance are yet underexplored.
2. **Implementation of Nyaya or Tarka Shastra principles for ethical AI decision-making:** No specific computational models or frameworks exist.
3. **Cultural Sensitivity and Diversity**: Limited research on how Dharmic principles might overcome cultural biases in AI systems and improve global cultural representation.

3. ETHICAL CONCERNS IN AI: A MODERN CHALLENGE

Artificial Intelligence (AI) has emerged as one of the most transformative technologies of our time, revolutionizing industries, enhancing productivity, and enabling capabilities that were once thought to be science fiction. However, as AI systems become increasingly integrated into the fabric of society, they bring with them a host of ethical challenges. These challenges are not merely technical but deeply societal, raising questions about fairness, responsibility, and the broader implications of technology on human lives. Before exploring the insights that Indian philosophical traditions can offer in addressing these concerns, it is crucial to understand the core ethical issues surrounding AI.

3.1 Bias and Discrimination

One of the most pressing ethical concerns in AI is the issue of bias and discrimination. AI systems rely heavily on data for training, and this data often reflects the biases and inequities present in society. For example, hiring algorithms trained on historical hiring data may reinforce gender or racial biases, favouring candidates who fit past patterns of hiring rather than evaluating all applicants on their merits. Similarly, predictive policing systems, when fed biased crime data, may disproportionately target certain communities, exacerbating systemic inequalities.

The implications of biased AI are far-reaching, particularly in sensitive domains such as healthcare, education, and the legal system. A biased diagnostic tool could lead to unequal access to life-saving treatments, while

discriminatory grading algorithms might perpetuate disparities in academic opportunities. These examples underscore the urgent need for strategies to identify and mitigate bias in AI systems, ensuring that they serve all members of society equitably.

3.2 Transparency and Explainability

Another significant challenge in AI ethics is the lack of transparency and explainability, particularly with complex models like deep learning algorithms. These systems often act as "black boxes," producing outputs without providing clear insights into their decision-making processes. This opacity poses a serious problem when AI systems are used in high-stakes situations, such as loan approvals, medical diagnoses, or legal judgments.

The inability to explain how decisions are made not only erodes trust but also limits accountability. Stakeholders—be it developers, regulators, or users—cannot fully evaluate the fairness or reliability of AI systems without understanding their inner workings. Efforts to address this issue have led to the development of methods for explainable AI (XAI), which aims to make AI systems more interpretable and their decisions more comprehensible. However, achieving a balance between model performance and explainability remains a significant challenge in the field.

3.3 Accountability

Closely tied to the issues of bias and transparency is the question of accountability. When an AI system causes harm—such as an incorrect medical diagnosis, a biased hiring decision, or a fatal accident involving an autonomous vehicle—determining who is responsible becomes a complex issue. Is it the developers who created the algorithm, the organizations that deployed it, or the end users who relied on it?

The challenge of accountability is compounded by the autonomous nature of some AI systems, which can make decisions or take actions that were not explicitly programmed by their developers. This raises questions about the extent to which AI systems themselves can be held accountable and whether they should be granted some form of legal or moral agency. Establishing clear frameworks for accountability is essential to ensuring that ethical standards are upheld and that victims of AI-related harm can seek redress.

3.4 Social Impact

Beyond specific instances of harm, AI has broader social implications that require careful consideration. The large-scale deployment of AI systems has the potential to reshape labor markets, displacing workers in industries ranging from manufacturing to professional services. While AI also creates new opportunities and roles, the transition can be disruptive, particularly for individuals and communities that lack the resources to adapt.

Privacy is another major concern, as AI systems often rely on vast amounts of personal data to function effectively. The rise of surveillance technologies powered by AI, such as facial recognition systems, has raised alarm about the erosion of privacy and the potential for misuse by authoritarian regimes. These technologies can be used to track individuals, suppress dissent, and infringe on civil liberties, highlighting the need for robust legal and ethical safeguards.

The social impact of AI also extends to issues of equity and access. As advanced AI technologies are often developed and controlled by a small number of corporations or nations, there is a risk that the benefits of AI will be unevenly distributed, exacerbating global inequalities. Ensuring that AI is used to promote inclusive growth and address societal challenges, rather than deepening existing divides, is a critical ethical imperative.

3.5 Modern Ethical Frameworks

In response to these challenges, various organizations and institutions have developed ethical frameworks to guide the development and deployment of AI. For example, the IEEE's **Ethically Aligned Design** and the EU's **Ethics Guidelines for Trustworthy AI** emphasize principles such as fairness, accountability, transparency, and

respect for human rights. These frameworks aim to ensure that AI systems are aligned with societal values and that their development is guided by ethical considerations from the outset.

However, while these frameworks provide a valuable foundation, they are not without limitations. They often focus on procedural aspects of ethics, such as ensuring compliance with standards or minimizing harm, rather than engaging with deeper questions about the purpose and goals of technology. This is where Indian traditional knowledge systems can offer a unique perspective.

3.6 Contributions of Indian Philosophy

Indian philosophical traditions, with their rich focus on ethical reasoning, logical rigor, and the social responsibility of knowledge, provide an additional layer of depth to the discussion of AI ethics. Concepts such as **Dharma** (moral duty), **Ahimsa** (non-violence), and **Lokasangraha** (the welfare of society) emphasize the importance of aligning actions with ethical principles and considering their broader impact on humanity and the natural world. By integrating these insights with modern ethical frameworks, it is possible to develop a more holistic approach to AI ethics—one that not only addresses immediate concerns but also fosters a long-term vision for the responsible development of technology.

4. NYAYA: THE SYSTEM OF LOGIC AND REASONING

Nyaya is one of the six orthodox schools of Indian philosophy, focusing on logic, reasoning, and epistemology. It emphasizes valid knowledge through pramāṇas (means of knowledge), such as perception, inference, comparison, and testimony. Nyaya offers valuable insights into decision-making processes, which are fundamental to AI ethics.

4.1 Application in AI Decision-Making

Nyaya's structured approach to logical reasoning can provide frameworks for building decision-making algorithms in AI. Its emphasis on sound inference can help improve transparency and explainability in AI systems by ensuring that AI decisions are grounded in valid and justifiable logic. For instance, Nyaya's emphasis on inference (anumāna) can be applied to machine learning models to ensure that their predictions are based on reasonable and transparent logic rather than hidden correlations.

4.2 Addressing AI Bias

Nyaya stresses the importance of avoiding errors in reasoning, known as "hetvabhasa" (fallacies). This idea aligns with modern efforts to detect and mitigate bias in AI systems. By incorporating Nyaya's logical rigor into AI training and validation processes, developers can reduce cognitive biases and fallacies embedded in AI models, ensuring more just outcomes.

5. TARKA SHASTRA: THE SCIENCE OF DEBATE AND CRITICAL INQUIRY

Tarka Shastra, another Indian knowledge system, focuses on the art of debate, logical disputation, and inquiry. This system emphasizes rigorous argumentation to arrive at truth and knowledge. The principles of Tarka Shastra, such as the need for coherent arguments, critical questioning, and addressing counter-arguments, are relevant to creating ethical and fair AI systems.

5.1 Debate in AI Ethical Frameworks

In AI ethics, decisions often involve weighing multiple ethical principles, such as fairness, utility, and individual rights. Tarka Shastra's structured approach to debate can inform ethical decision-making processes by encouraging AI systems to consider multiple viewpoints, question assumptions, and engage in transparent argumentation. This could be valuable in the development of AI systems that mediate complex ethical issues.

5.2 Counterfactual Reasoning

Tarka Shastra's method of addressing counter-arguments can inspire the development of AI systems capable of counterfactual reasoning—an essential part of explainable AI (XAI). AI models that can simulate and analyze

"what if" scenarios help increase trustworthiness and transparency, particularly in high-stakes domains like healthcare and finance.

6. DHARMA: ETHICAL FRAMEWORKS AND SOCIAL RESPONSIBILITY

Dharma, a central concept in Indian philosophy, refers to ethical duty, righteousness, and the proper way of living. Dharma offers a moral framework for evaluating human actions, which can be extended to machine actions in AI. The concept of Dharma includes obligations toward the welfare of others, social justice, and maintaining balance in society.

6.1 Responsible AI Development

The principles of Dharma align closely with the concept of "responsible AI," which calls for AI systems to be developed with consideration for their social, economic, and environmental impacts. By embedding Dharmic principles into AI development, developers can create systems that prioritize social welfare and ethical outcomes over purely profit-driven motives.

6.2 Fairness and Justice

Dharma's emphasis on fairness, equity, and duty toward all members of society can help guide the development of AI algorithms that strive for inclusivity and avoid perpetuating inequality. For example, in criminal justice AI systems, Dharma's emphasis on fairness can serve as a guiding principle to prevent biased sentencing recommendations based on race or socioeconomic status.

7. COMPARATIVE ANALYSIS: WESTERN VS. INDIAN ETHICAL APPROACHES IN AI

While Western ethical frameworks like Utilitarianism, Deontology, and Virtue Ethics have significantly influenced AI ethics, Indian philosophical systems offer alternative approaches. Indian traditions emphasize interconnectedness, collective welfare, and holistic decision-making, providing a broader ethical base for AI systems.

7.1 Western Ethical Frameworks in AI:

1. **Utilitarianism:** This ethical theory, championed by philosophers like Jeremy Bentham and John Stuart Mill, posits that the best action is the one that maximizes overall happiness or the greatest good for the greatest number. In AI, Utilitarianism could guide decisions that prioritize outcomes benefiting the majority. For example, AI systems might be designed to optimize societal benefits such as improved healthcare, transportation, or productivity. However, this approach often faces criticism for overlooking the needs of minorities or marginalized groups. By focusing solely on maximizing aggregate benefits, Utilitarianism can inadvertently reinforce existing inequalities.
2. **Deontology:** Rooted in the work of Immanuel Kant, Deontology emphasizes the importance of following moral rules and duties, regardless of the consequences. In AI, this framework might advocate for strict adherence to ethical guidelines, such as ensuring privacy, transparency, and fairness in AI systems. Deontological approaches are often rule-based, offering clear standards for developers. However, they can struggle to address complex, context-dependent ethical issues where rigid rules may not apply effectively, such as when AI systems encounter novel situations that require adaptive reasoning.
3. **Virtue Ethics:** Developed by Aristotle, Virtue Ethics emphasizes the development of moral character and virtues like honesty, fairness, and integrity. In the context of AI, this approach could focus on fostering systems that encourage virtuous behavior, both in the AI's decision-making processes and in the relationships, it nurtures with humans. While this framework offers a more holistic view of ethics, it can be difficult to translate these abstract virtues into concrete algorithms for AI systems.

7.2 Indian Philosophical Approaches in AI

1. **Dharma:** A core concept in Indian philosophy, Dharma refers to righteousness, moral duty, and living in harmony with the universe. Unlike Western individualistic ethics, Dharma emphasizes collective well-being and the interconnectedness of all beings. In AI, Dharma would advocate for systems that contribute to the welfare of society as a whole, ensuring that technology serves the broader human community, especially marginalized groups. This approach could help mitigate the risks of AI reinforcing inequality and exploitation, focusing instead on the social, cultural, and spiritual aspects of human life.
2. **Nyaya:** Nyaya, one of the six classical schools of Indian philosophy, is a system of logic and reasoning that stresses critical inquiry and the search for truth. Applying Nyaya to AI ethics would ensure that systems are built on sound logical reasoning, with transparent processes and accountable decisions. This framework encourages fairness, consistency, and the inclusion of diverse perspectives in decision-making, which could lead to AI systems that are not only rational but also ethically just and inclusive.
3. **Tarka Shastra:** This system of debate and reasoning promotes dialogue and inquiry to uncover truth. It emphasizes inclusivity and the importance of considering different viewpoints before arriving at conclusions. In the AI domain, Tarka Shastra could guide ethical decision-making by fostering inclusive processes where diverse perspectives—such as those from different cultures, socio-economic backgrounds, and disciplines—are incorporated into the design and implementation of AI systems.

7.3 Integrating Western and Indian Approaches

By integrating the strengths of both Western and Indian ethical traditions, AI ethics can adopt a more holistic and globally inclusive perspective. While Western frameworks like Utilitarianism, Deontology, and Virtue Ethics provide structured, outcome-oriented, and rule-based approaches, Indian philosophies such as Dharma, Nyaya, and Tarka Shastra offer a more collective, context-aware, and socially responsible view of ethics.

Combining these approaches could help address the limitations of each tradition. For example, a synthesis of **Utilitarianism** and **Dharma** could guide AI systems that maximize benefits while ensuring they serve the common good, with special attention to vulnerable groups. A fusion of **Deontology** and **Nyaya** could encourage strict adherence to ethical principles while promoting transparent, rational reasoning behind AI decisions. Finally, blending **Virtue Ethics** and **Tarka Shastra** could inspire systems that foster human virtues and promote open, inclusive debates about the ethical implications of AI technologies.

8. CONCLUSION

The ethical challenges posed by AI demand not only technical solutions but also deep philosophical reflection. Indian traditional knowledge systems, with their rich focus on logic, ethical reasoning, and social responsibility, offer valuable insights to address these concerns. By integrating concepts from **Nyaya**, **Tarka Shastra**, and **Dharma** into AI ethics, we can create systems that prioritize transparency, fairness, and accountability, while ensuring that AI technologies align with societal values. These traditional systems provide frameworks for logical rigor, avoiding cognitive biases, and emphasizing social responsibility, all of which are essential in the development of ethically sound AI.

The fusion of ancient Indian wisdom with modern AI technologies offers immense potential for shaping a future where AI systems are not only technically advanced but also morally grounded and socially responsible. This approach ensures that AI serves humanity as a force for good, rather than exacerbating existing inequalities or creating new ethical dilemmas.

9. FUTURE DIRECTIONS AND CHALLENGES

The integration of Indian knowledge systems into AI ethics is still in its early stages, but it holds significant potential to shape the future of AI development. Indian philosophical traditions, with their deep understanding of logic, ethics, and social responsibility, can offer valuable insights for building AI systems that are not only

technologically advanced but also ethically sound. As the field progresses, future research should focus on several key areas to fully realize the potential of these traditions in AI ethics.

9.1 Algorithmic Fairness and Transparency

One of the primary areas where Indian knowledge systems can contribute is in enhancing **algorithmic fairness** and **transparency**. The Nyaya school of philosophy, with its structured approach to logical reasoning, can provide frameworks for improving the explainability of AI models. By applying principles from Nyaya and **Tarka Shastra**, researchers can develop AI algorithms that are not only more transparent in their decision-making processes but also more just. These systems can be designed to ensure that their decisions are grounded in sound reasoning, avoiding hidden biases or unfair outcomes. For instance, integrating Nyaya's emphasis on inference (anumāna) into machine learning models could ensure that AI systems make decisions based on valid, interpretable logic rather than on statistical correlations that might obscure underlying biases.

9.2 Cultural Context in AI Systems

Another key challenge is embedding **Dharmic principles** into AI systems to ensure that they are **culturally sensitive** and prioritize **collective welfare**. In traditional Indian philosophy, concepts such as **Dharma** and **Lokasangraha** (welfare of society) emphasize ethical responsibility and social harmony. By incorporating these principles into AI development, it is possible to create systems that are aligned with the values of diverse cultural contexts. This would help address concerns related to the global implementation of AI, ensuring that systems are not biased toward any one cultural or social perspective but instead are designed to promote universal welfare.

9.3 Cross-Disciplinary Collaboration

To fully realize the potential of integrating Indian philosophical traditions into AI ethics, **cross-disciplinary collaboration** will be essential. Future research should encourage the collaboration of **philosophers**, **technologists**, **ethicists**, and **policymakers**. Such interdisciplinary efforts will ensure that ethical AI systems are informed by diverse knowledge systems and consider both technical capabilities and the broader social, cultural, and ethical implications of their deployment. These collaborations could lead to the creation of frameworks that not only adhere to universal ethical standards but also reflect local values and concerns, ensuring that AI development is truly inclusive and socially responsible.

As AI continues to evolve, these future directions will help ensure that the technology advances in a way that respects both human dignity and the collective good, guided by the wisdom of Indian philosophical traditions.

REFERENCES

1. Bhatti, U., Tang, H., Wu, G., Shahabzade, M., & Hussain, A. (2023). Deep learning with graph convolutional networks: An overview and latest applications in computational intelligence. *International Journal of Intelligent Systems*, 2023, 1-28.
2. Chaccour, C., Saad, W., Debbah, M., Han, Z., & Poor, H. (2022). Less data, more knowledge: Building next generation semantic communication networks. *ArXiv*, abs/2211.14343.
3. Ruan, S., Jiang, L., Xu, J., Tham, B. J., Qiu, Z., Zhu, Y., Murnane, E. L., Brunskill, E., & Landay, J. (2019). QuizBot: A dialogue-based adaptive learning system for factual knowledge. *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*.
4. Mohanty, J.N. (1966). *Indian Logic in Its Philosophical Context*. Oxford University Press.
5. Matilal, B. K. (1999). *Logic, Language, and Reality: An Introduction to Indian Philosophical Studies*. Motilal Banarsidass.
6. Radhakrishnan, S. (1923). *Indian Philosophy Vol. I & II*. Oxford University Press.
7. Subbarao, V.V. (1960). *Nyaya-Vaisheshika Philosophy and AI: A Comparative Study*. Poona University Press.
8. Floridi, L. (2015). *The Ethics of Information*. Oxford University Press.
9. Sarukkai, S. (2005). *Indian Logic and its Applications in Artificial Intelligence and Computing*. International Journal of Knowledge Engineering, 3(2), 45-56.
10. Patwardhan, B., & Kulkarni, G. (2019). *Ayurveda and Artificial Intelligence: A Convergence of Traditional Knowledge and Modern Technology*. Journal of Ayurveda and Integrative Medicine, 10(4), 215-225.
11. Rao, S. (2021). *Dharma and Digital Ethics: Indian Philosophical Contributions to AI Development*. Journal of AI Ethics, 2(1), 15-32.

INDIAN KNOWLEDGE SYSTEM: INNOVATION PRACTICES & CHALLENGES

[1]Kapil Prashar [2]Arti Lakhanpal Malhotra

[1]Professor, Department of Computer Science & Engineering, PCTE Institute of Engineering & Technology, Ludhiana

[2]Assistant Professor, Department of Computer Science & Engineering, PCTE Institute of Engineering & Technology, Ludhiana

ABSTRACT

Over thousands of years, the Indian subcontinent produced a vast and varied collection of knowledge, beliefs, and practices that make up the Indian Knowledge System. Its origins can be found in the ancient Vedas, Upanishads, and Puranas. Various civilizations and cultures have contributed to its evolution. Numerous topics are covered by this body of knowledge, such as physics, mathematics, architecture, astrology, philosophy, religion, and literature. It's foundation is a comprehensive strategy that unifies the mind, body, and spirit, among other facets of human existence. The Indian Knowledge System places a strong focus on the interdependence and connectivity of all living things and the universe, which is one of its main features. The idea that "Vasudhaiva Kutumbakam," or the entire world is one family, reflects this.

Additionally, the Indian Knowledge System emphasizes inner development and self-realization. This is accomplished by engaging in activities like yoga, meditation, and the search for wisdom and knowledge. The Indian Knowledge System is an essential component of Indian civilization, offering direction and motivation to both individuals and groups, even in the face of modernization. It's lessons on kindness, harmony, and balance have shaped Indian culture and are still having an impact on the world at large. The Indian Knowledge System has greatly benefited humanity via its philosophical discoveries, scientific breakthroughs, and spiritual practices; as such, it will leave a priceless and enduring legacy for future generations.

Keywords: Indian knowledge system, IKS, Upanishads, Vedas, Ayurveda, Yoga, Vedic astrology, literature, Indian philosophy, Yoga and meditation, Architecture and town planning, Vedic Knowledge

INTRODUCTION TO INDIAN KNOWLEDGE SYSTEM

The vast and antiquated body of ideas, customs, and philosophies known as the Indian knowledge system has been transmitted via the Indian lineage. It has greatly influenced Indian civilization and culture and spans a number of disciplines, including science, spirituality, literature, art, and social conventions.[18] The ancient manuscripts of the Vedas, which are regarded as the world's oldest scriptures, form the basis of the Indian knowledge system. The Vedas contain a vast amount of knowledge on subjects ranging from medicine, astronomy, mathematics, and politics, to spirituality and philosophy. [20]They provide insights into the Indian way of life, highlighting the importance of balance, harmony, and unity in society.

The holistic outlook on life that characterizes the Indian knowledge system is one of its main features. It recognizes the interdependence of all facets of life, including the relationship between the person and society, between people and the natural world, and between the material and the spiritual.[15] Numerous Indian disciplines, including Ayurveda, Yoga, and Vastu Shastra, which emphasize preserving harmony and balance both inside the body and with the environment, are representative of this holistic approach. The Indian knowledge system places a strong focus on learning from first hand observation and experience, which is another important feature.[12]

The teachings of ancient Indian sages and philosophers, who promoted critical thought and introspection as ways to develop wisdom and insight, are consistent with this methodology. [10]It also emphasizes the importance of oral tradition, which transmits information through conversations, debates, and storytelling. As a

result, the ideas, customs, and practices that make up the Indian knowledge system are numerous and complex, and they are deeply ingrained in Indian society and culture. It has been crucial in forming the Indian lifestyle, encouraging balance and harmony, and fostering a strong feeling of spirituality and community. It continues to have an impact on contemporary India, making it an essential part of the nation's history and identity [19]. It's influence is still visible in modern-day India, making it a crucial aspect of the country's identity and heritage.

REVIEW OF LITERATURE

According to Kapil Kapoor et.al. the immense body of information, beliefs, and practices that have been established and passed down from ancient times in the Indian subcontinent is referred to as the Indian knowledge system, sometimes known as the Indian school of thought or Hindu philosophy [21]. The ancient Vedic texts serve as the foundation of this knowledge system, which has developed over thousands of years to influence India's intellectual, spiritual, and cultural landscape. The Upanishads, intellectual writings that elaborate on the Vedas' deeper significance and meaning, came into being after the early Vedic era. [5]

The idea of self-realization—realizing that one is a part of the divine and the universe—was first presented by the Upanishads.[3]

Olivelle, 2024 et. al. also laid the foundation for the concept of karma, the law of cause and effect that governs the cycle of birth, death, and rebirth. [4]

Barman, 2023 et. al. emphasized that with the emergence of Buddhism and Jainism, the caste system, which had been prevalent in ancient India, began to weaken. These new religions challenged the traditional Brahmanical order and brought about significant social and religious reforms. As a result, the caste system gradually transformed into a class system, opening up opportunities for people from lower castes to access education and knowledge.[7]

drishtiias.com, 2022 et. al. stated that after India gained independence in 1947, efforts were made to revive and strengthen the traditional knowledge systems. Institutions like the Indian Institutes of Technology (IITs), Indian Institutes of Management (IIMs), and the Indian Council of Social Science Research (ICSSR) were established to promote research and education in various disciplines.[13] [14]

According to Mandavkar, 2023 et. al. Today, the Indian knowledge system is a vibrant blend of traditional wisdom and modern scientific advancements. Indian scholars and institutions continue to make significant contributions to various fields, including science, technology, medicine, mathematics, philosophy, literature, and art. Indian knowledge and philosophy continue to evolve and thrive, with many modern thinkers and scholars exploring and interpreting ancient texts in new ways. The Indian knowledge system has influenced various fields like science, mathematics, medicine, literature, and art, and continues to play a significant role in shaping Indian society and culture. [15]

KEY PRINCIPLES AND CONCEPTS

Dharma, often translated as "duty" or "righteousness", is the moral and ethical code that guides an individual's actions in accordance with cosmic order and harmony. It is considered to be the foundation of the Indian knowledge system, and is rooted in the belief that every living being has a specific role and purpose to fulfill in the universe. Moksha, also known as liberation or enlightenment, is the ultimate goal of the Indian knowledge system. It is believed that by living a life of dharma and accumulating good karma, one can break the cycle of rebirth and achieve moksha – a state of bliss, unity with the divine, and freedom from the cycle of birth and death. Furthermore, the Indian knowledge system views the world as a manifestation of the divine and emphasizes the importance of living in harmony with nature. This is reflected in practices such as yoga and Ayurveda, which focus on holistic health and well-being, and in the reverence for nature and its elements. [10]

Thus, the Indian knowledge system is deeply rooted in the concepts of dharma, karma, and moksha, which serve as the guiding principles for a virtuous and purposeful life. These concepts not only shape individual beliefs and practices, but also contribute to the social and cultural fabric of the country.

They continue to be highly relevant in modern times and serve as a reminder of the rich spiritual and

philosophical heritage of India. [6]

VEDAS AND UPANISHADS

India is a land known for its rich cultural heritage and ancient wisdom. At the core of this knowledge system lies the Vedas and Upanishads – the most revered texts of Hinduism. These texts, which were composed thousands of years ago, continue to hold significant relevance in modern times, serving as a foundation for Indian philosophy and spirituality. One of the remarkable aspects of the Vedas and Upanishads is their adaptability and relevance to modern times. Despite being composed thousands of years ago, the teachings and principles found in these texts are still applicable in today's world. The emphasis on inner reflection, mindfulness, and the pursuit of knowledge are essential for personal growth and self-discovery.[20]

Moreover, the Vedas and Upanishads also hold great importance in the field of science and technology. Many of the ideas found in these texts, such as the concept of infinity, the interconnectedness of all things, and the notion of the universe as energy, are now being explored and studied by modern scientists. These texts also provide valuable insights on topics such as ecology, astronomy, and medicine, which are still being researched and used in modern times. The impact of Vedas and Upanishads on the Indian education system is also noteworthy. The traditional Gurukul system of education, where students would live with their teacher to learn the Vedas, has now evolved into modern universities and institutes where the teachings of these ancient texts are still studied and passed on to future generations.[20]

GURU-SHISHYA TRADITION

The guru-shishya tradition, also known as guru-parampara, has been an integral part of Indian knowledge system for centuries. It refers to the relationship between a teacher (guru) and a disciple (shishya) and their transfer of knowledge through direct personal guidance. This tradition has played a significant role in the transmission of knowledge, values, and culture in India, and continues to hold immense importance even in the modern era.[16]

The origins of the guru-shishya tradition can be traced back to ancient India, where it was an essential aspect of the Vedic system of education. The concept of learning from a guru was not limited to formal education but was also prevalent in fields such as art, music, and spirituality. It was believed that the knowledge and wisdom of the guru could only be acquired through a personal and dedicated relationship between the guru and shishya. This close bond between the two was based on mutual respect, trust, and devotion, and it laid the foundation for a lifelong association.

The guru-shishya tradition has been passed down over generations and has stood the test of time. It has been responsible for preserving and safeguarding the knowledge of ancient India, including the Vedas, Upanishads, and other scriptures. This tradition has also helped in the continuity and evolution of various art forms such as classical music, dance, and painting, which require personal instruction and guidance from a guru.

In today's fast-paced world, where knowledge is easily accessible through various mediums, the guru-shishya tradition continues to hold immense relevance. It serves as a reminder of the importance of a teacher in one's life and the value of personal guidance in the pursuit of knowledge. Many renowned gurus are still actively practicing this tradition and passing down their expertise to their disciples, ensuring that it remains an integral part of Indian culture and education.

AYURVEDA AND TRADITIONAL MEDICINE

Firstly, Ayurveda, which means the knowledge of life, originated in India over 5000 years ago. It is considered the oldest system of medicine in the world and has been recognized by the World Health Organization as a traditional system of medicine. The foundation of Ayurveda is based on the belief that the mind, body, and spirit are interconnected, and any imbalance in one can led to diseases. It focuses on maintaining a balance between these elements through herbal medicines, dietary changes, and lifestyle modifications. Ayurveda also emphasizes the prevention of diseases and promotes a healthy lifestyle to achieve overall well-being. [9]

Similarly, Yoga, which originated in India over 5000 years ago, is not just a physical exercise but a way of life. It

is a practice that combines physical postures, breathing techniques, and meditation to achieve a balance between the mind, body, and spirit. The aim of Yoga is to create harmony between the individual and their surroundings. It has been proven to be an effective stress-relieving technique and has gained widespread recognition in the west as well. [17]

Thus, Ayurveda and other traditional medicine practices have played a significant role in the Indian knowledge system and are still relevant today. These practices not only focus on treating diseases but also on maintaining a healthy, balanced lifestyle. They also emphasize the importance of prevention and overall well-being. With the increasing popularity of alternative medicine, Ayurveda and other traditional practices are gaining recognition worldwide for their effectiveness and holistic approach to health. It is important to preserve and promote these ancient systems of medicine as they are an integral part of Indian culture and heritage. [9]

INFLUENCE ON OTHER FIELDS

India has a rich and diverse history, with one of the most significant aspects being its vast knowledge system. The Indian knowledge system, also known as the Indic knowledge system, has had a significant influence on various fields, including mathematics, astronomy, and philosophy. This system has continuously inspired modern research and continues to be a source of inspiration for scholars and scientists all around the world.

One of the most notable contributions of the Indian knowledge system is its impact on mathematics. The early civilizations of India made significant contributions to the field of mathematics, which continue to be studied and used today. The concept of the number zero, for example, was first discovered in India. This revolutionary concept changed the way we understand mathematics and paved the way for the development of modern arithmetic and algebra.

Indian mathematicians also made groundbreaking contributions to geometry, trigonometry, and the use of decimals, which are fundamental concepts in modern mathematics.

Philosophy is another area where the Indian knowledge system has had a profound influence. The ancient Indian texts, including the Vedas, Upanishads, and Bhagavad Gita, provide a deep understanding of the universe and its workings. These texts discuss metaphysical concepts, such as the nature of existence, consciousness, and the concept of time, which continue to inspire modern philosophers and scientists. The Indian philosophy of Vedanta, which emphasizes the oneness of all things and the interconnectedness of the universe, has also had a significant impact on modern quantum physics.[2]

Another crucial aspect of the Indian knowledge system is its focus on holistic and multidisciplinary learning. In contrast to the Western education system, which often compartmentalizes subjects, the Indian tradition has always emphasized the interconnectedness of various fields of study. This has led to the development of unique disciplines, such as Ayurveda, which combines the principles of medicine, philosophy, and spirituality. This holistic approach to learning has inspired modern researchers to explore and integrate different areas of knowledge, leading to innovative and groundbreaking discoveries. [1]

Thus, the Indian knowledge system has had a profound and lasting influence on various fields such as mathematics, astronomy, and philosophy. Its contributions continue to be studied, built upon, and inspire modern research. This rich and diverse tradition serves as a reminder of the greatness and depth of ancient Indian civilization and its ongoing impact on the world today. As we continue to uncover and understand the vast body of knowledge passed down by our ancestors, we can gain a deeper understanding of our world and its mysteries. [3]

PRESERVATION AND REVIVAL

India has a rich and ancient history, with a knowledge system that has been passed down for generations. This knowledge encompasses various fields such as philosophy, science, medicine, and culture. However, with the rise of globalization and modernization, there have been concerns about the preservation of this traditional knowledge system. In recent years, there has been a growing effort to revive and promote Indian knowledge system in the face of these changes.

One of the main challenges faced by the Indian knowledge system is the impact of globalization. With the increasing influence of Western systems and ideas, there has been a decline in the popularity and relevance of traditional Indian knowledge. This has been further amplified by the rapid pace of modernization, which has led to a shift towards a more technological and materialistic approach to life. To address these challenges, there have been several initiatives taken to preserve and promote Indian knowledge system. [4]

One of the key factors that have contributed to the revival of Indian knowledge system is the increased awareness and appreciation among the younger generation. With the availability of information at our fingertips, there has been a renewed interest in exploring and learning about our traditional knowledge. This has been further aided by the current trend of embracing holistic and sustainable living, which has led to a greater appreciation for the wisdom and practices of ancient India.

Moreover, the Indian knowledge system has also been gaining recognition on an international level. Many Western countries have started to acknowledge the value and efficacy of traditional Indian practices and have incorporated them into their own systems. For instance, Ayurveda has gained popularity in the West, with many people opting for it as an alternative to modern medicine. [9]

However, while efforts are being made to preserve and revive Indian knowledge system, there are still challenges that need to be addressed. One of them being the lack of government support and funding for research and development in traditional Indian sciences. There is also a need to bridge the gap between traditional knowledge and modern education, so that the two can complement each other.

CONCLUSION

The Indian knowledge system is an incredibly rich and diverse collection of ancient wisdom and practices that have stood the test of time. It is a system that emphasizes the holistic understanding of the self, nature, and the universe, and seeks to create harmony and balance in all aspects of life.

From the early Vedic period to the modern era, Indian knowledge has evolved and adapted to the changing times, but its core principles remain deeply ingrained in the culture and society of India. Its teachings have influenced not only the development of India but also the world at large, through its spread and adoption by other civilizations. One of the most remarkable aspects of the Indian knowledge system is its inclusivity and universality. It is not limited to a specific religion, belief system, or social class. Instead, it is open to all, making it accessible and relevant to people from all walks of life.

Furthermore, the Indian knowledge system is not just theoretical but deeply practical. It not only imparts knowledge and understanding but also provides practical tools and techniques for personal growth and development. Through practices such as yoga, meditation, and Ayurveda, it offers ways to achieve physical, mental, and spiritual well-being.

Thus, the Indian knowledge system is a treasure trove of wisdom that continues to inspire and guide countless individuals. As we move towards a more interconnected and fast-paced world, the principles and practices of this ancient system can serve as a guiding light for a more conscious and balanced way of living. Let us continue to embrace and celebrate this rich legacy and use it to create a better and more enlightened future for ourselves and generations to come.

REFERENCES

1. Abida Parveena, M. A. (2022). The traditional system of Unani medicine, its origin, evolution and Indianisation:A critical appraisal . Indian Journal of Traditional Knowledge, 511-521.
2. Anish, S. (2023, June 21). Yoga: How the great Bhartiya Knowledge System unites physical self with metaphysical beyond. Retrieved from saadho.org: https://saadho.org/timeless-wisdom/articles/yoga- how-the-great-bhartiya-knowledge-system-unites-physical-self-with-metaphysical-beyond
3. Audichya, D. N. (2023). Cultural Kaleidoscope: Unveiling the Richness of Indian Culture in Indian Literature. International Journal of Research Publication and Reviews, 1248-1252.
4. Barbara Csala, C. M. (2021). The Relationship Between Yoga and Spirituality: A Systematic Review of Empirical Research.

Frontiers in Psychology.

5. Barman, R. K. (2023). From Stigmatization to Neo-Buddhist Identity: Reflections on the Changing Identities of the Scheduled Castes of India. Sage Journals.
6. Bhardwaj, T. (2021, December 6). Reviving India's knowledge systems for modern Indian education and society. Retrieved from www.financialexpress.com: https://www.financialexpress.com/jobs- career/education-reviving-indias-knowledge-systems-for-modern-indian-education-and-society-2376952/
7. Biswas, A. K. (2016). Development Of Education In India During The Medieval Period: A Historical Approach. International Journal of Research and Analytical Reviews, 260-266.
8. britannica.com. (2024, February 7). Siddha medicine. Retrieved from www.britannica.com: https://www.britannica.com/science/Siddha-medicine
9. caleidoscope.in. (2024, February 16). The Origin of Ayurveda and Its Relationship with India. Retrieved from www.caleidoscope.in: https://www.caleidoscope.in/alternative-lifestyle/the-origin-of-ayurveda- and-its-relationship-with-india#google_vignette
10. Chandwani, N. (2019, March 8). The importance of the Gurukul system and why Indian education needs it. Retrieved from timesofindia.indiatimes.com: https://timesofindia.indiatimes.com/blogs/desires-of-a- modern-indian/the-importance-of-the-gurukul-system-and-why-indian-education-needs-it/
11. Das, D. S. (2021, June). Vedanta Philosophy and its Significance in searching the Absolute Truth. Retrieved from www.researchgate.net: https://www.researchgate.net/publication/352401919_Vedanta_Philosophy_and_its_Significance_in_searching_the_Absolute_Truth
12. Das, D. V. (2022, June 20). Yoga, one of the many ways India contributes to making the world a better place.Retrieved from times of india.indiatimes.com: https://timesofindia.indiatimes.com/blogs/voices/yoga-one-of-the-many-ways-india-contributes-to- making-the-world-a-better-place/
13. drishtiias.com. (2020, June 29). Schools of Indian Philosophy. Retrieved from www.drishtiias.com: https://www.drishtiias.com/to-the-points/paper4/schools-of-indian-philosophy
14. drishtiias.com. (2022, August 14). 75 Years of Independence: The Changing Landscape of India. Retrieved from drishtiias.com: https://drishtiias.com/blog/75%20years%20of%20independence%20the%20changing%20landscape% 20of%20india
15. education.gov.in. (2023, September 13). Indian Knowledge Systems. Retrieved from www.education.gov.in: https://www.education.gov.in/nep/indian-knowledge-systems
16. Garg, A. (2023). The Bhagavad Gita's Contribution to Indian Philosophy: A Metaphysical Examination. The Criterion: An International Journal in English, 35-41.
17. health.harvard.edu. (2021, June 12). Yoga for better mental health. Retrieved from www.health.harvard.edu: https://www.health.harvard.edu/staying-healthy/yoga-for-better-mental- health
18. Inbadas, H. (2017). Indian philosophical foundations of spirituality at the end of life. Mortality, 320- 333.
19. iskcondwarka.org. (2020, July 17). What Is Moksha and How Can We Attain It? Retrieved from iskcondwarka.org: https://iskcondwarka.org/blogs/moksha/
20. Jayswal, P. J. (2020, November 20). Importance of Vedic knowledge in modern times. Retrieved from timesofindia.indiatimes.com: https://timesofindia.indiatimes.com/readersblog/youth2020/importance-of-vedic-knowledge-in-modern-times-27937/
21. Kapil Kapoor, A. K. (2020, April 11). Indian Knowledge Systems. Retrieved from www.lkouniv.ac.in: https://www.lkouniv.ac.in/site/writereaddata/siteContent/202004120632194475nishi_Indian_Knowled ge_Systems.pdf
22. Singh, B. A. (2022, March 2). Ancient Indian Knowledge Systems and their Relevance Today – With an Emphasis on Arthaśāstra. Retrieved from indiafoundation.in: https://indiafoundation.in/articles-and- commentaries/ancient-indian-knowledge-systems-and-their-relevance-today-with-an-emphasis-on-arthasastra/
23. Singh, S. (2021). Analysing The Role Of Interactive Design In Performing Arts For Sensitization And Economy Development. International Journal of Creative Research Thoughts (IJCRT), 3192-3239.
24. Sondhi, S. (2023, August 26). Aspects Of Dharma Ethics Law and Action in. Retrieved from hal.science: https://hal.science/hal-04188649/document
25. Sondhi, S. (2023, August 26). ASPECTS OF DHARMA Ethics Law and Action in Indian Tradition. Retrieved from hal.science: https://hal.science/hal-04188649/document

26. Sujatha, V. (2020). The Universal and the Global: Contextualising European Ayurvedic Practices. Sage Journals Home.

27. sundayguardianlive.com. (2023, July 30). Embrace Indian Knowledge System, enrich higher education. Retrieved from sundayguardianlive.com: https://sundayguardianlive.com/opinion/embrace-indian- knowledge-system-enrich-higher-education

28. thewire.in. (2020, November 29). Charting the Ethical Landscape: Tagore's Vision of Nation in 'Where the Mind Is Without Fear'. Retrieved from thewire.in: https://thewire.in/culture/rabindranath-tagore- nation-gitanjali

29. timesofindia.indiatimes.com. (2023, December 27). How did yoga originate. Retrieved from timesofindia.indiatimes.com: https://timesofindia.indiatimes.com/speaking-tree/yoga-meditation/how- did-yoga-originate/articleshow/106315512.cms

30. Verma, N. (2023, June 21). Yoga In The Digital Age: Embracing Technological Advancements. Retrieved from goodindian.co.in: https://goodindian.co.in/blogs/news/yoga-in-the-digital-age- embracing-technological-advancements

31. Viader, J. K. (2022). Globalization and Its Impact on Indigenous Cultures. Retrieved from leadthechange.bard.edu: https://leadthechange.bard.edu/blog/globalization-and-its-impact-on- indigenous-cultures

32. Yates, C. (2017, September 29). The Five Big Contributions Ancient India Made to the World of Math. Retrieved from thewire.in: https://thewire.in/culture/ancient-india-maths

33. Yogini S. Jaiswal, L. L. (2017). A glimpse of Ayurveda – The forgotten history and principles of Indian traditional medicine. ELSIEVER- Journal of Traditional and Complimentary Medicine, 50–53.

BEHAVIORAL FINANCE UNVEILED: EXPLORING EMOTIONAL BIASES IN INVESTMENT CHOICES

Roshanpreet Kaur

Assistant Professor, Department of Business Management, Punjab College of Technical Education

ABSTRACT

Behavioral finance discovers the psychological reasons inducing financial decision-making, bridging the fields of economics and psychology. Contrary to traditional views of investors as rational entities focused solely on wealth maximization, real-world decision-making is often swayed by biases, emotions, and cognitive shortcuts. This study investigates the impact of three significant emotional biases—loss aversion, regret aversion, and overconfidence—on financial investment decisions through a meta-analytical approach.

Loss aversion bias, characterized by the tendency to prioritize avoiding losses over pursuing gains, has a strong correlation (r = 0.492) with risk-averse behavior, leading to premature selling of profitable assets and prolonged holding of depreciating ones. Regret aversion bias, with a correlation of 0.401, manifests as overly cautious investment strategies aimed at minimizing future regret, often causing investors to avoid high-potential opportunities or hold onto underperforming positions. Overconfidence bias, another significant factor, drives investors to overestimate their abilities, leading to excessive trading, poor diversification, and suboptimal portfolio management.

By synthesizing data from multiple studies, this research quantifies the influence of these emotional biases and highlights variations in their impact across populations and contexts. The findings underscore the pivotal role of human emotions in shaping financial behavior and offer deeper insights into the psychological underpinnings of investment decisions. This meta-analysis not only combines current information but also identifies gaps for forthcoming study, paving the way for an additional nuanced understanding of behavioral finance.

Keywords*: *Behavioural finance, investment decision, emotional biases

INTRODUCTION

One fascinating element that frequently defies logic in the realm of finance, where statistics and rationality rule, is human behaviour. The study of how psychological variables have emotional impact our financial decisions is known as behavioral finance, and it has an impact on investing decisions (Raheja & Dhiman, 2020). Behavioral finance allows us to see what goes through our minds when we make financial decisions. It blends economics and psychology to explain why we spend our money the way we do (Sapkota, 2023).

Investors were once thought to be completely logical individuals who only consider increasing their wealth when making decisions. But this idealistic approach isn't necessarily applicable to actual investors. They may make less-than-ideal financial decisions as a result of biases, emotions, and cognitive shortcuts (Ritika & Kishor, 2022).

"Amos Tversky" & "Daniel Kahneman" first proposed the idea of behavioural biases in the 1970. These biases are caused by human emotions and cognition, which provides new information on investor behaviour and how psychology affects decisions for investments and finances (Kahneman & Tversky, 1979).

Two important factors in financial decision-making are cognitive and emotional biases Emotional biases are those brought on by emotional variables like fear, remorse, and hubris, while reasoning biases are associated with the processing of the information and mistakes made during decision-making (Cotruş, Stanciu, & Bulborea, 2012).

Human reasoning is applied everywhere whether we talk about the financial markets or any other area of our life. Previous studies have investigated how different emotional biases including overconfidence, regret aversion, and loss aversion may affect how people invest (Gyanwali & Neupane, 2021). Nevertheless, a thorough analysis of these data is still lacking in order to ascertain that whether there is actually any influence on the investment decision choices because of these biases or not (Nkukpornu, Gyimah, & Sakyiwaa, Behavioural Finance and Investment Decisions: Does Behavioral Bias Matter?, 2020).

The important questions answered in this study are that how emotional biases like regret aversion, overconfidence bias and loss aversion bias affect the decisions related to financial investments. These questions are tried to answer and to identify the gap through meta-analysis which is done by carefully examining the studies that are done earlier.

This study explores the connection among three key emotional biases and investment decisions. Regret aversion bias arises when investors make irrational choices to avoid experiencing regret. Loss aversion bias emerges when investors prioritize avoiding losses over achieving gains, placing greater emphasis on potential losses. Overconfidence bias occurs when investors overestimate their ability to understand and analyse market conditions effectively. Therefore, this research explains more comprehensive understanding of emotional biases in investment decision-making through a meta-analytical approach. By utilizing correlation coefficients, the study seeks to quantify the effect sizes of each emotional bias. A systematic search strategy will be employed to identify relevant studies, with the anticipated outcomes including a summary of the effect sizes and an analysis of key variables that may influence these relationships

LITERATURE REVIEW

Emotional biases are categorized by (Ritika & Kishor, 2022) as second-order latent constructs that combine a variety of first-order biases. The emotional biases of regret aversion and loss aversion were recognized by (Baker, Kumar, & Goyal, 2021). The terms "endowment bias," "status quo bias," "self-control bias," "loss aversion bias," "overconfidence bias," and "affinity bias" have also been used by other researchers. But this study will concentrate on three major emotional biases: overconfidence, loss aversion, and regret.

THE BIAS OF LOSS AVERSION

One of the main emotional biases that significantly affects investing decisions is loss aversion bias, which was first conceptualized by prospect theory. Even when the profits are equal, people frequently experience the agony of losses more strongly than the joy of gains. Research on the subject, however, shows a startling discrepancy in results. While some research shows that loss aversion has a considerable impact on investment choices (Gupta & Shrivastava, Herding and loss aversion in stock markets: mediating role of fear of missing out (FOMO) in retail investors, 2022), (Hunguru, Sibanda, & Tadu, 2020); (Iram, Bilal, & Latif, 2021), other studies show that the association is weak or nonexistent (Armansyah, 2021) (Aydin, 2023). For instance, (Bhatia, Chandani, Divekar, Mehta, & Vijay, 2022), who also looked at the use of robo-advisory services by Indian investors, found a statistically insignificant relationship, whereas Kumar et al. (2018), who dealt with the loss aversion tendency of individuals in the Indian stock market, found a significant interaction. In contrast to (ATHUR, 2014) findings on investors in the Nairobi Stock Exchange, Kenya, (Hunguru, Sibanda, & Tadu, 2020) found a strong correlation among individual investors in Zimbabwe.
The necessity for a comprehensive meta-analysis to synthesize these data and uncover patterns and trends regarding the importance and intensity of loss aversion bias is highlighted by this discrepancy in studies. A more thorough understanding of its role in investment decision-making might be obtained with such an approach, allowing for more targeted interventions to lessen the consequences.

Individual investors prioritize capital preservation above growth due to the emotional bias of loss aversion, which holds that the pain of losses is greater than the pain of profits (Pompian, 2012), (Sapkota, 2023). This inclination is the root of behaviours like selling assets that have increased in value out of a fear of losing the gains or clinging onto sinking investments in the hopes of "winning back" (Pompian, 2012). Therefore, additional market swings could lead to portfolios that are already under-diversified to stray from their long-term objectives and lower their total return (Shilpi Gupta, 2021) (Gyanwali & Neupane, 2021).

REGRET AVERSION BIAS

Along with loss aversion bias, regret aversion bias is another emotional bias that arises from prospect theory and has a significant impact on investment decisions (Kahneman & Tversky, 1979); (Pompian, 2012). After suffering significant losses in the past, investors often adopt an excessively cautious attitude to investing and steer clear of audacious or dangerous choices (Bhatia, Chandani, Divekar, Mehta, & Vijay, 2022); (Hunguru, Sibanda, & Tadu, 2020); (Kahneman & Tversky, 1979). Their investing objectives may be negatively impacted by this low long-term capital growth (Octavia, Yuwono, & Monangin, 2022).

Like loss aversion bias, regret aversion bias shows a striking lack of consistency across research. In a study on women in Punjab, Pakistan, for instance, (Iram, Bilal, & Latif, 2021) discovered that regret aversion bias had a substantial correlation with financial literacy but a negligible impact on investment choices. (Elhussein & Abdelgadir, 2020) and (ATHUR, 2014), who studied individual investors on the Khartoum Stock Exchange and Nairobi Stock Exchange, similarly described the impact as negligible. On the other hand, research by (Wangzhou, Khan, Hussain, Ishfaq, & Farooi, 2021), Nkukpornu et al. (2020) , (Elhussein & Abdelgadir, 2020), and (Chadha, 2024) found a substantial correlation. This variation highlights how complicated and context-dependent regret aversion bias is. To carefully examine and synthesize findings from many studies and clarify the importance and severity of regret aversion bias in investment decision-making, a thorough meta-analysis is necessary. In addition to informing future studies and interventions meant to lessen the impacts of regret-aversion bias, such an analysis could offer insightful information about the fundamental causes of the prejudice. Making wise investment choices and attaining long-term financial success need an awareness of and ability to control regret aversion bias (Elhussein & Abdelgadir, 2020); (Octavia, Yuwono, & Monangin, 2022); (Wangzhou, Khan, Hussain, Ishfaq, & Farooi, 2021).

THE BIAS OF OVERCONFIDENCE

Overconfidence bias is another emotional bias that significantly impacts investment decisions, as noted by (Gyanwali & Neupane, 2021), (Pompian, 2012), (Ritika & Kishor, 2022), and (Sapkota, 2023). This bias leads investors to overrate their abilities and judgment when interpreting data or evaluating company reports. As a result of this overconfidence, they might disregard negative information that could serve as a cautionary signal, potentially leading to poor stock choices or hesitancy to sell existing investments (Bhatia, Chandani, Divekar, Mehta, & Vijay, 2022); (Lambert, Bessière, & N'Goala, 2012).

Overoptimistic shareholders often involve in extreme dealing, driven by the belief that they possess unique insights unavailable to others. This frequent trading behavior, fueled by an inflated sense of their analytical abilities, can lead to suboptimal financial outcomes, particularly in the Delhi-NCR region, where studies have observed poor long-term returns for such investors. Interestingly, the influence of overconfidence bias appears to be minimal among female investors, suggesting that gender may play a role in moderating the effects of this bias. Female investors may exhibit more cautious or balanced decision-making approaches, thereby mitigating the adverse impact of overconfidence on their investment performance. This finding highlights the need for further exploration of demographic factors in understanding the broader implications of emotional biases in financial decision-making. When (Baker, Kumar, & Goyal, 2021) looked at the Indian stock market, they too concluded that the influence was negligible. This discrepancy emphasizes how complex overconfidence bias is and how it can appear in a variety of settings and demographic groupings.
A thorough meta-analysis is necessary to obtain a better understanding of the frequency and severity of overconfidence bias in investing decision-making. The influence on investment decisions would ultimately be lessened with the use of more efficient interventions and techniques (Ahmad, Zulfiqar, & Shah, 2020); (Metwally, 2023) ; (Lambert, Bessière, & N'Goala, 2012).

FINDINGS

From the specific characteristics of each selected study, we meticulously collected key data points, including sample size, the country where the study was conducted, correlation coefficients, authors, and the year of publication. Each study was also assigned a unique code to ensure systematic organization and facilitate detailed analysis. This coding system allows us to examine the intricate relationships among four crucial variables—loss

aversion bias, overconfidence bias, regret aversion bias, and investment decision-making—across a variety of studies.

By categorizing and structuring the data in this manner, we can effectively identify patterns, trends, and discrepancies in how these emotional biases impact investment behaviors across diverse demographic and geographic contexts. Moreover, this approach enables the detection of potential moderating factors such as cultural, economic, or regulatory influences that may shape the intensity or direction of these biases. Such a comprehensive analysis not only deepens our understanding of the role emotional biases play in financial decision-making but also provides valuable insights for developing strategies to mitigate their negative effects, ultimately contributing to more informed and rational investment practices.

The findings of a meta-analysis evaluating the effects of three distinct emotional biases on investing decisions—regret aversion bias, overconfidence bias, and loss aversion bias. Additionally, an outlier was eliminated from the loss-aversion bias data set in order to perform the meta-analysis.

INVESTMENT CHOICES AND LOSS AVERSION BIAS

Twelve studies that look at the relationship between investing decision-making and loss aversion are included in the meta-analysis. With a standard error (S.E.) of 0.198, the correlation's total estimate is 0.492. There is a substantial correlation between them, as evidenced by the Z-statistic of 2.48 and the p-value of 0.013. With an I2 value of considerable heterogeneity, the analysis indicates that there is a high degree of variability among the studies and recommends the use of a random effect model. The estimate (0.312) decreased when the outlier was eliminated from the dataset, but the standard error (0.0848) decreased as well. Even after removing the outlier, the p-value <0.001 and Z-statistic of 3.68 show a highly significant association. The conclusion is that while loss aversion bias is linked to investment choices, the magnitude of the effects varies greatly throughout studies, maybe as a result of various sample sizes, methodology, or contextual factors.

Investment choices and regret aversion bias. Fourteen research examining the relationship between regret-aversion bias and investment decision-making are included in the analysis. The S.E. is 0.134 and the overall estimate is 0.401. There is a significant link, as indicated by the Z-statistic of 3 and the p-value of 0.003. Similar to loss aversion bias, there is a large amount of heterogeneity among the research, as indicated by the Q-test value of 463.639 ($p < 0.001$) and the I2 value of 0.9861. This indicates that although there is a correlation between regret aversion bias and investing choices, the degree of this correlation differs greatly throughout studies. The estimate (0.285) decreased when the outlier was eliminated from the dataset, but the standard error (0.0576) decreased as well. Even after removing the outlier, the p-value <0.001 and Z-statistic of 4.96 show a highly significant association. The results imply that regret aversion bias might affect investment choices, however the degree to which it does so will vary based on a number of study-specific variables.

INVESTMENT DECISIONS AND OVERCONFIDENCE BIAS

The meta-analysis includes 23 studies that explore the relationship between overconfidence bias and investment decision-making. The overall effect size of this relationship is estimated at 0.346, with a standard error of 0.0949. The analysis reveals a statistically significant connection, as indicated by a p-value of less than 0.001 and a Z-statistic of 3.65. Furthermore, the findings demonstrate substantial heterogeneity among the studies, as reflected by an I^2 value of 0.9847 and a Q-test value of 920.599 ($p < 0.001$), supporting the initial hypothesis of variability across the research.

To refine the results, an outlier was removed from the dataset. This adjustment lowered the estimate to 0.283, with a reduced standard error of 0.0728. Despite this change, the relationship remains highly significant, with a Z-statistic of 3.98 and a p-value of less than 0.001. This consistency indicates that while overconfidence bias has a strong and meaningful impact on investment decisions, the effect sizes reported across studies show considerable variation.

The observed heterogeneity suggests that differences in methodologies, sample characteristics, or other contextual factors might influence the strength of the relationship. For instance, variations in study design, population demographics, or cultural and economic contexts could play a significant role in shaping the extent

to which overconfidence bias affects investment behaviors. These findings highlight the complexity of this relationship and emphasize the need for further investigation into the underlying factors driving such variability, offering valuable insights for researchers and practitioners aiming to understand and address the influence of emotional biases in financial decision-making.

The analysis reveals a significant association between regret aversion bias and investment decision-making, with the relationship remaining substantial even after considering one potential outlier (OR-5). The overall effect size is estimated at 0.40, which indicates a meaningful and notable correlation between investment decisions and regret aversion bias. This suggests that investors are likely to be strongly influenced by the desire to avoid future regret when making financial decisions, which may lead them to take a more conservative approach or avoid certain risks.

The confidence interval for the effect size, ranging from 0.14 to 0.66, offers a 95% certainty that the true effect size lies within this range. This level of certainty adds reliability to the results, while the interval itself reflects the variability in the strength of the bias's impact. In other words, while regret aversion bias is consistently influential across studies, its exact impact on investment decisions can vary depending on specific factors, such as the context in which decisions are made, the characteristics of the investors, or the type of investment options available.

Regret aversion bias leads investors to avoid decisions that they believe could result in regret in the future. This behavior might manifest in ways such as holding on to losing investments for too long, avoiding high-risk opportunities, or failing to sell assets at an optimal time to prevent feelings of regret if those decisions turn out poorly. Such tendencies can have a profound effect on both individual investment strategies and broader market behaviors, as large numbers of investors may collectively contribute to market inefficiencies.

Furthermore, the variability observed in the effect size highlights the complexity of human decision-making and suggests that regret aversion does not affect all investors equally. The influence of this bias may differ based on factors like age, risk tolerance, past investment experiences, and cultural or socio-economic influences. Therefore, a more nuanced understanding of regret aversion bias is necessary, particularly in terms of how it can be mitigated in order to improve the quality of investment decisions. This expanded understanding can also inform the development of more targeted financial education programs and decision-support tools to help investors make more rational, less emotionally driven choices.

CONCLUSIONS AND DISCUSSIONS

Emotional biases (overconfidence bias, regret aversion bias, and loss aversion bias) and investment decisions are significantly positively correlated, according to the findings of this meta-analysis. By merging information from several separate studies, the meta-analysis method gave us a deeper comprehension of how these emotional biases affect investment choices. These results are consistent with other research, adding to the body of evidence supporting the notion that human emotions significantly influence investment choices.

The main conclusions of this meta-analysis were as follows:

1. Loss aversion bias: Figure 4 shows a positive association with an investment choice . The correlation value is 0.492. Investors with a loss-aversion bias are typically more risk cautious and place a higher value on preventing losses than on capital growth. Because of this bias, they sell winning assets too soon to lock in gains and hang onto sinking assets in the hopes of recovering losses. The effect sizes, however, fluctuate significantly between research, suggesting that different populations and conditions can have different effects on how loss aversion affects investment choices.
2. The regret aversion bias is further demonstrating, w a positive correlation of 0.401 with investment decisions. Because they are afraid of regretting any losses, investors with a regret aversion bias are typically extremely cautious and steer clear of risky investments. Holding onto losing positions and missing out on opportunities in undervalued markets are two consequences of this bias. Once more, the effect sizes differ between research, indicating that regret aversion has an impact on investing choices.

3. Overconfidence bias: The meta-analysis also shows that investment decision-making and overconfidence bias are positively correlated. Investors that are overconfident tend to overestimate their skills, which makes them make poor decisions and reluctant to sell their holdings. Additionally, excessive trading and inadequate portfolio diversification brought on by this bias may result in poor long-term performance. Like the other biases, the effect sizes differ greatly between the research, suggesting that context might affect how overconfidence affects investing choices can vary depending on the situation.

REFERENCES

1. Ahmad, M., Zulfiqar, S., & Shah, A. (2020). Overconfidence heuristic-driven bias in investment decision-making and performance: mediating effects of risk perception and moderating effects of financial literacy. Journal of Economic and Administrative Sciences, Vol. 38 No. 1, pp. 60-90.
2. Armansyah, R. F. (2021). Over Confidence, Mental Accounting, and Loss Aversion In Investment Decision. Journal of Auditing, Finance, and Forensic Accounting, 44-53.
3. ATHUR, A. D. (2014). Effect of Behavioural Biases on Investment Decisions of Individual Investors in Kenya. University of Nairobi.
4. Aydin, S. (2023). Analysis of the Effects of Loss Aversion, Optimism and Herding Biases and Fear of Missing Out on Investment Decision. Akademik Birikim Dergisi .
5. Baker, H. K., Kumar, S., & Goyal, N. (2021). Personality traits and investor sentiment. Review of Behavioral Finance.
6. Bhatia, A., Chandani, A., Divekar, R., Mehta, M., & Vijay, N. (2022). Digital innovation in wealth management landscape: the moderating role of robo advisors in behavioural biases and investment decision-making. International Journal of Innovation Science.
7. Chadha, M. (2024). Cognitive Biases Impact on Investor's Investment Decision of Retail Mutual Fund Investor . European Economic Letters.
8. Cotruş, A., Stanciu, C., & Bulborea, A. A. (2012). EQ vs. IQ Which is Most Important in the Success or Failure of a Student? Procedia - Social and Behavioral Sciences, 5211-5213.
9. Elhussein, N. H., & Abdelgadir, J. N. (2020). Behavioral Bias in Individual Investment Decisions: Is It a Common Phenomenon in Stock Markets? International Journal of Financial Research , Vol. 11 No. 6, p. 25.
10. Gupta, S., & Shrivastava, M. (2021). Herding and loss aversion in stock markets: mediating role of fear of missing out (FOMO) in retail investors. International Journal of Emerging Markets, Vol. 17 No. 7, pp. 1720-1737.
11. Gupta, S., & Shrivastava, M. (2022). Herding and loss aversion in stock markets: mediating role of fear of missing out (FOMO) in retail investors. International Journal of Emerging Markets, 1720-1737.
12. Gyanwali, I., & Neupane, G. (2021). Individual Investors Psychology and Investment Decision in NEPSE. The Lumbini Journal of Business and Economics.
13. Hunguru, P., Sibanda, V., & Tadu, R. (2020). Determinants of Investment Decisions: A Study of Individual Investors on the Zimbabwe Stock Exchange. Apploed Economics and Finance, Vol. 7, No. 5, p. 38,.
14. Iram, T., Bilal, A. R., & Latif, S. (2021). Is Awareness That Powerful? Women's Financial Literacy Support to Prospects Behaviour in Prudent Decision-making. Global Business Review.
15. Kahneman, D., & Tversky, A. (1979). Prospect Theory: An Analysis of Decision under Risk . Econometrica.
16. Lambert, J., Bessière, V., & N'Goala, G. (2012). Does expertise influence the impact of overconfidence on judgment, valuation and investment decision? Journal of Economic Psychology, Volume 33, Issue 6, 1115-1128.
17. Metwally, A. H. (2023). he Effect of Overconfidence Bias on Investors Decisions in the Egyptian Stock Market: The Role of Information Acquisition. Arab Academy for Science, Technology & Maritime Transport.
18. Nkukpornu, E., Gyimah, P., & Sakyiwaa, L. (2020). Behavioural Finance and Investment Decisions: Does Behavioral Bias Matter? International Business Rsearch.
19. Nkukpornu, E., Gyimah, P., & Sakyiwaa, L. (2020). Behavioural Finance and Investment Decisions: Does Behavioral Bias Matter? International Business Research, Vol. 13 No. 11, p. 65.
20. Nkukpornu, E., Gyimah, P., & Sakyiwaa, L. (2020). Behavioural Finance and Investment Decisions: Does Behavioral Bias Matter? International Business Research, Vol. 13 No. 11, p. 65.

21. Octavia, A. D., Yuwono, C. C., & Monangin, F. G. (2022). The Effect Of Financial Literature, Financial Behavior, & Regret Aversion Bias On Millennial Investment Decisions. Indikator: Jurnal Ilmiah Manajemen Dan Bisnis, Vol. 6 No. 3, p. 82.

22. Pompian, M. (2012). Behavioral Finance and Wealth Management: How to Build Investment Strategies That Account for Investor Biases. Wiley.

23. Raheja, S., & Dhiman, B. (2020). How do emotional intelligence and behavioral biases of investors determine their investment decisions? Rajagiri Management Journal.

24. Ritika, & Kishor, N. (2022). Development and validation of behavioral biases scale: a SEM approach. Review of Behavioral Finance.

25. Sapkota, M. P. (2023). Emotional Biases and Equity Investment Decision of Individual Investors . Journal of Business and Management Review, 12-20.

26. Shilpi Gupta, M. S. (2021). Herding and loss aversion in stock markets: mediating role of fear of missing out (FOMO) in retail investors. International Journal of Emerging Markets.

27. Wangzhou, K., Khan, M., Hussain, S., Ishfaq, M., & Farooi, R. (2021). Effect of Regret Aversion and Information Cascade on Investment Decisions in the Real Estate Sector: The Mediating Role of Risk Perception and the Moderating Effect of Financial Literacy. Frontiers in Psychology.

A PATHWAY TO HOLISTIC DEVELOPMENT: THE INTEGRATION OF INDIAN KNOWLEDGE SYSTEMS IN SECONDARY EDUCATION

[1]Naresh Sachdev [2]Rashmi Gujarati

[1]Professor, Business Management & Director, Punjab College of Technical Education Ludhiana, India

[2]Director IQAC, Punjab College of Technical Education Ludhiana, India

ABSTRACT

Integrating Indian Knowledge Systems in Secondary Education: A Pathway to Holistic Development' examines the feasibility and importance of integrating traditional Indian knowledge systems (IKS) to enhance secondary students' holistic development. The National Education Policy (NEP) 2020 emphasises integrating Indigenous knowledge systems into modern education, hence this study examines how Indian knowledge systems affect students' intellectual, emotional, and ethical growth. The study examines the potential of integrating Indigenous Knowledge Systems of India into secondary school curricula, assesses the impact of Traditional Indian Wisdom on holistic development across physical, mental, psychological, and metaphysical dimensions, understands educators' and students' perspectives on integrating these systems into mainstream curricula, and identifies obstacles and effective strategies for implementing Indian Knowledge Systems. The study analyses primary and secondary data using a qualitative approach. The findings suggest Indian knowledge systems could considerably improve secondary school pupils' progress. According to Swami Vivekananda's educational philosophy, Indian knowledge systems improved self-awareness, emotional resilience, and ethical reasoning. As the conventional knowledge framework linked learning to human growth, educators saw increasing student involvement and motivation. However, educator training, curriculum development resources, and resistance from Western-pedagogical-based educational groups were recognised as difficulties. However, the study shows that contextualising education within cultural and historical contexts is becoming more accepted. Experiential learning approaches like meditation, yoga, and storytelling, which align with Indian knowledge systems, can create a more balanced and thorough education. This research suggests that Indian knowledge systems may reshape secondary education into a more holistic and culturally embedded experience, paving the way for education that values both academic and extracurricular achievement as responsible members of society.

Keywords: Indian knowledge systems, holistic development, secondary education, NEP 2020, Swami Vivekananda, experiential learning.

INTRODUCTION

The extensive and diverse Indian Knowledge Systems (IKS) have developed over thousands of years, covering areas such as philosophy, science, mathematics, medicine, architecture, and the arts(Vaz, 2024).The necessity of incorporating Indian Knowledge Systems (IKS) into the secondary school system in order to support holistic development and protect India's rich cultural legacy is becoming more widely acknowledged.(How Students Can Benefit from the Indian Knowledge System Scheme Implemented by the Government, 2024). One of the main areas of the current research studies that aim to protect India's cultural legacy and promote students' holistic development is the incorporation of Indian Knowledge Systems (IKS) into secondary schooling. (S. K. Sharma & Makhijani, 2023) Indian knowledge systems, rooted in philosophies like the Vedas, Upanishads, Ayurveda, Yoga, and the wisdom of scholars like Swami Vivekananda, provide an alternative framework for holistic education, placing emphasis on self-awareness, character development, and the interconnectedness of personal growth and societal responsibility. In order to address the demand for a more comprehensive and culturally sensitive education system in India, the National Education Policy (NEP) 2020 supports the implementation of Indian Knowledge Systems (IKS) into secondary school curriculam.

OBJECTIVES

1. To explore the need of integrating Indian knowledge systems in secondary education.
2. To evaluate the potential of IKS in promoting holistic development—covering physical, mental, psychological, ethical dimensions.
3. To understand the perceptions of educators and students regarding the incorporation of these approaches being incorporated into regular curriculum.
4. To identify challenges and best practices for the effective implementation of IKS in modern education

RESEARCH METHODOLOGY

This study utilizes a qualitative research methodology, focusing on in-depth analysis through primary and secondary data collection. Interviews with educators, students, and curriculum developers were conducted to understand their perspectives and experiences related to IKS. Group discussions were held with students to gain insights into their experiences and how traditional knowledge systems have influenced their holistic development. Secondary data was gathered from academic papers, historical texts, and government reports on NEP 2020 and Indian knowledge systems. Thematic coding was employed to identify common patterns, insights, and contradictions within the data.

RELATED LITERATURE

This literature review synthesizes key findings from various studies exploring the implications, benefits, and methodologies associated with the incorporation of IKS in educational curricula. Several studies have highlighted the need and importance of unifying IKS into secondary education. IKS is deeply rooted in ancient Indian texts, including the Vedas, Upanishads, and various philosophical treatises, encapsulating traditional knowledge and insights into disciplines such as mathematics, astronomy, and medicine. In order to address societal issues and foster a more accessible atmosphere for learning, the National Education Policy (NEP) 2020 emphasises the significance of incorporating IKS into modern education (Ministry of Human Resource Development, 2020). A study by (Mishra et al., 2024) found that, there are many advantages to implementing traditional Indian knowledge systems into secondary education, such as the advancement and safeguarding of India's cultural treasures, the encouragement of innovation and creative thinking by utilising age-old wisdom, and the development of students' sense of pride and belonging in their country. Similarly, a report by the Ministry of Education (Ministry of Human Resource Development, 2020)highlights the value of connecting traditional Indian knowledge systems into secondary school curriculum, pointing out that these systems are based in Vedic literature and are intended to encourage and promote additional research to address modern societal challenges (Vaz, 2024) Discussion Holistic Development Comprehensive growth of an individual, involving intellectual, emotional, social, physical, and spiritual dimensions, is known as holistic development. It is an integrative approach to growth that takes into account all aspects of an individual's life, unlike traditional development models that may only focus on cognitive or physical growth. Holistic development aims to promote a balanced and interconnected advancement of all dimensions—intellectual, emotional, social, physical, and spiritual. It is based on various philosophical and psychological theories that emphasize seeing individuals as whole beings rather than fragmented parts. Key theories informing holistic development include Maslow's Hierarchy of Needs, which emphasizes fulfilling a range of human needs for holistic well-being, Erikson's Psychosocial Development stages, highlighting the importance of social and emotional growth, and Bronfenbrenner’s Ecological Systems Theory, which underscores the impact of multiple environmental systems on an individual's development.

DIMENSIONS OF HOLISTIC DEVELOPMENT

Various dimensions influence the overall growth and well-being of an individual in holistic development. Intellectual development involves nurturing cognitive abilities, critical thinking, creativity, and acquiring knowledge essential for problem-solving and adapting to new challenges. Emotional development involves nurturing emotional intelligence, self-awareness, and managing and expressing emotions in a healthy manner, crucial for building resilience and fostering positive relationships. Social development involves forming and

maintaining relationships, understanding social norms, and beneficent to the community, fundamental for instilling a sense of pride and interconnectedness. Physical development encompasses the growth and maintenance of the body through physical activity, nutrition, and overall health, supporting other aspects of development by providing the energy and vitality needed for learning and engagement. Spiritual development involves exploring meaning, purpose, and values and often involves connecting to something greater than oneself, whether through religion, philosophy, or personal reflection.

Figure 01: Dimensions of Holistic Development

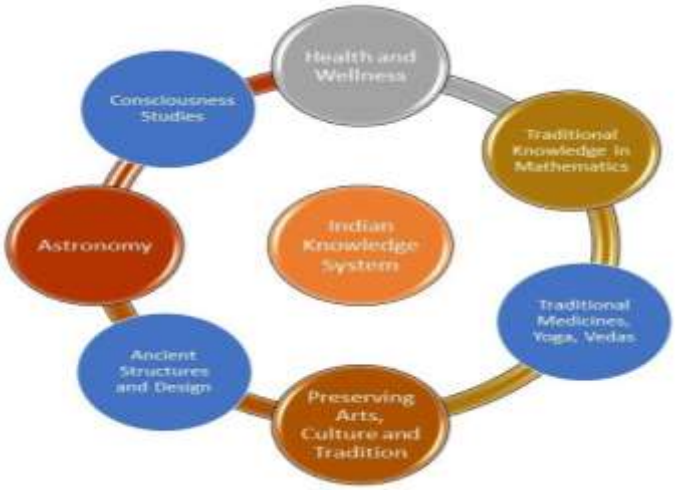
HOLISTIC DEVELOPMENT IN EDUCATION

In education, holistic development is increasingly acknowledged as a crucial goal. Traditional education systems often prioritize academic achievement, sometimes at the expense of other developmental areas. However, holistic education aims to develop the whole child, fostering not only intellectual abilities but also emotional, social, physical, and spiritual growth. Approaches such as Montessori, Waldorf, and Reggio Emilia emphasize experiential learning, creativity, and the maturing moral and ethical values, aligning closely with the doctrines of holistic development.

THE INDIAN KNOWLEDGE SYSTEM (IKS)

The Indian Knowledge System (IKS) denotes the rich and ancient body of knowledge that originated in India and has evolved over millennia. It is deeply embedded in the country's cultural, philosophical, scientific, and spiritual traditions and disciplines, including philosophy, science, arts, language, mathematics, medicine, and governance. IKS is characterized by its holistic approach, seeking harmony between the material and spiritual aspects of life. It is an extensive and ancient tradition encompassing diverse fields of knowledge, philosophy, and culture, emphasizing a multi-dimensional approach that highlights the interdependency of all the fields of knowledge, including science, philosophy, art, and spirituality. It views the human being as an integrated entity of body, mind, and spirit, with education emphasising on whole person's development rather than just one aspect. Indigenous Knowledge Systems of India places spirituality as a core component of knowledge, encompassing an understanding of life, existence, and the universe, not limited to religion. Concepts such as "Atman" (self), "Dharma" (duty/righteousness), and "Moksha" (liberation) are central to this system. Another crucial component is value-oriented instruction, which incorporates morality, ethics, and values into the classroom with the goal of fostering characteristics like humility, non-violence, compassion, and honesty in addition to intellectual development. IKS focuses on practical wisdom and the application of knowledge in everyday life, demonstrated through fields like Ayurveda (medicine), Yoga (mind-body discipline), Vaastu Shastra (architecture), and Jyotisha (astronomy/astrology). It covers a wide range of disciplines such as science, mathematics, medicine, linguistics, philosophy, arts, politics, and economics, encouraging cross-disciplinary study. Ancient Indian traditions advocate for sustainable living and harmony with nature, emphasizing the need of conserving the environment and living sustainably.

Figure 02: Indian Knowledge Systems: Key features



The primary goal of IKS is the pursuit of self-realization and inner wisdom, believing that true knowledge leads to liberation (Moksha). The inward journey, through meditation, contemplation, and yoga, is considered essential for intellectual and spiritual growth. IKS is inclusive and pluralistic, promoting dialogue among various schools of thought, respecting diverse perspectives and accepting multiple ways of attaining knowledge and truth. The traditional Indian system of education relied heavily on the Guru-Shishya (teacher-student) model, where knowledge was passed down orally through close interaction between the teacher and the student. IKS draws heavily from ancient Indian texts such as the Vedas, Upanishads, Puranas, Shastras, and various other treatises, providing a vast repository of knowledge on subjects ranging from metaphysics to governance, demonstrating that IKS is not just a knowledge system but a way of life that integrates material and spiritual pursuits, with a focus on the overall well-being of individuals and society

Table: 01 Indian Knowledge System v/s Harmonious Development

Indian Knowledge System (IKS)	**Harmonious Development**	
Definition	A collection of knowledge and practices that includes science, technology, medicine, philosophy, arts, and more.	The all-round development of a child, including their self-realization and abilities.
Features	Based on a holistic approach that integrates the mind, body, and spirit.	Educationists believe that all a child's powers and capacities should be developed harmoniously.
Significance	A source of guidance and inspiration for individuals and communities, and a valuable legacy for future generations.	Gandhiji was a strong advocate of harmonious development.

Key Areas of Indian Knowledge System for Secondary Education Secondary school curricula may integrate the Indian Knowledge System (IKS) into key subjects like Indian philosophy and ethics, drawing on teachings from philosophical texts such as the Upanishads and the Bhagavad Gita to promote values like compassion, non-violence, and social responsibility. (Baral, 2024). It is essential to emphasize the expansion of ethical values like truth (Satya), non-violence (Ahimsa), compassion (Karuna), and selflessness (Nishkama Karma). Utilizing concepts from Vedic mathematics, astronomy, and traditional medicine (Ayurveda) can make the teaching of modern mathematics and science more culturally relevant and engaging (S. K. Sharma & Makhijani, 2023). Furthermore, studying classical Indian art forms, such as music, dance, and literature, can help students gain a pride for the richness and diversity of India's old age wisdom. Introducing students to yoga postures, breathing exercises (Pranayama), and meditation techniques to promote physical, mental, and emotional well-being is an important aspect of the Indian knowledge system. Physical education incorporating traditional Indian martial arts like Kalaripayattu and yoga-based fitness routines should also be included in the school curricula.

Additionally, learning the basics of Sanskrit, Pali, Prakrit, Tamil, and other classical Indian languages helps the learners to reach ancient texts and literature. Exposure to classical Indian literature such as the epics (Ramayana, Mahabharata), poetry (Kalidasa), and stories from Panchatantra and Jataka tales can foster creativity, imagination, and moral development. To nurture creativity, it is important to learn Indian classical music (Hindustani, Carnatic) and dance forms (Bharatanatyam, Kathak, Odissi). Furthermore, teaching the ancient Indian wisdom of living in harmony with nature, the concept of "Prakriti" (nature), and sustainable practices is important. It is equally important for students to understand indigenous agricultural knowledge, including crop cycles, organic farming techniques, and the sustainable use of natural resources. Introducing students to the contributions of India in fields like science, mathematics (Aryabhata, Bhaskara), medicine (Charaka, Sushruta), and philosophy is essential. Learning from texts like Arthashastra (by Kautilya) and understanding the ancient systems of governance, economic policies, and statecraft is crucial. Additionally, the traditional art of structured debate can enhance communication skills, argumentation, and the ability to think deeply about philosophical and moral questions.

Utilizing moral tales from Indian scriptures such as the Panchatantra, Jataka Tales, and the Mahabharata to instil life skills, problem-solving capabilities, and ethical reasoning is crucial. Integration of Indian leadership principles that emphasize empathy, community service (Seva), and setting a good example is also essential. Incorporating traditional Indian architectural principles, including constructing buildings in harmony with nature, holds significant importance. Lastly, understanding India's diverse architectural heritage and the necessity of preserving historical monuments is vital. Integrating these focal points into secondary education would be in line with the objectives of the National Education Policy (NEP) 2020, which stresses the resurgence of Indian Knowledge Systems for comprehensive development

RELEVANCE OF INTEGRATING IKS IN SECONDARY EDUCATION

The introduction of Indian Knowledge Systems (IKS) in secondary education curricula is extremely pertinent and welltimed, as it is in line with the goals of the National Education Policy (NEP) 2020 and meets the requirement for a more comprehensive and culturally responsive education system in India. (Kumawat, 2021) India possesses a rich and diverse cultural heritage shaped by centuries of ideological and ethical traditions. Integrating Indian Knowledge Systems (IKS) into secondary education allows schools to play a vital role in preserving and promoting this heritage, while fostering a sense of accomplishment and belongingness among students. This is particularly significant in an era of globalization, where traditional knowledge systems are under threat of being overshadowed by Western-centric curricula. Indian Knowledge Systems highlight the importance of nurturing the whole individual, including their cognitive, emotional, and spiritual dimensions. By embedding IKS into secondary education, schools can promote a more holistic approach to learning that extends beyond merely acquiring information and skills. Students can explore the interconnectedness of all aspects of life, the significance of ethical behaviour, and the value of mindfulness and introspection. The Indian Knowledge Systems are intrinsically multidisciplinary, drawing wisdom from diverse fields such as philosophy, science, mathematics, and the arts. Incorporating IKS into secondary education allows schools to inspire students to find links between various subjects and to approach challenges from diverse angles. This can cultivate the ability to think critically, innovation, and problem-solving capabilities, all of which are vital for success in the 21st century. (K. & D., 2024). Many of the challenges facing the world today, such as climate change, social inequality, and mental health issues, have roots in the way we think about and interact with the world. The Indian Knowledge Systems offer alternative perspectives and solutions that can complement and enrich contemporary approaches to these challenges. By incorporating IKS into secondary education, schools can equip students with the knowledge and tools they need to negotiate these issues in innovative and sustainable ways. (Kalan, 2023) In education, the National Education Policy (NEP) 2020 highlights the value of advancing Indian languages, art forms, and tradition. Recognising the importance of traditional knowledge systems in enhancing the educational experience and advancing a more inclusive and equitable educational system, it expressly asks for the inclusion of IKS into curricula at all educational levels. (Baral, 2024) The effective execution of NEP 2020 and the shaping of education in India can be facilitated by schools through the integration of IKS into secondary education. The integration of Indian Knowledge Systems (IKS) into secondary education curricula is both timely and highly relevant, aligning with the core principles of the National

Education Policy (NEP) 2020 and addressing the need for a more inclusive and culturally attuned education system in India. By preserving cultural heritage, promoting holistic development, fostering interdisciplinary learning, and tackling modern challenges, the incorporation of IKS can significantly shape the future of education in India. It is therefore essential for schools, educators, and policymakers to collaborate in developing effective strategies for implementing IKS in secondary education, ensuring that its advantages are accessible to all students. Challenges Integrating Indian Knowledge Systems (IKS) into classrooms presents various obstacles that educators must navigate to a successful and meaningful implementation. Educators may not have a comprehensive understanding of the depth and breadth of IKS or its potential benefits for student learning, which can make it challenging to effectively incorporate IKS into their lessons and engage students in meaningful discussions about traditional knowledge systems (S. K. Sharma & Makhijani, 2023) IKS, often passed down orally or through traditional practices, presents difficulties in finding welldocumented and reliable resources for classroom use. Additionally, the absence of standardized curricula and teaching materials specifically designed for integrating IKS can hinder its implementation in schools (R. Sharma & Maheshwari, 2024) Some educators may resist incorporating IKS into their teaching due to concerns about academic rigor, relevance, or cultural appropriation, and overcoming this resistance requires effective communication, professional development, and a deep knowledge of the value and authenticity of IKS (Education et al., 2023). Balancing the inclusion of IKS into the curriculum with teaching modern, globally relevant knowledge and skills is important to make sure that students receive a well-rounded education (Ambika, 2024) It is imperative to guarantee that the IKS being taught is authentic, accurate, and respectful of cultural sensitivities to avoid potential misrepresentations or oversimplifications of traditional knowledge systems, which can lead to cultural appropriation or disrespect (Mishra et al., 2024)

Many teachers may lack adequate training in IKS or effective strategies for integrating it into their teaching practices, making it essential to provide professional development opportunities for teachers to learn about IKS and develop appropriate teaching methods. Educators must also be mindful of potential barriers, such as language differences or lack of accessibility with conventional practices, and work to create inclusive learning environments to make sure that IKS is attainable and equitable for all students, leaving aside of their cultural background or socioeconomic status. Educators can collaborate with IKS experts, community members, and local organizations to develop appropriate teaching resources and strategies to overcome these challenges. Providing ongoing professional development and support for teachers, as well as promoting a system of openness and respect for diverse knowledge systems, can also contribute to the successful integration of IKS in classrooms. Findings The influence of the Indian Knowledge System (IKS) on the holistic progress of secondary students is diverse, encompassing educational, cultural, and ethical aspects. IKS advocates for a comprehensive approach to learning that highlights the interconnections of knowledge across various subjects. By the inclusion of India's old age wisdom with current disciplines, students develop critical thinking skills and a broader grasp of different fields. This interdisciplinary method fosters creativity and problem-solving abilities, preparing students to effectively address contemporary challenges. Infusing IKS into the curriculum instils a sense of cultural pride in students. Studying ancient texts like the Vedas and epics like the Mahabharata enables students to recognize India's rich intellectual traditions. This cultural affinity enhances their identity and nurtures a sense of belonging, which is crucial for balanced development. IKS underscores values such as compassion, respect for nature, and ethical decision-making. By integrating these values into the educational framework, students are nurtured to become socially responsible individuals who make positive contributions to society. This value-based education cultivates empathy and ethical leadership among young learners. The teachings within IKS often include practical applications, such as sustainable agricultural practices from ancient texts like the Arthashastra and holistic health principles from Ayurveda. By learning these practices, students can address contemporary issues like climate change and health crises with time-tested solutions. This practical approach enhances their ability to effectively tackle real-world problems. Engaging with IKS has been demonstrated to enhance cognitive functions through practices such as yoga and meditation. These activities improve focus, emotional regulation, and resilience among students, contributing to their overall wellbeing and academic performance. IKS encourages community involvement by connecting students with local cultures and traditions. This engagement fosters a sense of responsibility toward preserving cultural heritage while promoting social cohesion within communities. The National Education Policy (NEP) 2020 stresses the integration of IKS into all

levels of education, including secondary schooling. This initiative aims to connect traditional knowledge with modern educational practices, ensuring that students are well-rounded individuals equipped to contribute to society harmoniously. Conclusion In conclusion, the Indian Knowledge System profoundly influences the balanced development of secondary students by advocating for holistic education, cultural pride, ethical values, practical knowledge application, cognitive benefits, community engagement, and integration into modern curricula. Together, these aspects cultivate well-rounded individuals prepared to navigate the complexities of today's world while remaining rooted in their cultural heritage.

REFERENCES

1. Ambika, P. (2024). Leveraging Indian Knowledge Systems for Holistic Development of Prospective Teachers. Thiagarajar College of Preceptors Edu Spectra, 6(1), 1–8. https://doi.org/10.34293/ eduspectra. v6i1.01
2. Baral, S. (2024). Integrating Indian Knowledge Systems for Holistic Development through NEP 2020. Global Online Electronic International Interdisciplinary Research Journal (GOEIIRJ), XIII(V), 414–420. www.goeiirj.com
3. Education, H., Paper, G. S., Heritage, I., Education, H., Education, H., & Iks, T. (2023). Mains Marathon.
4. How students can benefit from the Indian Knowledge System scheme implemented by the Government. (2024). Indus University Publications. https://indusuni.ac.in/how-students-can-benefit-from-the-indian-knowledge-system.php
5. K., S., & D., S. K. (2024). Holistic Development through Implementation of NEP-2020. RESEARCH REVIEW International Journal of Multidisciplinary, 9(5), 50–55. https://doi.org/10.31305/rrijm.2024.v09.n05.007
6. Kalan, K. (2023). ANALYSIS OF NATIONAL EDUCATION POLICY 2020 IN ATTAINING BETTER. 8(3), 431–437.
7. Kumawat, H. (2021). Study Of the Indian National Education Policy 2020 Towards Achieving Its Objectives. 20(1), 2481–2486. https://doi.org/10.17051/ilkonline. 2021.01.279
8. Ministry of Human Resource Development. (2020). National Education Policy 2020 Government of India. Government of India, 14–16. https://www.mhrd.gov.in/sites/ upload_ files/mhrd/files/NEP_Final_English.pdf
9. Mishra, S., Tripathy, A. B., & Patro, P. R. (2024). INTEGRATING TRADITIONAL INDIAN KNOWLEDGE SYSTEM IN INDIAN HIGHER EDUCATION IN NEP 2020 PERSPECTIVES. 14(3), 346–352.
10. Sharma, R., & Maheshwari, E. (2024). Integrating India' s Ancient Wisdom into School Education: Need, Challenges and way forward.
11. Sharma, S. K., & Makhijani, K. (2023). Indian Knowledge System. In Green Chemistry, its Role in Achieving Sustainable Development Goals, Volume1 (pp. 219–230). https://doi.org/10.1201/9781003301769-9
12. Vaz, D. (2024). Integrating Traditional Indian Knowledge into the Education System. 45(1), 3151–3158

THE FUTURE OF FOOD: PREDICTIONS AND TRENDS FOR THE NEXT DECADE

[1]Gagandeep Kaur [2]Swastika Jain [3]Naresh Sachdev

[1]Deputy Director, Research, Punjab College of Technical Education, Ludhiana

[2]Assistant Director, Research, Punjab College of Technical Education, Ludhiana

[3]Director, Department of Business Management, Punjab College of Technical Education, Ludhiana

INTRODUCTION

1. Technological Innovations

Technological advancements are transforming every stage of the food supply chain, from production and processing to distribution. By leveraging innovations in machinery, data analytics, and digital tools, the global food system is becoming more efficient, sustainable, and resilient to challenges such as climate change, labor shortages, and supply chain disruptions. Below, we explore how technology is shaping each of these areas in detail.

1.1 Technological Advancements in Food Production

Modern agricultural practices have been revolutionized by innovations such as precision agriculture, genetically modified organisms (GMOs), automation, and advanced irrigation systems. These technologies aim to enhance productivity while reducing the environmental impact of farming.

Precision Agriculture

Precision agriculture uses tools like drones, satellite imaging, and soil sensors to collect data on crop health, soil conditions, and weather patterns. This enables farmers to make informed decisions about planting, irrigation, and fertilization. For instance:

- In India's Punjab and Haryana regions, precision irrigation using soil sensors has reduced water consumption by up to 30% while maintaining crop yields (Ranganathan et al., 2016).
- GPS-guided tractors in the United States and Australia help farmers reduce fuel consumption and achieve greater planting accuracy, leading to higher crop efficiency.

GMOs and Biotechnology

Genetically modified crops, such as drought-resistant maize and pest-resistant cotton, have significantly boosted agricultural productivity. For example, drought-tolerant maize in sub- Saharan Africa has improved yields by 20% in regions prone to water scarcity (Niles et al., 2021).

Automation and Robotics

Robotic systems like automated harvesters and AI-driven monitoring systems are alleviating labor shortages and improving efficiency. Companies like John Deere have pioneered autonomous tractors equipped with AI for real-time analysis, enabling optimized planting and harvesting schedules.

1.2 Technological Advancements in Food Processing

Food processing technologies ensure quality, extend shelf life, and create value-added products, contributing to food security and reduced waste. Innovations in this area include advanced packaging, artificial intelligence (AI), and food engineering.

AI in Food Processing

Artificial intelligence enhances quality control by detecting defects in products through machine vision systems. For instance:

- PepsiCo uses AI-driven inspection systems to identify inconsistencies in potato chips, reducing waste and ensuring uniformity.

Sustainable Packaging Innovations

Edible and biodegradable packaging materials made from algae, starch, or cellulose are reducing the environmental impact of food packaging. A notable example is Evoware, an Indonesian startup that produces seaweed-based packaging, reducing single-use plastic waste.

High-Pressure Processing (HPP)

HPP technology, which uses high pressure instead of heat to sterilize food, retains nutritional value and extends product shelf life. This is particularly beneficial for ready-to-eat meals and beverages, where freshness and safety are critical.

1.3 Technological advancement in food distribution

The distribution phase of the food system has seen tremendous improvements due to advancements in blockchain, logistics technologies, and IoT-enabled supply chain management.

Blockchain for Traceability

Blockchain ensures transparency and accountability in the supply chain. For example:

- Walmart's adoption of IBM Food Trust allows the company to trace the origin of leafy greens in 2.2 seconds, compared to weeks with traditional systems. This reduces risks of contamination and enhances consumer trust.

IoT in Cold Chain Logistics

Internet of Things (IoT) devices monitor temperature, humidity, and other conditions in real-time during transportation, ensuring that perishable items remain fresh. Companies like Maersk use IoT-enabled containers to optimize cold chain management for global shipments.

E-Commerce and Last-Mile Delivery

Technological platforms such as Instacart and Amazon Fresh have revolutionized food distribution by offering same-day delivery of groceries and prepared meals. These innovations gained prominence during the COVID-19 pandemic, when online grocery sales in the U.S. surged by 40% (World Bank, 2022).

Benefits and Challenges of Technological Advancements Benefits

- **Increased Efficiency:** Technologies like robotics and AI reduce production and processing times, while digital platforms streamline distribution.
- **Sustainability:** Precision agriculture and sustainable packaging reduce resource usage and environmental impact.
- **Enhanced Food Security:** GMOs and improved logistics ensure food availability in regions prone to shortages.

Challenges

- **High Costs:** The adoption of advanced technologies often requires significant investment, making them inaccessible to small-scale farmers.
- **Skill Gaps:** The effective use of these technologies requires technical expertise, highlighting

the need for farmer training and education.

- **Data Privacy Concerns:** The integration of IoT and blockchain raises issues around data ownership and privacy.

2. CONSUMER PREFERENCES

Consumer preferences are rapidly evolving due to increasing awareness of health, sustainability, and ethical issues. These shifts are reshaping the global food industry, influencing product development, marketing strategies, and supply chain management. Three significant trends stand out: the rise of plant-based diets, demand for personalized nutrition, and convenience-driven solutions.

2.1 The Rise of Plant-Based Diets

Plant-based diets are gaining traction globally, driven by growing concerns about health, environmental sustainability, and animal welfare. This shift is catalyzed by scientific evidence, media campaigns, and consumer demand for alternative protein sources.

Drivers of Adoption

- **Health Benefits:** Studies have linked plant-based diets to reduced risks of chronic diseases such as heart disease, diabetes, and obesity. For example, a study by Tilman and Clark (2014) highlights that vegetarian diets reduce the risk of ischemic heart disease by 29%.
- **Environmental Sustainability:** Plant-based diets have a lower environmental footprint compared to meat-based diets. The Food and Agriculture Organization (FAO) reports that livestock production contributes to 14.5% of global greenhouse gas emissions. Shifting to plant-based foods can mitigate climate change and reduce land and water usage.
- **Ethical Concerns:** Awareness of animal cruelty in factory farming has led many consumers to seek cruelty-free dietary alternatives.

Market Impact

- **Growth in Plant-Based Products:** Companies like Beyond Meat and Impossible Foods have driven the market for plant-based meat substitutes. Global sales of plant-based meat were valued at $5.6 billion in 2021 and are projected to reach $10 billion by 2025 (Euromonitor International, 2021).
- **Regional Trends:** In India, a traditionally vegetarian-friendly country, startups like GoodDot and Epigamia are offering innovative plant-based dairy and meat alternatives. Meanwhile, in Western markets, oat milk brands like Oatly have seen exponential growth.

Challenges

- **Taste and Texture:** Consumer adoption is often limited by perceptions of taste and texture. Innovations in food science are addressing these concerns.
- **Affordability:** Plant-based products are often priced higher than traditional meat or dairy, making them less accessible to low-income groups.

2.2 Personalized Nutrition

Personalized nutrition is a growing trend that tailors dietary recommendations to an individual's genetic makeup, lifestyle, and health goals. The rise of wearable devices, health apps, and nutrigenomics has facilitated this shift.

Technological Drivers

- **AI and Machine Learning:** Tools like MyFitnessPal and Foodvisor analyze dietary habits and provide tailored nutritional advice.

- **DNA Testing and Nutrigenomics:** Companies like 23andMe and Nutrigenomix offer DNA-based dietary recommendations, linking genetics to optimal nutrient intake.

Market Impact

- **Consumer Behavior:** A 2020 survey by Nielsen found that 49% of consumers are willing to pay a premium for personalized health solutions.
- **Emerging Startups:** Companies like Habit (a subsidiary of Campbell Soup Company) provide meal plans based on individual metabolic profiles.

Benefits

- **Health Outcomes:** Personalized nutrition helps in managing chronic conditions like diabetes and obesity. For instance, individuals can receive diet plans tailored to improve their gut microbiome, enhance energy levels, or reduce inflammation.
- **Consumer Engagement:** Tailored solutions encourage consumers to actively participate in their health and well-being.

Challenges

- **Data Privacy:** Collecting sensitive health data raises privacy concerns. Companies must adhere to regulations like GDPR to ensure consumer trust.
- **High Costs:** DNA testing and customized nutrition plans are often expensive, limiting accessibility

2.3 Convenience-Driven Solutions

The demand for convenience is shaping food consumption patterns, with consumers prioritizing time-saving and hassle-free meal options. This trend is particularly pronounced among urban, dual-income households.

Key Drivers

- **Busy Lifestyles:** Increasing work hours and urbanization have reduced the time available for meal preparation.
- **Technological Integration:** Food delivery apps and e-commerce platforms have made it easier to access pre-cooked meals and groceries.

Market Trends

- **Ready-to-Eat and Meal Kits:** Companies like HelloFresh and Blue Apron offer pre- portioned meal kits, simplifying cooking for busy individuals. Ready-to-eat food sales are expected to grow by 7.2% annually between 2021 and 2026 (Grand View Research, 2022).
- **On-the-Go Snacking:** The market for healthy snacks, such as protein bars and fruit pouches, is expanding rapidly, with brands like KIND Snacks capitalizing on the trend.
- **Food Delivery Services:** Platforms like Zomato, DoorDash, and Uber Eats have transformed the way consumers access food, offering a range of options from local restaurants to cloud kitchens.

Challenges

- **Sustainability Concerns:** Single-use packaging associated with convenience foods raises environmental concerns. Companies are exploring compostable or reusable packaging as solutions.
- **Nutritional Quality:** Many convenience foods are high in sodium and preservatives. The industry is responding by developing healthier options.

3. ENVIRONMENT CHALLENGES

The global food system is significantly impacted by a range of environmental challenges, including climate change, biodiversity loss, and water scarcity. These challenges pose direct threats to food security, agricultural productivity, and the sustainability of food production systems. To address these issues, adaptive strategies such as regenerative agriculture, the development of drought- resistant crops, and improved water management practices are being explored and implemented. The need for innovation in food systems is critical, as it ensures long-term food security while mitigating environmental harm.

3.1 Climate Change and Its Impact on Food Systems

Climate change is one of the most pressing environmental challenges facing the global food system. It impacts agricultural productivity by altering temperature and precipitation patterns, increasing the frequency and severity of extreme weather events such as droughts, floods, and storms. These changes disrupt crop yields, reduce soil fertility, and exacerbate food insecurity, especially in vulnerable regions.

Key Impacts of Climate Change on Agriculture

Temperature Changes: Increased temperatures can reduce the yield of heat-sensitive crops like wheat, maize, and rice. A study by Lobell et al. (2011) suggests that for every 1°C increase in global average temperature, global crop yields could decrease by 5–15% for crops like wheat.

Increased Extreme Weather Events: Unpredictable and intense weather patterns, such as prolonged droughts, floods, and storms, can devastate crops and damage infrastructure, further threatening food production. For example, the 2019 cyclone in Mozambique destroyed over 100,000 hectares of crops, displacing thousands of farmers and affecting food security (FAO, 2020).

Reduced Growing Seasons: Changing climatic conditions can lead to shorter growing seasons in certain regions, impacting crop yields and food availability. In sub-Saharan Africa, changing rainfall patterns have already led to reduced productivity, threatening livelihoods and food security for millions of people.

Adaptive Strategies to Mitigate Climate Change Effects

Climate-Resilient Crops: Development of climate-resilient crops, such as drought-resistant varieties of rice, maize, and wheat, is crucial. In Africa, genetically modified (GM) drought- tolerant maize varieties have increased yields by up to 20% in water-scarce areas (Qaim, 2012).

Regenerative Agriculture: This agricultural approach focuses on improving soil health, increasing biodiversity, and enhancing carbon sequestration through practices like no-till farming, agroforestry, and rotational grazing. The Rodale Institute (2020) reports that regenerative agriculture can help sequester up to 322 billion metric tons of carbon dioxide globally, reversing some effects of climate change.

3.2 Biodiversity Loss and Its Consequences for Food Systems

Biodiversity loss is another critical challenge that threatens global food security. A reduction in biodiversity leads to the loss of vital ecosystem services, such as pollination, pest control, and soil fertility, which are essential for food production. The FAO (2020) estimates that over 75% of global food crops depend on animal pollination, yet many pollinator species, including bees and butterflies, are in decline due to pesticide use, habitat destruction, and climate change.

Consequences of Biodiversity Loss

Reduced Pollination Services: As pollinator populations decline, crops that depend on them, such as fruits, vegetables, and nuts, are threatened. The decline in bee populations, for example, has already been linked to lower yields of crops like apples and almonds in the United States and Europe (Goulson, 2015).

Pest and Disease Management: Loss of natural predators and biodiversity means that pests and diseases can proliferate, potentially devastating crops and reducing agricultural yields. The increase in monocultures, where one crop is grown over large areas, exacerbates this problem.

Strategies to Address Biodiversity Loss

Agroecological Practices: Incorporating biodiversity-friendly farming practices, such as planting cover crops, diversifying crops, and creating habitats for pollinators, can help support ecosystems and improve food production resilience.

Conservation of Natural Habitats: Protecting natural ecosystems like forests, wetlands, and grasslands is essential for maintaining biodiversity. The establishment of biodiversity reserves and the promotion of sustainable farming practices can support the recovery of pollinators and other critical species.

3.3 Water Scarcity and Its Impact on Agriculture

Water scarcity is a critical issue that impacts food systems worldwide. With the global population increasing and freshwater resources becoming increasingly strained due to overuse, pollution, and climate change, agricultural practices that are water-efficient are essential for sustaining food production. Agriculture is the largest user of fresh water globally, accounting for around 70% of global water withdrawals (FAO, 2017).

Key Impacts of Water Scarcity on Food Systems

Reduced Crop Yields: Water scarcity directly affects crop growth, leading to reduced yields, especially in arid regions. For instance, in India's Punjab region, water depletion from excessive irrigation has led to falling crop productivity and soil degradation (Kaur et al., 2020).

Water-Intensive Crops: Certain crops, such as rice and cotton, are highly water-intensive. With limited water availability, the cultivation of such crops is increasingly unsustainable, putting pressure on food systems.

Geopolitical Conflicts: Water scarcity also has geopolitical implications, with countries sharing water resources at risk of conflict over access to shared rivers and aquifers. The conflict between India and Pakistan over the Indus River is a notable example of how water scarcity can exacerbate tensions between nations (Agarwal, 2018).

Water Management Strategies

Efficient Irrigation Systems: Precision irrigation systems, such as drip and sprinkler irrigation, have been implemented in regions like Israel and California to reduce water wastage and improve crop yields. In Israel, the use of drip irrigation has enabled farmers to increase agricultural output with 40% less water (Hoffman et al., 2015).

Rainwater Harvesting: In regions like Africa, rainwater harvesting systems are being developed to store rainwater for agricultural use during dry seasons. This technology has been successful in countries like Kenya, where farmers are using rainwater storage tanks to improve water availability during droughts.

Drought-Resistant Crops: Developing drought-resistant crops, like drought-tolerant maize, is another strategy to combat water scarcity. These crops require less water to thrive and are increasingly used in regions such as sub-Saharan Africa, where water availability is a major challenge.

4. GLOBAL INFLUENCES

Global food systems have become increasingly interconnected, creating both opportunities and vulnerabilities. While globalization has enhanced access to diverse foods and increased trade efficiency, it has also exposed food systems to global shocks, such as pandemics, geopolitical conflicts, and rapid urbanization. The COVID-19 pandemic and the Ukraine-Russia conflict are two key events that have illuminated the fragility of food supply chains, underscoring the need for stronger resilience strategies, adaptive policies, and greater localization of food systems to ensure long-term food security. This section explores how these global influences affect food affordability, supply chain resilience, and overall food system stability.

4.1 The COVID-19 Pandemic and Its Impact on Global Food Systems

The COVID-19 pandemic revealed the vulnerability of global food supply chains to disruptions. During the early months of the pandemic in 2020, various sectors of the global food system faced severe challenges,

including labor shortages, disrupted transportation, and restrictions on food exports. These disruptions caused widespread shortages of essential food items and increased food prices globally.

Key Impacts of the COVID-19 Pandemic

Labor Shortages: As lockdown measures were implemented worldwide, agricultural production and food processing industries experienced labor shortages. In the U.S., many farm workers and food processing employees were unable to work due to illness or quarantine measures. According to a report by the International Labour Organization (2020), the agricultural sector lost up to 30% of its workforce during the pandemic, leading to reduced food production and processing capacity.

Supply Chain Disruptions: The global logistics network, including shipping routes and transportation systems, was heavily disrupted due to pandemic-related restrictions. Container shortages, port congestion, and delays in international shipping resulted in food delivery delays. The Food and Agriculture Organization (FAO, 2020) estimated that the pandemic caused a 15% reduction in global food trade volumes in 2020, particularly affecting countries reliant on food imports.

Rising Food Prices: The supply chain disruptions, combined with increased demand for staple goods, caused food prices to rise. According to the FAO (2020), global food prices increased by 6% in 2020, with prices for meat, dairy, and cereals rising the most. In many developing countries, food insecurity worsened as rising food costs made it difficult for low-income households to afford essential goods.

Shift Toward E-Commerce: The pandemic accelerated the growth of online grocery shopping and home delivery services. Platforms like Amazon Fresh and Instacart saw a 40% increase in sales during the lockdown periods. According to a report by McKinsey & Company (2020), e- commerce for groceries is expected to grow by more than 25% annually, a trend that is likely to continue post-pandemic.

Long-Term Implications for Food Systems: The COVID-19 crisis has highlighted the need for greater resilience in food systems. Countries are now focusing on diversifying food sources, increasing local food production, and investing in technology-driven solutions to improve the flexibility and robustness of food supply chains. Policies that promote the decentralization of food production, such as supporting small-scale and local farming, are being discussed more frequently to mitigate future disruptions.

4.2 The Ukraine-Russia Conflict and Its Impact on Global Food Security

The ongoing Ukraine-Russia conflict, which began in February 2022, has had a profound impact on global food security. Both Russia and Ukraine are major producers of essential commodities like wheat, corn, and sunflower oil. The war has disrupted these vital agricultural production areas, leading to skyrocketing food prices, shortages, and growing food insecurity in multiple regions worldwide.

Key Impacts of the Ukraine-Russia Conflict on Global Food Systems

Disruption of Grain Exports: Ukraine is one of the world's largest exporters of wheat and corn. Prior to the conflict, Ukraine exported around 10% of the global wheat supply and 15% of global corn exports. The war has disrupted these shipments due to port blockages, damage to infrastructure, and the lack of safe transport routes. According to the FAO (2022), in the first months of the war, Ukrainian wheat exports fell by more than 50%, contributing to a significant decrease in global grain availability.

Soaring Global Food Prices: The conflict exacerbated the global food price crisis. In 2022, global food prices hit record highs, with wheat prices rising by nearly 50% and corn prices increasing by 35% (World Bank, 2022). Countries dependent on imports from Russia and Ukraine, such as Egypt, Lebanon, and Tunisia, saw their food import bills soar. In Africa, where many countries rely heavily on wheat imports, the price of bread and staple foods rose dramatically, contributing to food riots and social unrest.

Impact on Developing Countries: Low-income countries, particularly those in sub-Saharan Africa and the Middle East, were hit hardest by the food supply disruptions. According to the World Food Programme (2022), nearly 47 million people in East Africa faced food insecurity exacerbated by rising wheat prices and the conflict's

effects on regional agricultural production. In countries like Egypt, which imports more than 50% of its wheat from Russia and Ukraine, the conflict led to a severe food crisis, pushing millions of people into poverty and hunger.

Fertilizer Shortages: The war also caused disruptions in the global fertilizer market. Russia is a major producer of fertilizer, and sanctions against Russia have led to a global shortage of fertilizers. This shortage has driven up fertilizer prices, further impacting food production costs. The FAO (2022) reported that global fertilizer prices increased by 30% in 2022, leading to higher production costs for farmers and ultimately higher food prices for consumers.

Long-Term Implications for Food Security: The Ukraine-Russia conflict has underscored the risks of over-reliance on specific regions for critical food and agricultural inputs. In the long term, countries are likely to invest in food system diversification, focusing on boosting domestic production and exploring alternative international trade partners. Furthermore, the conflict has highlighted the need for policies that ensure food affordability and availability in crisis situations, particularly for vulnerable populations.

4.3 Urbanization and Its Influence on Food Systems

Urbanization is another global trend that affects food affordability and supply chain resilience. With over 56% of the global population now living in urban areas, urbanization is shaping food systems in both positive and challenging ways. As urban populations grow, the demand for food increases, putting pressure on food production and supply chains.

Key Impacts of Urbanization on Food Systems

Increased Demand for Processed and Convenient Foods: Urbanization is often associated with a shift toward more processed and convenient foods, as people living in cities have less time for food preparation. This trend has led to the rise of fast food, packaged snacks, and ready-to-eat meals. According to the World Health Organization (WHO, 2021), the demand for ultra-processed foods has contributed to rising rates of obesity and diet-related diseases in urban areas.

Pressure on Supply Chains: Urban areas often rely on food imports from rural regions, which can be disrupted by supply chain failures, weather events, or political instability. As urban populations grow, supply chains face increasing pressure to provide food to densely packed cities. This can lead to food price volatility, particularly for perishable goods.

Food Deserts and Inequality: Urban areas, particularly in low-income countries, are increasingly experiencing food deserts—areas with limited access to affordable, healthy food. As large cities expand, low-income neighborhoods may find themselves further disconnected from fresh food sources, leading to higher prices and poor nutrition. According to a study by Walker et al. (2010), low-income urban areas in the U.S. face significant barriers to accessing healthy foods, contributing to food insecurity and health disparities.

Policy Responses to Urbanization Challenges

Urban Agriculture: Many cities are turning to urban agriculture as a way to address food insecurity and create more sustainable food systems. Urban farming initiatives, including rooftop gardens, vertical farming, and community gardens, are growing in popularity. These practices allow for local food production in cities, reducing the reliance on distant agricultural regions and improving food security. For example, Singapore has developed vertical farms that provide a significant portion of its fresh vegetables (Liu et al., 2020).

Improved Food Distribution Systems: To address urban food challenges, cities are focusing on improving food distribution systems, including local food hubs, farmers' markets, and direct-to- consumer services. These strategies aim to create a more resilient and sustainable urban food system.

5. TO PROPOSE SUSTAINABLE SOLUTIONS THROUGH POLICY, INNOVATION, AND COLLABORATION

Addressing the multifaceted challenges facing global food systems requires comprehensive and integrated solutions. These solutions must stem from collaboration across various sectors, including government, industry, and civil society, as well as through the innovative use of technology and policy interventions. To build a sustainable and resilient food system, it is crucial to prioritize sustainability in food production, consumption, and distribution while addressing environmental, social, and economic factors. This section discusses key strategies and sustainable solutions for tackling food system challenges, focusing on policy frameworks, technological innovation, and collaboration across stakeholders.

5.1 Policy Interventions for Sustainable Food Systems

Governments play a critical role in fostering sustainable food systems through effective policies that incentivize environmental stewardship, improve food security, and promote sustainable agricultural practices. Policy frameworks must ensure long-term sustainability by addressing food insecurity, protecting ecosystems, and mitigating climate change.

Key Policy Interventions

- **Sustainable Agricultural Subsidies:** One of the most effective ways governments can influence agricultural practices is by shifting subsidies from unsustainable agricultural practices (such as monocropping and chemical-intensive farming) toward sustainable and regenerative practices. Policies can incentivize farmers to adopt crop rotation, agroforestry, and soil health practices. For instance, in the European Union, the Common Agricultural Policy (CAP) has increasingly focused on "green" payments that support sustainable farming techniques (European Commission, 2021). This policy framework provides direct payments to farmers who implement environmentally friendly practices, such as reducing pesticide use and enhancing biodiversity.
- **Carbon Pricing and Emissions Targets:** Governments can also use carbon pricing, such as carbon taxes or cap-and-trade systems, to encourage industries to reduce emissions. For example, the EU's Carbon Border Adjustment Mechanism (CBAM), which was introduced in 2021, charges carbon-intensive goods at the border, driving both local and global industries to adopt greener technologies. The idea is to internalize the environmental costs of carbon emissions, promoting industries that produce low-carbon food products.
- **Regulations on Food Waste:** Policies that regulate food waste and incentivize resource- efficient practices are critical to improving food system sustainability. The UN has set a target to halve global food waste by 2030 as part of its Sustainable Development Goal 12 (FAO, 2021). Governments can support this goal through policies that reduce food waste in both production and consumption phases. For example, France introduced legislation in 2016 banning supermarkets from throwing away unsold food, instead requiring them to donate it to charities. This policy has contributed to reducing food waste and improving food access for low-income populations.
- **Sustainable Trade Policies:** Governments can also encourage sustainable food sourcing by implementing trade policies that incentivize ethical sourcing of agricultural products. For instance, in 2022, the EU proposed the "Farm to Fork Strategy," which aims to make food systems fair, healthy, and environmentally-friendly. It encourages the use of sustainable practices such as reducing pesticide use, increasing organic farming, and ensuring fair wages for agricultural workers (European Commission, 2020).

5.2 Innovation in Food Production and Technology

Technological innovation is one of the most promising avenues for addressing the growing challenges of food production and sustainability. Through technological advancements, we can increase food production without expanding land use, reduce the environmental footprint of farming, and make food systems more efficient.

Key Technological Innovations

- **Precision Agriculture:** Precision agriculture leverages data, sensors, drones, and artificial intelligence (AI) to optimize crop production, reduce input waste, and conserve resources like water. A study by the International Food Policy Research Institute (IFPRI, 2021) showed that precision agriculture techniques could increase crop yields by 20-30% while reducing water usage by up to 50% in areas that face water scarcity. Farmers using precision irrigation, for example, are able to apply water only where and when it is needed, significantly conserving water resources.
- **Alternative Proteins and Lab-Grown Meat:** With the increasing environmental concerns surrounding livestock farming, there has been a rise in alternative proteins, such as plant- based meats and lab-grown (cultured) meat. According to a report by the Good Food Institute (2021), the global plant-based meat market is projected to reach $21.1 billion by 2027, driven by increasing consumer awareness of environmental and health impacts associated with traditional meat production. Lab-grown meat, such as the cultured chicken approved for sale in Singapore in 2020, uses 96% less water and generates 45% fewer greenhouse gas emissions compared to conventional meat production (Good Meat, 2021).
- **Vertical Farming and Urban Agriculture:** Innovations in vertical farming and hydroponics are revolutionizing food production by growing crops in controlled, urban environments with minimal land use. These technologies allow for year-round food production, reducing the need for large-scale land use and transportation. In Singapore, for example, vertical farming company *Sustenir Agriculture* grows over 10 varieties of crops in its urban farm using hydroponics, producing high-quality food in the heart of the city (Liu et al., 2020). This innovation helps alleviate pressure on rural land and reduce carbon emissions from long-distance food transport.
- **Food Waste Reduction Technologies:** Innovations in food waste management, such as food waste-to-energy technologies and food repurposing, can help reduce the environmental impact of wasted food. A study by the FAO (2020) showed that 30-40% of food produced globally is wasted, contributing significantly to environmental degradation. Technologies like anaerobic digesters convert organic waste into biogas, which can be used for energy, reducing food waste and increasing energy sustainability. Additionally, repurposing food scraps into new products, such as using surplus bread for beer production, is gaining traction in the food industry (Weitzman, 2021).

5.3 Collaborative Approaches: Industry, Consumers, and Civil Society

Addressing the sustainability challenges in food systems requires strong collaboration between governments, industries, consumers, and civil society organizations. All stakeholders must play a part in building a more resilient and equitable food system.

Key Areas for Collaboration

- **Public-Private Partnerships (PPPs):** Governments and businesses can work together through PPPs to promote sustainable food practices. One example is the partnership between the FAO and the World Economic Forum's *New Vision for Agriculture* initiative, which brings together public and private stakeholders to align agriculture with sustainable development goals (World Economic Forum, 2021). Such collaborations allow for knowledge-sharing, pooling of resources, and the development of policy frameworks that support sustainable agriculture at scale.
- **Consumer Advocacy and Behavior Change:** Consumer behavior plays a significant role in shaping food systems. The increasing demand for plant-based foods, organic products, and sustainably sourced goods is pushing companies to adapt their offerings. NGOs like the *World Resources Institute* have highlighted the importance of consumer education in shifting eating habits towards more sustainable diets. Governments can promote such shifts by subsidizing healthier and more sustainable foods, providing incentives for local food systems, and creating policies that ensure transparency in food labeling, so consumers can make informed choices (World Resources Institute, 2021).

- **Corporate Responsibility:** Companies, especially those in the food and agriculture industries, have a significant role in shaping the sustainability of food systems. Companies like Unilever and Nestlé are working toward sustainability goals that include sourcing 100% of their ingredients from sustainable farms and reducing food waste throughout their supply chains. In 2021, Nestlé reported that it had reduced its carbon emissions by 30% since 2018 and committed to achieving net-zero emissions by 2050 (Nestlé, 2021). These corporate sustainability efforts are essential to scaling sustainable food production practices.
- **Non-Governmental Organizations (NGOs):** NGOs play a crucial role in advocating for food systems transformation. Organizations such as *Oxfam* and *The World Food Programme* work to promote food security and sustainable agriculture through policy advocacy, humanitarian aid, and education programs. Collaboration with governments and private sectors can amplify the reach of these efforts.

REFERENCES

1. Qaim, M. (2012). Genetically modified crops and food security. PLOS ONE, 7(11), e50423. https://doi.org/10.1371/journal.pone.0050423
2. FAO. (2013). Tackling climate change through livestock: A global assessment of emissions and mitigation opportunities. Food and Agriculture Organization of the United Nations.
3. Goulson, D. (2015). The impact of pesticides on the health of pollinators. Science Progress, 98(2), 104-122. https://doi.org/10.1177/0036850415580196
4. Hoffman, M. H., et al. (2015). Water use efficiency and management in Israeli agriculture. Agricultural Water Management, 154, 53-61. https://doi.org/10.1016/j.agwat.2015.01.024
5. Ranganathan, J., Waite, R., Searchinger, T., & Hanson, C. (2016). The future of food: Farming practices for a changing climate. World Resources Institute.
6. FAO. (2017). The state of food and agriculture: Leveraging food systems for inclusive rural transformation. Food and Agriculture Organization of the United Nations.
7. Agarwal, A. (2018). Water conflicts in India: A perspective. Environmental Science & Policy, 88, 113-121. https://doi.org/10.1016/j.envsci.2018.07.004
8. IBM. (2018). IBM Food Trust: Enhancing food safety with blockchain. Retrieved from https://www.ibm.com/foodtrust
9. FAO. (2020). The state of food security and nutrition in the world 2020. Food and Agriculture Organization of the United Nations.
10. Rodale Institute. (2020). Regenerative organic agriculture: Sequestering carbon and reversing climate change. Rodale Institute Reports.
11. Liu, Y., Yang, W., & Shen, J. (2020). Urban agriculture in Singapore: A study of vertical farming. Agricultural Systems, 183, 102832. https://doi.org/10.1016/j.agsy.2020.102832
12. Good Meat. (2021). Lab-grown chicken: Sustainable meat for the future. https://goodmeat.co
13. International Food Policy Research Institute (IFPRI). (2021). Precision agriculture and sustainable food systems: The role of technology. IFPRI Policy Brief.
14. Nestlé. (2021). Nestlé sustainability: Our progress towards 2020 and beyond. https://www.nestle.com/sustainability
15. Weitzman, D. (2021). Sustainable food innovation: From food scraps to new products. Sustainable Development Journal, 34(2), 177-189. https://doi.org/10.1002/sd.2131
16. World Economic Forum. (2021). New vision for agriculture: A public-private partnership to drive food systems transformation. https://www.weforum.org/projects/new-vision-for-agriculture
17. World Resources Institute. (2021). Shifting diets for sustainable food systems. https://www.wri.org/insights/shifting-diets
18. Grand View Research. (2022). Meal kit delivery services market size, share & trends analysis. Retrieved from www.grandviewresearch.com
19. World Bank. (2022). Food crisis: Impact of the Ukraine-Russia conflict on global food supplies. Retrieved from https://www.worldbank.org
20. World Food Programme. (2022). Ukraine crisis: Global food security impact.

21. McKinsey & Company. (2020). The future of grocery: E-commerce, digital disruption, and the new normal.

22. Nielsen. (2020). Consumer health trends report. Retrieved from www.nielsen.com

23. European Commission. (2020). Farm to Fork Strategy: For a fair, healthy and environmentally- friendly food system. https://ec.europa.eu/info/food-farming-fisheries/sustainability/farm-fork- strategy_en

24. European Commission. (2021). The Common Agricultural Policy (CAP) in the EU. https://ec.europa.eu/info/food-farming-fisheries/cap_en

EDUCATION IN 21ST CENTURY

Monica

Assistant professor, KC College Of Education, Nawashar

Education is the key to emancipation; it can empower man to accomplish anything. Education is the spark that ignites the faculties of mind, body, and intellect which further develop into skills and knowledge. Without education these faculties would remain mere seeds of possibilities. Although education is the basis for overall development of a person, but skill development is also the need of the hour as it certainly helps one to compete in the world. Education should be mixed with skills development. Experimenting, field trips, practical work, projects, research work, hands on training, internship etc should be introduced at early age. Only then the true objectives of education can be achieved. The greater focus on skill development will open tremendous opportunities to schools as they would become the real centers of learning to life. Referring to four pillars of education, learning to do, the schools will actually train the children to do so. Higher education programmers have to be redesigned to meet the growing demands of specialization, to provide flexibility in the combination of course, to facilitate mobility across courses, and to update and modernize existing curricula.

The existing course-curricula generally do not adequately acquaint the students with Indian reality; nor do they equip them with the capabilities and tools to analyze and solve Indian problems. A thorough understanding of the Indian socio-economic scenario in its totality is essential for transforming it properly and speedily. The curriculum is the tool with which this objective can be achieved. Under the existing instructional methods, the students become passive learners; their own initiative, imagination and innovativeness seldom make any contribution. The curricula to be developed for higher education courses should seek to rectify the above defects. The acquisition of a growing degree of dynamism by our higher educational system constitutes one of the most important challenges of the emerging era. The criteria of quality and relevance of higher education should be given top priority. International standards have to be maintained while restructuring the courses.

The Dakar framework for Action states that all young people and adults have “the human rights to benefit from an education that will meet their basic learning needs in the best and fullest sense of the term; an education that includes learning to know, learning to do, learning to live together and learning to be” based on four pillars of education in the Delor‘s report to UNESCO of the international commission on education for the Twenty first Century (UNESCO,1996). This report stresses the importance of enhancing of twenty first century. It offers a conceptual basis for a life skills approach to education that not only reinforces the definition of Life Skills as psychosocial life skills with practical psychomotor skills.

The teachers at all levels have the responsibility of changing the tone and the content of education (curriculum) to make it meaningful for the students who would need a sound education for a better future. The curriculum has to be responsive to the needs and aspirations of a society that undergoes change with the passage of time. The concerns and priorities of the nation should, therefore, be suitably reflected in the curriculum at all levels.

The term 21st century has become an integral part of educational thinking and planning for the future. Educators and administrators are actively searching for ways to prepare students for the future, and the educational system has been evolving faster than ever before. Various studies have shown us that rote memorization is not an effective learning strategy and that teacher-centered classrooms may not be the most efficiently structured ones for student engagement.

However, despite learning about the skills that students will need to develop to become successful in the 21st century, as well as what beliefs about education may be worth hanging onto or throwing away, schools and teachers are left trying to figure out what their role needs to be in the education of their 21st century students.

Nowadays, we don’t live in the same world. Society is a mix of many different beliefs and cultures. Globalization has opened up the world and allowed people to connect in new and exciting ways. We blend traditions and create unique belief systems that are not taught in any classroom, but are developed through our

life experiences and passions. We transmit our values and cultures without the expectation of them being adopted by our audience, just accepted by them.

Society has changed. We cannot adequately prepare students for the society that exists today or will exist tomorrow, if we continue to prepare them for the society that existed yesterday. In order to prepare students to play their role in the 21st-century society we are a part of, a few things need to be considered when deciding how education will look in our schools and classrooms.

The goal of modern education is to focus on ensuring that children would be problem solvers, decision makers, and enablers. Students need to leave school with life skills that help them navigate challenges even if they don't know the solutions to them. Most importantly they need to be comfortable to work with people around them who have different backgrounds and life experiences collaboratively.

EDUCATIONAL SYSTEM FOR THE 21ST CENTURY MUST SATISFY THE FOLLOWING CRITERIA

1. It must respond to the needs of the individual as well as community. There should be excellence in relevance.
2. The system must dynamically interact with the needs, aspirations and the cultural ethos of the society, yet catch up with the changing technology.
3. It must tackle the issue of knowledge proliferation by appropriate mechanisms such as focusing on "learning how to learn "dividing the curriculum into common "core" plays wide range of optional modules to be opted and attained at the individual pace, designing preparatory course etc.
4. The centers of learning viz. schools, colleges, and universities should establish strong bonds with the consumers and the society on one hand, and the service providers and the agencies, on the other for achieving relevance. The approach to education should be essentially inter- disciplinary and multidimensional.
5. The system must make optimum utilization of new technology and bring cost- effectiveness.
6. It must be flexible and collaborative.

PHILOSOPHY OF EDUCATION FOR 21ST CENTURY

The following are the important characteristics of the philosophy of education for the 21st century:

1. A new view of knowledge
2. A greater integration of knowledge
3. A renewed commitment to lifelong learning
4. A commitment to the goal that education must be for all
5. An emphasis on personal development, self-awareness, esteem and confidence, in order to deal with a rapidly changing world.
6. A commitment to promoting inter -personal development supporting the ability of young people to develop relationships with others.
7. A commitment to co-operative globalism i.e. commitment to care for all.

DEVELOPING A NEW VIEW OF LEARNING FOR THE 21ST CENTURY

To encourage interactive learning, learning environment needs to be encouraged to include:

1. Pupil goal- setting
2. Problem –oriented learning

3. Enterprising learning (the enterprise capability includes skills of thinking, planning , communicating, problem-solving, monitoring and assessing will)
4. Collaborative learning
5. Technology – based learning
6. Teachers playing the role of facilitators instead of being the sources of knowledge

Modern teaching methodology is focused on thinking and analytical skills. The transferable abstract thinking skills and reflective observation in students helps in developing future careers. The process involves the use of project making, field trips, and facing challenges in a controlled environment. It is the bedrock of future success as it bridges the gap between learning and doing. The discrepancy between theory and practice is overcome. The learning curve is enhanced, and the methodology is instrumental in producing demonstrable mindset and behavioral changes.

Education needs to help students take part in this global community and find ways of impacting more than just their neighborhood. This doesn't mean that they do not need to learn the value of helping others around them and protecting their immediate environment, but that they should also be learning about how they can help and protect a world further away from them, but also closer all the time.

1. INSTRUCTION SHOULD BE STUDENT-CENTERED

The days of lecturing teachers has passed – though not entirely. While student-centered learning is strongly encouraged in the 21st century, this does not mean that the teacher can never give a lecture again. Instead, it means that the main source of knowledge in the classroom should not be the teacher. Education is no longer about listening to the teacher talk and absorbing the information. In order to contribute to society, students will need to be able to acquire new information as problems arise. Then, they will need to connect the new information with the knowledge they already have and apply it to solving the problem at hand. They will not be able to call upon a teacher for answers, so will need to have 'learned how to learn' on their own.

In this classroom model, the teacher would act as a facilitator for the students. Instead of passively receiving information, the students would gather information on their own, under the guidance of their teacher. Students have an enhanced sense of motivation and responsibility. They engage in many different types of hands-on activities, as well as demonstrate learning in many different ways. Learning is about discovery, not the memorization of facts.

2. EDUCATION SHOULD BE COLLABORATIVE

Students must learn how to collaborate with others. Society today has people collaborating across the globe. How can students be expected to work with people from other cultures, with different values from their own, if they are not able to work with the people they see each day in their classroom?

Students should be encouraged to work together to discover information, piece it together, and construct meaning. Collaboration should also be dynamic. Students should learn how to recognize the different strengths and talents each person can bring to a project, and change roles depending on those attributes. Schools should also be collaborating with other educational institutions around the world to share information and learn about different practices or methods that have been developed. They should be willing to alter their instructional methods in light of new advancements.

3. LEARNING SHOULD HAVE CONTEXT

Student-centered does not mean that the teacher gives up all control of the classroom. While students are encouraged to learn in different ways, the teacher still provides guidance as to the skills that need to be acquired. The teacher can make a point of helping students to understand how the skills they are building can be applied in their lives. Students will be much more motivated to learn something that they can see the value in. Since we are no longer preparing students for specific tasks and roles, we need to take a more general approach

and teach them the skills that are useful in any situation. Lessons have little purpose if they do not have any impact in a student's life outside of the school.

4. SCHOOLS SHOULD BE INTEGRATED WITH SOCIETY

In order to prepare students to become responsible citizens, we need to model what a responsible citizen is. Schools will often work at accomplishing this by creating events for the school community, by encouraging students to join committees or take part in school projects, and by occasionally helping the community around them with activities such as food drives or neighborhood clean-ups. With the powers of technology and the internet, students of today can do even more. Our community is no longer just the area of space located around the school, but reaches out and envelopes the world.

Education needs to help students take part in this global community and find ways of impacting more than just their neighborhood. This doesn't mean that they do not need to learn the value of helping others around them and protecting their immediate environment, but that they should also be learning about how they can help and protect a world further away from them, but also closer all the time. Moreover, the most successful worker in the twenty first century will be the person who has the balanced personal development, and who is open to new ideas and opportunities. Therefore, education programmers' for the work force will have to be conceived broadly.

REFERENCES

1. Essential rules of 21st century learning
2. Education and development Dr J.S.Dhillon
3. Dinker,G.: Towards maximization of learning potential of learners Wholistic Teacher Education, CASE, Faculty of Education of Education and Psychology , M.S. University of Baroada, Vadodara.
4. M.B.(Ed.): Fourth survey of Research in Education, NCERT, New Delhi.
5. NCF(2005) : National Curriculum Framework ,NCERT, New Delhi:
6. Walia J.S. Education in Emerging Indian Society, Ahim Paul Publisihers
7. www.unesco.org/delors/India.htm

NAVIGATING THE INTERFACE OF DATA PRIVACY LAWS AND FINTECH: CHALLENGES, OPPORTUNITIES, AND ETHICAL INNOVATIONS

[1]Mehak Goyal [2]Naresh Sachdev [3]Tanya Mohan [4]Kawalpreet Sharma

[1,3,4] Assistant Professor, Department of Business Management, Punjab College of Technical Education, Ludhiana, Punjab, India.

[2] Director, Department of Business Management, Punjab College of Technical Education, Ludhiana, Punjab, India.

ABSTRACT

This investigation examines the evolving connection between information confidentiality regulations and Financial Technology (FinTech) enterprises, focusing on the impact of these policies on creativity, adherence, and client confidence. Using a comprehensive review of current publications, the analysis identifies the challenges FinTech companies have in handling complex legal frameworks, as well as the opportunities. The research aims to bridge the gaps in understanding that exist where technology, law, and ethics intersect in the rapidly evolving world of digital finance. It seeks to explore how these areas interact, uncovering the challenges and complexities that arise as digital currencies and monetary systems advance.

Keywords: FinTech, Data Privacy Laws, Regulatory Compliance, Ethical Innovation, Artificial Intelligence (AI), Digital Financial Ecosystem, Technological Advancement, Regulatory Compliance

INTRODUCTION

Fintech has changed the way financial services work by offering new and creative tools that make it easier for more people to access services, improve efficiency, and keep customers more engaged. Nevertheless, the swift growth of FinTech has introduced notable difficulties, especially in the domain of data protection. As dependence on large databases and artificial intelligence grows, safeguarding customer information has become a top responsibility. This study explores the impact of legislation regarding data privacy on FinTech businesses, demonstrating the balance of innovation and compliance with laws. Through an analysis of international regulatory systems and their effects, the research aims to offer perspectives on cultivating a resilient and ethically sound FinTech environment.

In order to improve the efficiency, accessibility, and user experience, innovative solutions have been cropping up in the global financial world. All thanks to Financial Technology (FinTech).

FinTech companies have increased technologies like big data, artificial intelligence (AI), and blockchain to disrupt traditional financial models (Narayan & Tiwari, 2021). However, with this rapid technological advancement comes the challenge of ensuring the protection of consumer data. As data privacy breaches, cyber threats, and the of personal information become more prevalent, the safeguarding of sensitive data has become a top priority in the FinTech sector (Binns, 2018).

Data privacy laws like - the European Union's General Data Protection Regulation (GDPR) and California Consumer Privacy Act (CCPA) aims to protect the consumers' personal data that creates new obligations for companies such as FinTech firms, that ensures transparency and accountability in data handling. These laws generated both possibilities and challenges that get for FinTech enterprises. On one hand, compliance with these laws can build trust and confidence among consumers, fostering ethical practices in the sector (Chakraborty & Joshi, 2019). On the other hand, they present challenges such as high compliance costs and operational hurdles that may limit innovation and slow technological advancements (Hughes & Siedel, 2020).

Furthermore, the global nature of FinTech complicates the regulatory landscape, as companies operating in

multiple jurisdictions must comply with varying data protection laws, each with its own requirements and enforcement mechanisms (Zohar & Halpern, 2020). Thus, the interplay between FinTech innovation and data privacy laws requires careful consideration to ensure that companies can continue to innovate while protecting consumer data.

This research focuses on understanding how data privacy laws affect the way FinTech companies innovate and operate. By examining the balance between regulatory compliance and technological advancement, the study identifies challenges and opportunities for FinTech firms navigating the evolving legal landscape. Moreover, it aims to propose strategies that can help FinTech companies align regulatory compliance with ethical innovation, fostering a sustainable and consumer-friendly ecosystem.

The growth of Financial Technology (FinTech) has revolutionized the global financial services sector, offering innovative solutions that enhance efficiency, accessibility, and user experiences (Narayan & Tiwari, 2021). As FinTech companies adopt technologies like big data, artificial intelligence (AI), and blockchain, they challenge traditional financial models while introducing new risks, particularly regarding data privacy (Binns, 2018). As digital transactions become more common, protecting consumer data has become a top priority. This has led to the introduction of data protection laws worldwide, like the European Union's General Data Protection Regulation (GDPR) and California's Consumer Privacy Act (CCPA).

These data privacy regulations, while providing essential protections for consumer information, also pose challenges to FinTech firms. The complex regulatory landscape, including varying data protection requirements across jurisdictions, complicates compliance for FinTech companies, especially those operating globally (Zohar & Halpern, 2020). Moreover, while adhering to data privacy laws can help build consumer trust and ensure ethical practices, it also raises concerns about the high costs of compliance and the potential stifling of innovation (Chakraborty & Joshi, 2019). Understanding how data privacy laws impact FinTech innovation and operations is critical for balancing compliance with technological progress in the sector (Hughes & Siedel, 2020).

The research into this intersection of FinTech and data privacy laws suggests that while compliance can create operational constraints, it also presents opportunities for ethical innovation by establishing a framework for responsible data handling and transparency (Chou & Liu, 2020). This highlights the need for FinTech companies to align regulatory compliance with technological advancements, ensuring that innovation does not come at the expense of consumer protection (Haggerty & Lee, 2021).

The complexity of data privacy laws and their impact on FinTech operations underscores the importance of navigating these regulatory frameworks carefully. This study focuses on examining the challenges and opportunities created by data privacy laws. It aims to suggest strategies that enable FinTech companies to innovate while staying compliant and upholding ethical standards.

OPPORTUNITIES

Development of Privacy-Enhancing Technologies (PETs): FinTech firms can innovate with technologies like encryption and blockchain to protect consumer data while maintaining service functionality.

Increased Consumer Trust and Loyalty: By prioritizing data privacy and transparency, FinTech companies can build trust, strengthen relationships, and foster long-term loyalty.

Compliance as a Market Differentiator: Proactively complying with regulations can serve as a competitive edge, attracting privacy-conscious consumers and protecting the company from legal risks.

New Business Models Focused on Data Privacy: FinTech firms can adopt privacy-centric business models, such as subscription-based services, where consumers pay for enhanced privacy features.

Enhanced Cross-Border Data Protection Solutions: Developing flexible, compliant solutions for global markets can help FinTech companies expand internationally while maintaining high privacy standards.

Regulatory Technology Solutions: The complexity of data privacy laws creates opportunities for innovations, helping firms efficiently navigate compliance through AI and automation.

REVIEW OF LITERATURE (ROL)

The Global Evolution of Data Privacy Laws

The growth of data privacy regulations marks a watershed moment in the worldwide attempt to safeguard consumer data in an increasingly digital society. As financial services move to digital platforms, massive volumes of personal data are being collected, stored, and processed, raising serious privacy issues. The General Data Protection Regulation (GDPR), implemented by the European Union in 2018, is one of the world's most comprehensive data protection legislation, imposing rigorous requirements for data processing procedures. Dorfleitner et al. (2023), the GDPR sets a global benchmark by mandating transparency, accountability, and consumer consent in the processing of personal data. These regulations have significantly influenced FinTech firms operating in the European Union and beyond, pushing companies to reassess their data handling processes and adopt practices that prioritize consumer privacy.

However, the implementation of such stringent laws across different jurisdictions presents challenges. As Dorfleitner et al. (2023) note, the lack of uniformity in data privacy laws worldwide creates a complex regulatory landscape for multinational FinTech companies. Different countries have varying levels of regulatory rigor, leading to difficulties in achieving compliance across borders. This fragmentation results in FinTech firms needing to navigate amaze of laws and regulations, which increases operational costs and complicates the development of global strategies. While the GDPR has set a global precedent, many countries still lack comprehensive data protection frameworks, creating significant legal gaps and enforcement challenges for global companies. Ensuring uniformity in data protection regulations continues to be a significant challenge in the digital financial landscape.

FINANCIAL TECHNOLOGY ETHICS

The integration of technology into finance brings significant ethical challenges, particularly regarding data privacy. Aldboush and Ferdous (2023) emphasize that FinTech companies must focus on being transparent, respecting data ownership, and avoiding bias, especially in AI- driven financial services. As FinTech firms leverage big data and AI to deliver personalized services, ethical questions arise about the use of consumer data. A critical issue is ensuring that consumers are clearly informed about how their data is collected, processed, and shared. Transparency is essential for fostering trust, especially in the financial industry, where consumers expect a strong commitment to confidentiality and ethical handling of their sensitive information.

As AI-driven financial services continue to grow, significant ethical concerns arise, particularly regarding data ownership and algorithmic bias. Aldboush and Ferdous (2023) stress that FinTech companies must establish clear policies on data ownership to ensure consumers maintain control over their personal information.

Equally important is addressing the risk of algorithmic bias. FinTech firms should implement strict anti-discrimination measures to prevent AI systems from perpetuating or amplifying existing inequalities. Ethical considerations in FinTech extend beyond mere regulatory compliance; they reflect a deeper commitment to fairness and responsibility. This includes leveraging AI and data analytics to create inclusive financial services that benefit all consumers, especially vulnerable or underserved populations, rather than excluding or disadvantaging them.

REGULATORY CHALLENGES

The regulatory challenges faced by FinTech firms are a focal point of many studies in the field. Sinaga (2021) highlights that the dynamic nature of the FinTech industry, coupled with rapidly evolving regulatory frameworks, makes it difficult for firms to stay compliant with existing and emerging regulations. The regulatory landscape is characterized by frequent changes, with new laws and amendments being introduced at both national and international levels. This fluidity poses a significant challenge for FinTech companies, which must invest considerable resources in staying informed about regulatory changes and adjusting their operations accordingly.

Kharisma (2020) highlights the operational challenges faced by FinTech firms due to fragmented regulatory environments. Since FinTech companies often operate across multiple regions, each with its own set of rules on data privacy, consumer protection, and financial services, they must adapt their strategies to comply with

varying regulations in each jurisdiction. This adds complexity to their operations.

Furthermore, many regions have not yet developed clear guidelines for emerging FinTech services like cryptocurrency, digital wallets, and peer-to-peer lending, creating additional uncertainty for companies trying to innovate in these areas. As Sinaga (2021) points out, this regulatory uncertainty can hinder innovation, as firms may be reluctant to invest in new technologies without a clear understanding of how they will be regulated.

OPPORTUNITIES FOR INNOVATION

While regulatory challenges persist, data privacy laws also offer opportunities for innovation in the FinTech sector. Prastyanti et al. (2023) argue that compliance with data privacy regulations can create a competitive advantage by fostering consumer trustIn an era marked by frequent data breaches and increasing consumer concerns about privacy, FinTech firms that prioritize data protection can set themselves apart from competitors. By implementing strong security measures and being transparent about how they handle consumer data, these companies can build trust and enhance their reputation, ultimately attracting more customers who value their privacy and security.

Ethical compliance, as Prastyanti et al. (2023) suggest, can enhance a company's reputation and build long-term consumer loyalty, which is essential for sustainable growth in the FinTech industry.

Furthermore, adhering to data privacy laws can drive innovation by encouraging FinTech firms to develop new technologies and practices that align with regulatory requirements. Prastyanti et al. (2023) highlight that data privacy laws often push companies to adopt more secure and efficient systems, such as advanced encryption techniques, blockchain for transparent data sharing, and AI for enhanced fraud detection. These technologies not only improve compliance,

but they also provide new opportunities for business and increase operational efficiencies. As Prastyanti et al. (2023) conclude, while the regulatory environment presents challenges, it can also serve as a catalyst for innovation, leading to the development of more secure, ethical, and consumer-centric FinTech solutions.

OBJECTIVES

To review the challenges, opportunities and ethical innovations of data privacy laws and financial technology.

RESEARCH GAP

While much research has focused on the technological and economic aspects of FinTech, there is limited exploration of how legal frameworks intersect with ethical considerations. In particular, the impact of data privacy laws on promoting ethical innovation and building consumer trust has not been thoroughly examined. This study seeks to address this gap by offering a detailed analysis of the relationship between regulatory compliance, ethical practices, and technological advancement in the FinTech industry.

FINDINGS

- Fostering Ethical Innovation: Data privacy laws like the GDPR encourage FinTech firms to adopt ethical innovations, such as encryption a nd AI-driven privacy solutions, which enhance data security and consumer trust. These innovations help firms comply with regulations while gaining a competitive edge.
- Enhanced Consumer Trust: Adherence to data privacy laws boosts consumer trust by demonstrating a commitment to protecting personal information. Ethical compliance helps FinTech firms build long-term consumer loyalty and differentiate themselves in a crowded market.
- Operational Challenges: The fragmented global regulatory landscape creates challenges for FinTech companies, particularly those operating across multiple regions. Companies face high compliance costs and complexities due to varying regulations, but those that invest in compliance can gain a competitive advantage.

- Opportunities for Sustainable Growth: Data privacy laws present opportunities for FinTech firms to grow sustainably by adopting privacy-centric technologies, enhancing their reputation, and attracting consumer and investor confidence.
- Impact of Regulatory Uncertainty: Regulatory uncertainty, especially regarding emerging technologies like cryptocurrencies, can stifle innovation as companies wait for clearer regulations. Clearer and more consistent global standards could help mitigate this issue.
- Ethical Compliance as a Competitive Differentiator: Companies that prioritize ethical compliance with data privacy laws stand out in the market by gaining consumer trust, which is crucial for building long-term customer relationships in the FinTech sector.
- Future Regulatory Trends: As global data privacy laws evolve, future trends may lead to greater harmonization across jurisdictions, but also more stringent requirements. FinTech companies must stay adaptable to meet these changing regulatory demands.

CONCLUSION

This research seeks to enhance understanding of how data privacy laws influence the growth and development of the FinTech sector. As the digital financial ecosystem evolves, data privacy and protection have become crucial for both consumers and service providers. By filling existing research gaps, this study will offer a detailed analysis of how regulatory frameworks, especially data privacy laws, shape the technological advancements and ethical practices within FinTech. The findings will provide valuable insights into the role of data privacy in driving innovation while ensuring ethical responsibility in the industry.

Data privacy regulations like the General Data Protection Regulation (GDPR) and the California Consumer Privacy Act (CCPA) have set global standards for how personal data should be collected, processed, stored, and shared. While these regulations aim to protect consumers, they also impose significant compliance burdens on FinTech companies. This research will explore the complexities of these laws and examine how they affect FinTech firms' ability to innovate while ensuring compliance with strict data privacy and security requirements. Understanding the impact of these laws is essential, as they not only establish operational boundaries for FinTech companies but also create opportunities for the ethical development of new technologies and business models.

REFRENCES

1. Aldboush, H. H., & Ferdous, M. (2023). Building trust in fintech: an analysis of ethical and privacy considerations in the intersection of big data, AI, and customer trust. *International Journal of Financial Studies*, *11*(3), 90.
2. Khan, H. H., Khan, S., & Ghafoor, A. (2023). Fintech adoption, the regulatory environment and bank stability: An empirical investigation from GCC economies. *Borsa Istanbul Review*, *23*(6), 1263-1281.
3. Rabbani, M. R. (2022). Fintech innovations, scope, challenges, and implications in Islamic Finance: A systematic analysis. *International Journal of Computing and Digital Systems*, *11*(1), 1-28.
4. Makhija, P., Chacko, E., & Sinha, M. (2021). Transforming Financial Sector Through Financial Literacy and Fintech Revolution. *Financial Inclusion in Emerging Markets: A Road Map for Sustainable Growth*, 239-255.
5. Pranto, T. H., Hasib, K. T. A. M., Rahman, T., Haque, A. B., Islam, A. N., & Rahman, R. M. (2022). Blockchain and machine learning for fraud detection: A privacy-preserving and adaptive incentive-based approach. *IEEE Access*, *10*, 87115-87134.
6. Boto, K., Amos, G., Moran, J., Robbins, J., & Welden-Iley, J. The Rise of Fintech: Liability and Insurance. In *The Global Insurance Market and Change* (pp. 246-285). Informa Law from Routledge.
7. Dadabada, P. K. (2024). Analyzing the Impact of ESG Integration and FinTech Innovations on Green Finance: A Comparative Case Studies Approach. *Journal of the Knowledge Economy*, 1-20.
8. Hermawati, N., & Trinugroho, I. (2023). Fintech Studies in Indonesia: A Systematic Literature Review. In *International Student Conference on Accounting and Business* (Vol. 2).
9. Roh, T., Yang, Y. S., Xiao, S., & Park, B. I. (2024). What makes consumers trust and adopt fintech? An empirical investigation in China. *Electronic Commerce Research*, *24*(1), 3-35.

10. Colletti, M. (2024). Privacy Law: A Global Comparision of Data Protection Regulation. *Suffolk Transnat'l L. Rev.*, *47*, 262.
11. Lerner, J., Seru, A., Short, N., & Sun, Y. (2020). Financial innovation in the 21st century: Evidence from US patenting. *NBER Working Paper*, *28980*.
12. Garcia, R., & Torres, S. (2021). The intersection of technology, law, and ethics in the FinTech sector. Journal of Financial Law and Technology, 17(2), 40-55.
13. Hartzog, W., & Richards, N. (2020). Privacy's constitutional moment and the limits of data protection. *BCL Rev.*, *61*, 1687.
14. Masud, S. B., Rana, M. M., Sohag, H. J., Shikder, F., Faraji, M. R., & Hasan, M. M. Understanding the Financial Transaction Security through Blockchain and Machine Learning for Fraud Detection in Data Privacy and Security.
15. Łasak, P., & Williams, J. Digital Transformation and the Economics of Banking.
16. Marengo, A. (2024). Navigating the nexus of AI and IoT: A comprehensive review of data analytics and privacy paradigms. *Internet of Things*, 101318.
17. Ng, E., Tan, B., Sun, Y., & Meng, T. (2023). The strategic options of fintech platforms: An overview and research agenda. *Information Systems Journal*, *33*(2), 192-231.
18. Nawazish, S., & Afza, T. (2024). Fintech and Economic Policy Uncertainty Integration: Driving Efficiency in Commercial Banks through the Lens of ARDL Approaches. *The Critical Review of Social Sciences Studies*, *2*(2), 147-176.
19. Mishra, D., Kandpal, V., Agarwal, N., & Srivastava, B. (2024). Financial Inclusion and Its Ripple Effects on Socio-Economic Development: A Comprehensive Review. *Journal of Risk and Financial Management*, *17*(3), 105.
20. Neuwirth, R. J., & Tan, Y. (2024). Regulating FinTech in the Greater Bay Area: RegTech and the Role of Regulatory Sandboxes. *The Chinese Journal of Comparative Law*, *12*, cxae014.
21. Solow-Niederman, A. (2022). Information privacy and the inference economy. *Nw. UL Rev.*, *117*, 357.
22. Daoud, G. (2023). *The Evolving Nature Of Financial Crime With The Increase Of Internet Capabilities. Challenge Identification, Legal Considerations And Policy Recommendations* (Doctoral dissertation, School of Advanced Study).
23. Passanisi, F. (2024). FinTech as a transformative model for financial inclusion: a systematic review.
24. Lauridsen, N. (2024). The role of payments in digital finance.
25. Łasak, P., & Williams, J. Digital Transformation and the Economics of Banking. Aboojafari, R. Innovative Finance for Technological Progress.
26. Daoud, G. (2023). *The Evolving Nature Of Financial Crime With The Increase Of Internet Capabilities. Challenge Identification, Legal Considerations And Policy Recommendations* (Doctoral dissertation, School of Advanced Study).
27. Girard, T. The Global Political Economy of Digital Technology.
28. Winn, J. K., & Wright, B. (2000). *The law of electronic commerce*. Wolters Kluwer.
29. Daoud, G. (2023). *The Evolving Nature of Financial Crime with The Increase of Internet Capabilities. Challenge Identification, Legal Considerations and Policy Recommendations* (Doctoral dissertation, School of Advanced Study).
30. Houser, K., & Bagby, J. W. (2023). Next-Generation Data Governance. *Duke Law & Technology Review*.
31. Lui, A., & Lamb, G. W. (2018). Artificial intelligence and augmented intelligence collaboration: regaining trust and confidence in the financial sector. *Information & Communications Technology Law*, *27*(3), 267-283.
32. Martin, K. (2022). *Ethics of data and analytics: Concepts and cases*. Auerbach Publications.
33. Schnebel, E. (2024). Ethical issues of Digital Finance: what is changing by Digital Finance? What are social implications? How do we develop it ethically? In *The Elgar Companion to Applied AI Ethics* (pp. 197-251). Edward Elgar Publishing.
34. Bergmann, M., Maçada, A. C. G., de Oliveira Santini, F., & Rasul, T. (2023). Continuance intention in financial technology: a framework and meta-analysis. *International Journal of Bank Marketing*, *41*(4), 749-786.
35. Schnebel, E. (2024). Ethical issues of Digital Finance: what is changing by Digital Finance? What are social implications? How do we develop it ethically? In *The Elgar Companion to Applied AI Ethics* (pp. 197-251). Edward Elgar Publishing.
36. Alami, I., & Guermond, V. (2023). The color of money at the financial frontier. *Review of International Political Economy*, *30*(3), 1073-1097.
37. Brantley, R. L. (2022). *Determinants of Black American FINTECH Acceptance: A Technology Acceptance Model (TAM) Qualitative Case Study*. Northcentral University.
38. Verma, B., Singla, B., & Mittal, A. (Eds.). (2024). *Digital Technologies, Ethics, and Decentralization in the Digital Era*. IGI Global.

A COMPARATIVE STUDY BETWEEN E-RECRUITMENT AND TRADITIONAL RECRUITMENT AMONG PRIVATE EMPLOYEES IN LUDHIANA CITY

[1]Tanya Mohan [2]Naresh Sachdev [3]Mehak Goyal [4]Kawalpreet Sharma

[1,3,4]Assistant Professor, Department of Business Management, Punjab College of Technical Education, Ludhiana, Punjab, India.

[2]Director, Department of Business Management, Punjab College of Technical Education, Ludhiana, Punjab, India.

ABSTRACT

This research, "A Comparative Study between E-Recruitment and Traditional Recruitment among Private Employees in Ludhiana City," explores the evolution of recruitment methods and their implications for employers and job seekers. The study highlights the growing significance of e-recruitment, defined as using web-based platforms like LinkedIn, job portals, and social media for hiring. It compares these methods with traditional approaches, such as newspaper ads and job fairs, evaluating their effectiveness, convenience, and cost-efficiency. Primary data were collected through a survey of 200 private employees in Ludhiana, examining their preferences and experiences with both methods. The findings indicate that while e- recruitment offers advantages like broader reach, transparency, and efficiency, traditional recruitment retains value in personal interaction and process familiarity. Challenges such as online scams and data privacy concerns in e-recruitment are contrasted with the time- consuming nature and limited scope of traditional methods.

The study concludes that e-recruitment complements rather than replaces traditional methods. It recommends adopting a hybrid approach that leverages the strengths of both, ensuring inclusivity and effectiveness in meeting diverse recruitment needs.

Keywords: E-recruitment, Traditional recruitment, Private Employees

INTRODUCTION

The actions and procedures that a business takes with the primary goal of identifying and luring possible employees are referred to as recruitment. (Breaugh & Starke, 2000). It is an essential part of human resource management as it performs the crucial function of drawing important resources i.e. human capital into the organization (Barber, 1998). Online recruitment, also referred to as e-recruitment is one of the worldwide trends for HR realms (Bussler & Davis, 2001). It has evolved into a sophisticated interactive engine with the potential to automate every

facet of the hiring process virtually (Joe Dysart, 2006). The internet can ease the selection of employees, especially where long distances are involved (Galanaki, 2005). E-recruitment has grown tremendously over the past one decade and is now widely used by both recruiters and job seekers across the globe (Cober & Brown, 2006). The internet has proved to be a powerful tool for the delivery of diverse kind of services like HR planning, HR evaluation, HR rewards and HR recruitment etc. under the umbrella of EHRM.

E-RECRUITMENT

E-recruitment, often known as online recruiting, is the process of finding, attracting, interviewing, and recruiting new employees utilizing cloud-based recruitment tools, web- based resources, and other technology. The aim of e-recruitment is to make recruiting more efficient and cost-effective. HR managers may also reach a bigger pool of potential employees and speed up the hiring process by employing e-recruitment.

COMPARISON BETWEEN E-RECRUITMENT AND TRADITIONAL RECRUITMENT

The process of posting a position through e-recruitment is faster than traditional recruiting. In addition, the screening process is much more efficient. Recruiters can use a range of tools to locate the best matches, ranging from simple filters to AI-powered technology.

One can only reach the audience of the media where you post your ad, whether it's newspapers, radio, or television, if you use traditional recruiting methods. Posting a job on job boards, social media, and other sites makes it available to a much larger audience.

With the growing number of organizations hiring remote workers, this benefit is becoming increasingly important. E-recruiting helps employers to find candidates from anywhere in the world, whereas traditional recruitment has only limited reach.

Paid Facebook advertisements or banner ads are an important aspect of e-recruiting, capturing even those potential employees who are not even looking for a job and weren't considering a certain company, whereas traditional recruitment is done only in writing, which makes the process time-consuming.

When considering the size of the audience, posting job adverts on the Internet is less expensive than publishing them in traditional media.

REVIEW OF LITERATURE

Adelanke H. Olaniyan & Sharma Hemlata (2023) finds out that Human Resources (HR) can optimize e recruitment channels to enhance job satisfaction ratings and ensure employee performance and relevance remain top priorities. Therefore, HR managers and organizations should strategically leverage electronic platforms for hiring to improve their recruitment outcomes.

Dragusha B. , et. al. (2021), in his research theoretical framework on effectiveness of e- recruitment on HRM concluded that E-recruitment is one of the most important human resource management processes that is an effective measure for the right people at the right place and at the right time. E-recruitment is not only an aspect of human resource management but it is signifacant for identifying and attracting potential employees. Electronic recruitment improves selection process. Electronic recruitment will not replace traditional recruitment methods but it will enhance traditional recruitment methods. Electronic recruitment and traditional recruitment methods are integral part of human resource management.

Kumar R., et. al. (2021), in his research e-recruitment: research of media and portals concluded that most of the Human Resource use Human Resource Portals than Social Media networks. When social sites are considered, some professional networks such as LinkedIn served good for most of the Human Resource Recruiters and Recruits to meet each other. Naukri is the widely used Human Resource Portal. Furthermore it is obviously found that recruitment communication should be properly done in order to finish the recruitment process more effectively since it entirely moderates the relationship between dependent and independent variables.

Radha S., et. al. (2020), in her research e-recruitment: an edge over traditional recruitment concluded that electronic recruitment highlights the paperless recruitment processes, a more creative as well as less expensive. E-recruitment has provided some remarkable benefits in terms of cost and efficiency.

Ahlawat R., et. al. (2018), in her research e-recruitment via social networking sites: A comparative study with traditional recruitment methods concluded that e-recruitment is very popular in modern era. E-recruitment saves the time, effective and efficient in completion recruitment objectives. It has been investigated that e-recruitment will likely to grow in coming years.

Sneha S. (2017), in her research e-recruitment: A new dimension of HRM in India concluded that the real strength and power of online recruitment, when done properly, lie in utilizing internet technology to not just attract candidates but to deal with them too. In this sense it is also about

Rationalizing the recruitment process -so busy HR departments can give a better recruitment service to their colleagues in finance, marketing, sales and manufacturing. E-Recruitment is present as well as a bright future of

recruitment industry that will keep growing year after year. With lots of positive traits it has some limitations like concern in rural India, problem with less educated population, strong belief and trust towards face to face interview to name a few, but if we look at the bright side of the story these problems are very little and will surely be gone by the power of education.

Okolie U., et. al. (2017), in his research e-recruitment: Practices, opportunities and challenges concluded that e-recruitment has created a great leap in the history of recruitment. Online recruitment has many advantages to companies like low cost, less time, quick, wider area and better match. It has been correctly said that the adoption of e-recruitment is about more than just technology.

RESEARCH GAP

Despite the growing adoption of e-recruitment, there remains a notable gap in research concerning the perspectives of employees on this method. While organizations have extensively explored its benefits, such as efficiency and cost-effectiveness, the direct advantages perceived by employees when using e-platforms to secure jobs remain under-researched. Understanding these perspectives could provide valuable insights into how e-recruitment aligns with job seekers' expectations and experiences, shedding light on its overall effectiveness and areas for improvement.

OBJECTIVES

- To study factors affecting behaviour of job seekers towards e-recruitment vs traditional recruitment.
- To identify the critical success factors in the e-recruitment process and also know how e-recruiting affects the overall traditional process.

DATA ANALYSIS AND INTERPRETATION TECHNIQUES

For data analysis and interpretation data was classified and tabulated. Different tools such as tables, pie-charts, and bar-diagram have also been used to ensure the objectives drawn.

DATA ANALYSIS AND INTERPRETATION

Table 1 Demographic profile of the respondents

Age	**Number of respondents**	**Percentage of respondents**
18 – 24 years	22	11%
25 – 34 years	53	26.5%
35 – 44 years	99	49.5%
45 – 54 years	26	13%
55+	0	0%
Total	200	100%
Gender	**Number of respondents**	**Percentage of respondents**
Male	96	48%
Female	104	52%
Total	200	100%
Qualifications	**Number of respondents**	**Percentage of respondents**
Undergraduate	33	16.5%
Graduate	83	41.5%
Post graduate	78	39%
Phd	6	3%
Total	200	100%
Occupation	**Number of respondents**	**Percentage of respondent**
Business person	14	7%
Private employee	109	54.5%
Public employee	50	25%
Student	25	12.5%
Free lancing	2	1%
Total	200	100%
Sector	**Number of respondents**	**Percentage of respondents**
Education	17	8.5%

FMCG	10	5%
Healthcare	16	8%
Food industry	13	6.5%
Tourism	10	5%
Financial services	17	8.5%
Engineering	2	1%
Hospitality	4	2%
Automobile	9	4%
Telecom	6	3%
Steel	3	1.5%
Textile	9	4.5%
Real estate	3	1.5%
Banking	70	35%
Insurance	11	5.5%
Total	200	100%

ANALYSIS AND INTERPRETATION

- Amongst the 200 respondents, 49.5% are in the age group of 35 - 44 years, 26.5% are in the age group of 25- 34 years, 13% are in the age group of 45 – 54 years, 11% are in the age group of 1-24 years and 0% are above 55+ years.
- Amongst the 200 respondents, 52% falls under the female and 48% of respondents falls under 42%.
- Amongst the 200 respondents, 41.5% are graduated, 39% are post graduated, 16.5% are under graduated and 3% are under PHD
- On the basis of sector, maximum 35% of respondents falls under the category of banking and 8.5% each fall under financial services and healthcare and rest of the percentages falls under the rest of the sector.

Table 2 Frequency of searching jobs online (e.g. job boards, company websites, social media)

Options	Number of respondents	Percentage of respondents
Never	5	2.5%
Rarely	31	15.5%
Occasionally	85	42.5%
Frequently	64	32
Very frequently	15	7.5%
Total	200	100

ANALYSIS AND INTERPRETATION

Above figure shows that around 42.5% of respondents occasionally search for jobs online by using various online job portals and 32% of respondents frequently used online platforms in search of jobs, 15.5% respondents regularly used these platforms and rest 7.5% and 2.5% of respondents rarely or never used these platforms.

Table 3 Platforms use when searching for jobs online.

Option	Number of respondents	Percentage of respondents
Online job boards	56	28%
Company websites	62	31%
Social media platforms	80	40%
Others	2	1%
Total	200	100

ANALYSIS AND INTERPRETATION

As per above figure, around 40% of the respondents use social media platforms app which include LinkedIn, Facebook, Instagram to search for jobs available online and around 31% of the respondents go for official company websites in order to know the vacancies available and 28% of the respondents go for online job boards

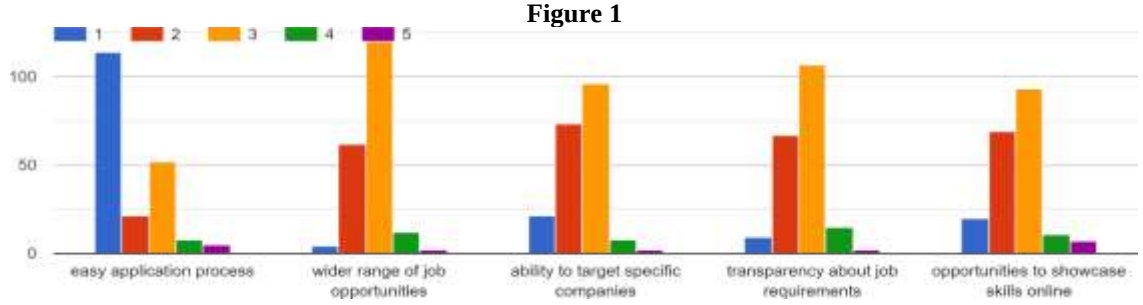
ISBN: 978-93-5680-531-6
www.npapublishing.in

which include job related websites i.e. naukari.com, indeed and many more and only 1% of respondent have chosen other

Rate the following aspects of e-recruitment you find most helpful in your job search.

ANALYSIS AND INTERPREATATION

Figure 1



Opportunities to Showcase Skills Online

- This aspect is rated highest among the given options.
- Job seekers appreciate platforms that allow them to highlight their skills, projects, and achievements online.
- It provides a chance to create a strong professional profile that stands out to potential employers.
- Showcasing skills through portfolios, personal websites, and LinkedIn profiles can attract recruiters' attention.

Transparency About Job Requirements

- Another highly rated aspect.
- Job seekers value clear and detailed job descriptions.
- Transparency helps them assess whether they meet the requirements and align with the role. It reduces wasted time for both job seekers and employers by ensuring a better fit.

Rate The Following Concerns About E-Recruitment.

Figure 2

ANALYSIS AND INTERPREATAION

Lack of Personal Interaction

- The blue bars in the graph represent the concern related to "lack of personal interaction." This concern is rated on a scale from 1 to 5, with 1 being the least concerned and 5 being the most concerned.
- Looking at the graph, we see that the majority of respondents rated this concern at level 2. This suggests

ISBN: 978-93-5680-531-6
www.npapublishing.in

that while it is a concern, it is not considered critical by most individuals.

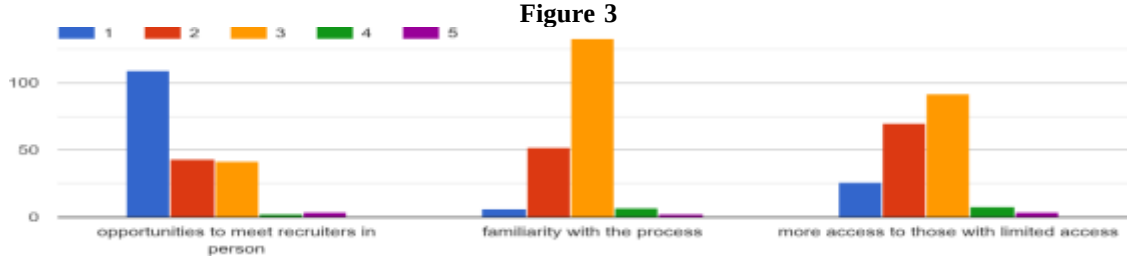
Potential of Online Scams

- The orange bars represent the concern regarding the "potential of online scams." Respondents rated this concern from 1 to 5.
- Interestingly, the highest concentration of responses falls at level 5, indicating that many people perceive this as a significant concern when considering e-recruitment.

Data Privacy Concerns

- The green bars correspond to the concern about "data privacy." Again, respondents rated this concern on the same scale.
- Similar to the potential of online scams, the data privacy concern also peaks at level 5. This suggests that individuals are highly wary of their personal data being mishandled during e- recruitment processes.

Figure 3



ANALYSIS AND INTERPRETATION

Opportunities to Meet Recruiters in Person

- The blue bar represents the statement "opportunities to meet recruiters in person."
- Most respondents seem to strongly agree with this aspect of the traditional method. Meeting recruiters face-to-face provides a chance to make a personal impression and discuss qualifications directly.
- This positive perception suggests that in-person interactions during job fairs or campus recruitment events are valued by job seekers.Familiarity With The Process
- The orange bar corresponds to the statement "familiarity with the process."
- Respondents' ratings are more evenly distributed across the scale, with no strong trend.
- Some may find the traditional method familiar and straightforward, while others might prefer newer, digital approaches.
- Overall, this aspect receives a moderate rating.

More Access To Those With Limited Access

- The red bar represents the statement "more access to those with limited access." Interestingly, most respondents strongly disagree with this aspect.
- This suggests that traditional methods may not be as inclusive or accessible to everyone, especially those who face barriers like geographical limitations or lack of resources.
- Digital platforms can bridge this gap by providing broader access to job opportunities.

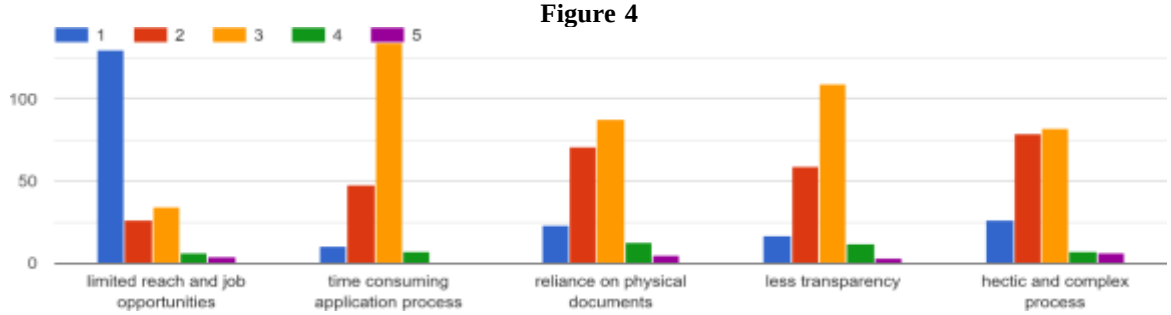
ISBN: 978-93-5680-531-6
www.npapublishing.in

INTERPRETATION

Overall, the traditional method's strength lies in face-to-face interactions with recruiters. However, it may not be equally accessible to all individuals. Balancing traditional and digital approaches can enhance the job search experience for a diverse range of candidates.

Rate The Following Concerns About Traditional Recruitment Method

Figure 4



ANALYSIS AND INTERPRETATION

Limited Reach and Job Opportunities

- The orange bar represents the concern related to "limited reach and job opportunities."
- The low rating suggests that most respondents do not strongly agree with this concern. It implies that traditional methods may not always provide a wide range of job options or reach all potential candidates effectively.

Time-Consuming Application Process

- The blue bar corresponds to the statement about the "time-consuming application process."
- The higher rating indicates that many individuals find the traditional recruitment process to be time-intensive. This aligns with the perception that manual paperwork and lengthy procedures can be cumbersome.

Reliance on Physical Documents

- The green bar represents the concern regarding "reliance on physical documents."
- The intermediate rating suggests that respondents have mixed feelings about this aspect. While some may appreciate the tangible nature of physical documents, others might find it outdated or inconvenient.

Less Transparency

- The purple bar corresponds to the concern about "less transparency."
- The high rating implies that transparency is a significant issue with traditional recruitment methods. Lack of clear communication or information during the process can lead to frustration and uncertainty.

Hectic and Complex Process

- The red bar represents the concern related to a "hectic and complex process."
- Another high rating indicates that respondents perceive traditional recruitment as challenging and intricate. Cumbersome steps, multiple stages, and unclear guidelines contribute to this perception.

ISBN: 978-93-5680-531-6
www.npapublishing.in

INTERPRETATION

- Traditional recruitment methods have both strengths (such as in-person interactions) and weaknesses (such as complexity and lack of transparency).
- Balancing traditional practices with modern digital approaches can enhance the overall recruitment experience for job seekers and employers alike.

How would you rate the effectiveness of traditional recruitment methods in helping you finding job opportunities

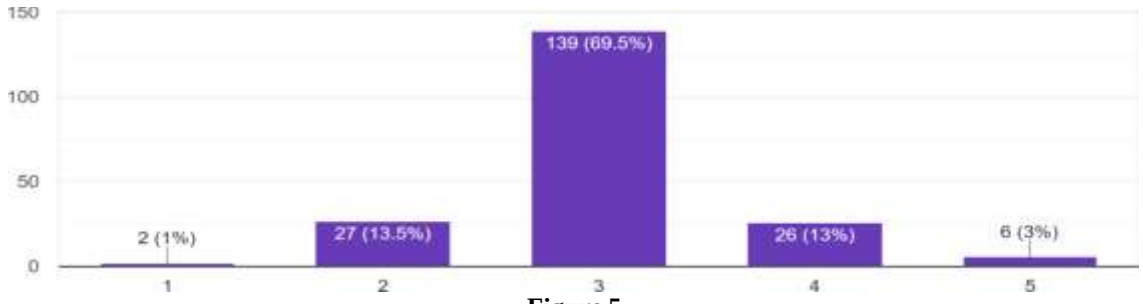


Figure 5

ANALYSIS AND INTERPRETATION

As per above table and diagram, around 69.5% of respondents have found traditional recruitment methods attractive to find a job and rated 3 on a scale of 1-5 and other 13.5% and 13% have rated 2 and 4 respectively.

Table 4 The effectiveness of e-recruitment platforms in helping you find job opportunities can be rated on a scale of 1-5.

Rating	Number of respondents	Percentage of respondents
1	5	2.5%
2	21	10.5%
3	135	67.5%
4	35	17.5%
5	4	2%
Total	200	100%

ANALYSIS AND INTERPRETATIPON

As per above table and figure, around 67.5% have rate 3 on a scale of 1-5 to describe the effectiveness of the e-recruitment methods or apps to find jobs and around 17.5% of respondents have rated 4 and 10% of respondents have rated 2 and rest have rated 1 and 5 respectively.

Table 5 The user friendliness of e-recruitment websites or platforms can be compared to traditional ones.

Rating	Number of respondents	Percentage of respondents
1	4	2%
2	12	6%
3	134	67%
4	45	22.5%
5	5	2.5%
Total	200	100%

ANALYSIS AND INTERPRETATION

As per table and diagram, I interpret that 67% of respondents are find e recruitment methods user friendly by giving a common rating of 3 on a scale of 1-5 and 22.5% pf respondent gave the rating of 4 that conclude that most of the respondents feels that e-recruitment is a user friendly platform to find a job.

Rate the following aspects on a scale of 1-5

- E recruitment helps in cost saving as compared to traditional ones
- Technology advancement has affected the efficiency of traditional recruitment
- E-recruitment helps in time saving as compared to traditional ones
- E recruitment is more convenient than traditional recruitment
- E recruitment is easy method to apply for jobs as compared to traditional ones
- E recruitment will replace the traditional recruitment

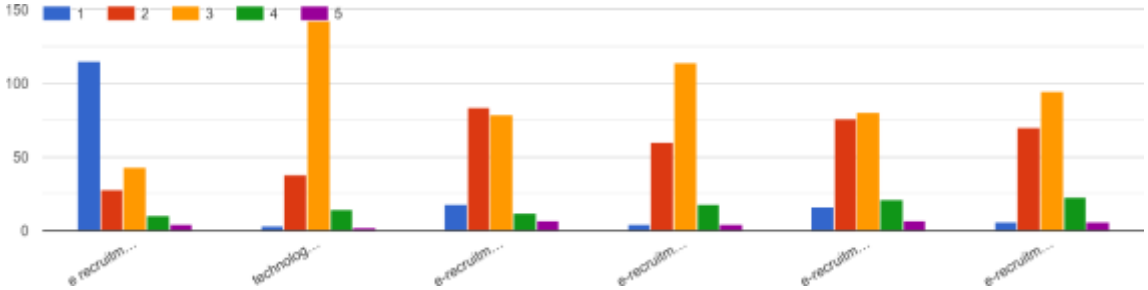


Figure 6

ANALYSIS AND INTERPRETATION

E-Recruitment Helps in Cost Saving

The statement suggests that e-recruitment is more cost-effective compared to traditional methods.

Analysis

- E-recruitment eliminates the need for physical paperwork, printing, and postage costs.
- Online platforms allow companies to reach a wider audience without geographical limitations.
- Overall, e-recruitment can reduce administrative expenses associated with traditional processes.

Technology Advancement Affects Efficiency of Traditional Recruitment

This statement acknowledges that technological advancements impact traditional recruitment.

Analysis

- Automation, artificial intelligence, and data analytics enhance efficiency. Traditional methods may become outdated if not adapted to technological changes. **E-Recruitment Helps in Time Saving**
- The statement implies that e-recruitment is quicker than traditional methods.

Analysis

- Online applications, automated screening, and instant communication save time. Traditional processes (such as manual resume sorting) can be time-consuming. **E-Recruitment Is More Convenient**
- E-recruitment is considered more convenient than traditional methods.

Analysis

Job seekers can apply from anywhere, anytime using digital devices. Convenience attracts tech-savvy candidates

who prefer seamless experiences.

E-Recruitment Is an Easy Method to Apply for Jobs

E-recruitment simplifies the application process.

Analysis

User-friendly interfaces, pre-filled forms, and clear instructions make it easier. Traditional methods (such as mailing physical resumes) require more effort.

E-Recruitment Will Replace Traditional Recruitment

This statement predicts a shift from traditional to e-recruitment.

Analysis

- While e-recruitment is growing, complete replacement is debatable. Some roles or industries may still rely on personal interactions.
- A hybrid approach (combining both methods) is likely in the future.

Interpretation

E-recruitment offers advantages in terms of cost, efficiency, time-saving, convenience, and ease of use. However, traditional methods have their merits, especially when personal connections matter. Organizations should adapt to a changing landscape while considering the unique needs.

FINDINGS

Traditional recruitment is not replaced by E-recruitment, traditional recruitment has their own values but E-recruitment makes the recruitment process easy for companies and for people as well. Through e-recruitment one can find the job sitting anywhere and apply the same at any time. Recruitment process will be faster and global due to E-recruitment. E-recruitment helps in saving time. Online platforms will act as a platform for both job seekers to search the job and corporate sectors to hire appropriate candidates.

1. 42.5% of respondents occasionally search for jobs online
2. 40% and 31% of respondents prefer to use social media platforms like LinkedIn, Facebook and company websites to search for jobs
3. Opportunities to showcase skills online and transparency about job requirements are two most of the rated factor that are helpful in e-recruitment
4. Potential of online scams are one of the highly rated concern by the respondents in e- recruitment
5. Around 87% of respondents have used traditional recruitment methods for getting a job
6. Opportunities to meet face to face with recruiters in recruitment process is one of the factor is highly rated by the respondents for selecting traditional recruitment methods for searching a job
7. Time consuming and limited reach of the job opportunities in traditional recruitment methods is highly rated of the disadvantages present
8. 69.5% of the respondents find traditional recruitment methods effective in finding job opportunities
9. 67.5% of the respondents find e-recruitment methods effective in findings job opportunities
10. 67% of respondents find e-recruitment methods user friendly as compared to traditional ones
11. Most of the respondent feels e- recruitment helps in cost saving and it is convenient and also technology has affected the traditional recruitment method in today's era.

CONCLUSION AND RECOMMENDATIONS

In conclusion, I can say that most of the people prefer E-recruitment and will choose to find and apply for jobs through online platforms as it is easy method to do so. The scope of E-recruitment will enhance in near future.

1. Embrace a Multi-Platform Approach: Don't limit yourself to one job board. Utilize a mix of free and paid options, including social media like LinkedIn.
2. Invest in Content: Create compelling job descriptions that showcase your company culture and the position.
3. Automate Wisely: Use online tools strategically to free up time for focusing on qualified candidates.
4. Maintain Human Touch: Respond to applicants and consider video interviews for initial stages, but remember to follow up even in rejections.

REFERENCES

1. Barber, A. E. (1998). *Recruiting Employees: Individual and Organizational Perspectives*. Sage Publications.Barua, Anitesh; and Whinston, Andrew B. (2000). Measuring The Internet Economy. The University of Texas at Austin and Cisco Systems, www.internetindicators.com.
2. Breaugh, J. A. (1992). Recruitment: Science and practice. Boston: PWS-Kent. Breaugh, JA, & Starke, M.(2000). Research on employee recruitment: So many studies, so many remaining questions. *Journal of Management*, *26*(3), 405-434.Breaugh, J. A. and Starke, M. (2000). 'Research on Employee Recruitment: So Many Studies, So Many Remaining Questions'. Journal of Management, 26/3: 405-434.
3. Cappelli, P. (2001). Making the most of on-line recruiting. *Harvard business review*, *79*(3), 139- 148.
4. Carlson, K. D., Connerley, M. L., & MECHAM III, R. L. (2002). Recruitment evaluation: The case for assessing the quality of applicants attracted. *Personnel Psychology*, *55*(2), 461-490.
5. Seneviratne, I., Schexnayder, C., & Wiezel, A. (1999). Establishing a world wide web presence. *Practice Periodical on Structural Design and Construction*, *4*(2), 69-74.
6. Collins, C. J., & Han, J. (2004). Exploring applicant pool quantity and quality: The effects of early recruitment practice strategies, corporate advertising, and firm reputation. *Personnel psychology*, *57*(3), 685-717.Effects of shortage of human resource on organisational output, Madhavi, International Journal scientific Research on organisational output, November 2023.
7. Epstein, R., & Singh, G. (2003). Internet recruiting effectiveness: evidence from a biomedical device firm. *International Journal of Human Resources Development and Management*, *3*(3), 216-225.
8. Feldman, D. C., & Klaas, B. S. (2002). Internet job hunting: A field study of applicant experiences with on-line recruiting. *Human Resource Management: Published in Cooperation with the School of Business Administration, The University of Michigan and in alliance with the Society of Human Resources Management*, *41*(2), 175-192.
9. Feldman, W., & Feldman, P. (1999). Using the Internet for Tracking, Hiring.
10. Galanaki, E. (2002). The decision to recruit online: A descriptive study. *Career development international*, *7*(4), 243-251.
11. Khan, S., & Kawadkar, H. (2022). Study on Preference of Job Applicants towards E-Recruitment Process. *SAMRIDDHI: A Journal of Physical Sciences, Engineering and Technology*, *14*(01 SPL), 76-80. http://recruitment.naukrihub.com/e-recruitment.html
12. Kaplan, S., & Sawhney, M. (2000). E-hubs: the new B2B marketplaces. *Harvard business review*, *78*(3), 97-97.
13. Haas, C. T., Glover, R. W., Tucker, R. L., & Terrien, R. K. (2001). *Impact of the Internet on the Recruitment of Skilled Labor*. Center for Construction Industry Studies, The University of Texas at Austin.
14. Rynes, S. L., Bretz Jr, R. D., & Gerhart, B. (1991). The importance of recruitment in job choice: A different way of looking. *Personnel psychology*, *44*(3), 487-521.
15. Taylor, M. S., & Collins, C. J. (2000). Organizational recruitment: Enhancing the intersection of research and practice.
16. Warner, M. (2013). 'Making sense'of HRM in China: setting the scene 1. In *'Making Sense'of Human Resource Management in China* (pp. 1-25). Routledge.

SUSTAINABLE DEVELOPMENT IN HOTEL MANAGEMENT: A REVIEW

[1]Tulika Tuli [2]Manisha Sood [3]Shubhika Batra

[1]Assistant Professor, Punjab College of Technical Education, Ludhiana, Punjab

[2]Assistant Professor, Punjab College of Technical Education, Ludhiana, Punjab

[3]Assistant Professor, Punjab College of Technical Education, Ludhiana, Punjab

ABSTRACT

This paper examines the integration of sustainability practices within the hotel management industry, focusing on technological innovations, stakeholder engagement, and operational strategies. Drawing from a comprehensive review of the literature, the study identifies effective strategies for promoting sustainability, including the use of smart technologies for energy and resource management (Rahimi & Gunlu, 2016), staff training programs (Kasim, 2009), and partnerships with local suppliers to reduce carbon footprints (Bohdanowicz & Zientara, 2008). The research also highlights challenges faced by the industry, such as high first investment costs (Mihalic, 2016), regional economic barriers, and customer behaviour inconsistencies in prioritizing sustainability over cost (Dolnicar & Grün, 2009). Additionally, the study emphasizes the role of green certifications (Chan et al., 2013) and government support (Gössling et al., 2018) in driving the adoption of sustainable practices. The findings suggest that aligning customer preferences with sustainability goals is crucial, as is ensuring transparency in sustainability reporting (Epstein & Buhovac, 2014). The paper concludes with recommendations for hotel operators to invest in scalable, cost-effective technologies, promote community engagement, and adopt flexible financial models to overcome regional economic challenges. By using government incentives and fostering partnerships with local stakeholders, hotels can enhance their sustainability efforts, ultimately contributing to a more sustainable global hospitality industry. This research underscores the importance of a holistic, region-specific approach to sustainability that accounts for local economic conditions and infrastructure limitations.

Keywords: sustainable development, hotel management, green practices, and stakeholder engagement.

INTRODUCTION

While the rest of the world debates endlessly on which nation should take the lead in implementing sustainable development measures across the board, it is onto us, as common citizens, to sensitise ourselves and embark on this journey to understand, equip, and deploy measures of sustainability in all areas we can. One sector which has the biggest impact on the global carbon footprint is hospitality. Hotels contribute a whopping one per cent of global carbon emissions (WSHA, 2024), making it a sector of great interest for all those looking to minimise the human impact on the ecosystem.

For existing hotels, discussing sustainable development would mean an integration between social, economic, and environmental considerations that can be translated into operational practices. A major challenge that all hotels face is their ability to make the right choice that helps keep high and consistent levels of guest satisfaction. Often, these choices are not in the best interest of our environmental goals. Trying to ensure room service efficiency can lead to the sourcing of packed plastic bottles as refilling via an in- house bottling plant might take longer. Similarly, to ensure quick food delivery, storing par-cooked vegetables and gravies might seem functional, but it attracts higher power consumption and promotes wastage. As the largest hotel chains in the world battle these two impossible choices, frameworks such as the Hotel Carbon Measurement Initiative (HCMI) and Hotel Water Measurement Initiative (HWMI) (WSHA, 2020) have helped outline standard sustainability practices and acted as lighthouses for those aiming to reduce their carbon emissions while ensuring an endearing experience for their guests.

The intersection of sustainability and hospitality has also become a driving factor for innovation and growth in

the industry. Hotels that prioritise green practices often find themselves at the forefront of market trends, attracting environmentally conscious travellers who value eco-friendly accommodations. From implementing energy-efficient technologies to offering zero-waste dining experiences, many establishments have discovered that sustainable operations not only help the environment but also reduce costs and enhance brand loyalty. As customer awareness continues to grow, integrating sustainability into the core of hotel operations is no longer just a moral imperative but a business necessity. This transformation signifies a shift toward a more resilient and forward-thinking hospitality sector, capable of addressing global challenges while meeting the evolving expectations of modern consumers.

Sustainability in hotel management also extends beyond operational efficiencies and customer experiences. It involves building relationships with local communities, reducing reliance on non-renewable resources, and supporting biodiversity conservation. Many hotels now source ingredients locally, reducing the carbon footprint associated with transportation while supporting local farmers and suppliers. Additionally, some properties incorporate sustainable architectural designs, such as green roofs and solar panels, to minimise their ecological impact. These measures not only contribute to environmental preservation but also provide a unique selling point that appeals to eco- conscious guests.

Moreover, regulatory pressures and international agreements, such as the Paris Agreement, have pushed the hospitality industry to adopt more sustainable practices. Compliance with these regulations often requires significant investments in technology and training, but they also pave the way for long-term benefits, including energy savings and improved resource management. For instance, smart building technologies that optimise energy consumption and water usage are becoming a cornerstone of sustainable hotel operations, highlighting how innovation and environmental responsibility can go hand in hand.

In addition to operational changes, there is a growing emphasis on educating guests about sustainability. Hotels are using their platforms to raise awareness and encourage responsible behaviour among their patrons. Simple initiatives, such as incentivising towel and linen reuse or providing information on local conservation efforts, can make a substantial difference. This collaborative approach not only enhances the guest experience but also fosters a shared sense of responsibility for the planet.

The journey toward sustainable development in hotel management is undoubtedly complex, requiring a balance between economic viability, environmental stewardship, and social responsibility. However, as more stakeholders recognise the interconnectedness of these elements, the industry is poised to become a leader in global sustainability efforts. By embracing innovative solutions and fostering a culture of accountability, hotels can play a pivotal role in shaping a more sustainable future for both the industry and the planet.

REVIEW OF LITERATURE

Sustainable development in hotel management has evolved from being a niche focus to a global necessity. As the hospitality industry continues to expand, the emphasis on sustainability addresses the environmental, social, and economic challenges posed by rapid growth. This review explores key themes, including green practices, stakeholder involvement, technology integration, customer perception, and government policies, while highlighting gaps for further research.

Rahimi and Gunlu (2016) aimed to examine the impact of smart systems, such as automated lighting and heating, on reducing energy consumption. Technology plays a pivotal role in enabling sustainability in hotel management. Their study highlighted the effectiveness of Internet of Things (IoT)-enabled devices in monitoring water usage and waste management in real time. The findings emphasized operational efficiency as a critical outcome of technology integration. However, the study found significant gaps, including the high initial investment costs and the lack of expertise in emerging markets, which hinder widespread adoption.

Kasim (2009) and Bohdanowicz and Zientara (2008): Engaging stakeholders— customers, employees, suppliers, and local communities—is critical to achieving sustainable outcomes. Kasim (2009) focused on the role of employee training in eco- friendly practices to ensure seamless implementation of green initiatives. The study revealed that proper training enhances the effectiveness of sustainability programs. Similarly, Bohdanowicz and Zientara (2008) explored collaborations with local suppliers, finding that such partnerships

reduce carbon footprints and bolster regional economies. The gap found in both studies was the inconsistent engagement of stakeholders across different hotel categories and geographic regions.

Han et al. (2011): Sustainability increasingly influences customer choices in hospitality. Han et al. (2011) investigated customer preferences for hotels advertising green practices, such as reducing single-use plastics and providing eco-friendly amenities. The research concluded that green branding positively affects customer loyalty. However, Dolnicar and Grün (2009) highlighted a discrepancy between customer claims of prioritizing sustainability and their actual willingness to pay higher prices for green services. This gap underscores the need for further exploration of customer behaviour and pricing strategies.

Gössling et al. (2018) and Higgins-Desbiolles (2018): Policy frameworks are instrumental in driving sustainability. Gössling et al. (2018) evaluated the role of government incentives, such as tax breaks for eco-certifications, in encouraging hoteliers to adopt sustainable practices. The findings showed a positive correlation between policy support and sustainability adoption. However, Higgins-Desbiolles (2018) found barriers such as inconsistencies in regulatory enforcement and the absence of global standards, which hinder widespread implementation.

Zorpas et al. (2015): Eco-friendly architectural designs are gaining popularity in the hospitality sector. Zorpas et al. (2015) examined the integration of renewable materials, natural ventilation, and solar energy systems in hotel construction. The findings demonstrated that such innovations significantly reduce environmental impact while enhancing the guest experience. However, the study noted a lack of standardization in sustainable design practices across the industry.

Hwang and Ok (2013) and Sloan et al. (2015): The food and beverage (F&B) sector is a significant contributor to a hotel's environmental impact. Hwang and Ok (2013) focused on the benefits of sourcing organic and locally produced ingredients, emphasizing reduced carbon emissions and support for regional agriculture. Sloan et al. (2015) explored zero-waste kitchen initiatives, such as composting and recycling programs, identifying these as emerging standards in eco-conscious hotels. The studies highlighted gaps in scaling these practices to larger operations without compromising cost efficiency.

Epstein and Buhovac (2014) and Font et al. (2012): Metrics and reporting systems are essential for evaluating sustainability initiatives. Epstein and Buhovac (2014) investigated the use of key performance indicators (KPIs), the likes of waste reduction, energy efficiency, and social impact, to assess a hotel's sustainability efforts. Font et al. (2012) examined third-party certifications, like ISO 14001 and Green Globe, as benchmarks for continuous improvement. Despite these advancements, both studies noted challenges in achieving consistency and transparency in sustainability reporting.

Mihalic (2016): While sustainability has gained traction globally, its implementation in developing economies faces unique hurdles. Mihalic (2016) explored the financial constraints, lack of awareness, and limited access to green technology that impede progress in these regions. The study also highlighted cultural and infrastructural differences as barriers to replicating successful sustainability models from developed countries. Addressing these gaps requires tailored strategies that account for local contexts.

Jones et al. (2017) investigated the role of corporate social responsibility (CSR) in advancing sustainability in the hospitality industry. Their study revealed that CSR initiatives, such as community engagement and charitable activities, positively impact brand reputation and customer trust. However, the research highlighted a gap in measuring the direct environmental benefits of these initiatives, suggesting a need for integrated frameworks.

Chan et al. (2013) focused on green certifications and their influence on hotel operations. The study found that eco-certified hotels demonstrated better resource management and customer satisfaction compared to non-certified counterparts. However, the research pointed out the lack of customer awareness regarding the meaning and significance of various certifications, calling for improved communication strategies.

Rivera et al. (2016) analysed the impact of sustainable supply chain management on hotel sustainability goals. The findings emphasized the importance of selecting suppliers who align with eco-friendly values. The study

identified gaps in monitoring and enforcing supplier compliance, particularly in regions with less regulatory oversight.

Chen and Peng (2020) explored the role of renewable energy in reducing the carbon footprint of hotels. The study highlighted the potential of solar and wind energy systems in achieving significant energy savings. However, it also noted challenges such as high installation costs and variable energy outputs, which can impact feasibility.

Walker and Brown (2019) examined the integration of artificial intelligence (AI) in enhancing sustainable hotel operations. Their research demonstrated that AI technologies, such as predictive analytics and automated systems, can optimize energy use and waste management. The study identified a need for industry-wide training programs to address skill gaps in implementing these technologies.

GAPS IN THE LITERATURE

Despite significant advancements, several gaps remain in the existing body of knowledge:

- **Inconsistent Stakeholder Engagement**

  There are several studies (e.g., Kasim, 2009; Bohdanowicz and Zientara, 2008) that emphasize the importance of engaging stakeholders, including employees, customers, and suppliers, in sustainability efforts. However, there is inconsistent implementation across hotel categories and geographic regions. Research is needed to find effective methods for universal stakeholder involvement that cater to diverse contexts.

- **Barriers to Sustainability in Developing Economies**

  Mihalic (2016) and Rivera et al. (2016) highlight significant challenges in adopting sustainability practices in developing economies due to financial constraints, limited access to green technology, and cultural differences. This gap shows the need for localized strategies and resource allocation frameworks to support sustainability in underdeveloped regions.

- **Measurement and Reporting Challenges**

  Studies like Epstein and Buhovac (2014) and Font et al. (2012) underscore the importance of sustainability metrics and certifications. However, achieving transparency and consistency in reporting is still a challenge. There is a lack of unified global standards for assessing and communicating sustainability performance.

  Sustainable development in hotel management requires a comprehensive approach, integrating technological advancements, stakeholder collaboration, and government support. While progress has been made, the industry must overcome financial and operational challenges, particularly in developing regions. Future research should address these gaps and explore innovative solutions to make sustainability more accessible and impactful globally.

OBJECTIVES

- To Evaluate Effective Strategies for Implementing Sustainability Across Hotel Operations.
- To address Regional and Economic Barriers to Sustainability

METHODOLOGY

This review paper employs a secondary research approach to analyse existing literature on sustainable development in hotel management. The method centres on synthesizing information from peer-reviewed journal articles, industry reports, and case studies to address identified gaps and fulfil the study's objectives. By reviewing previously published works, this study examines key themes, including technological integration, stakeholder engagement, sustainability metrics, and regional challenges in implementing sustainable practices.

The data collection process involved a comprehensive search of academic databases such as Scopus, JSTOR, and

Google Scholar, alongside industry reports from organizations like the World Tourism Organization and Green Hotelier. Keywords such as sustainable development, hotel management, green practices, and stakeholder engagement guided the search. Peer-reviewed articles published within the last two decades were prioritized to ensure relevance, with a focus on studies discussing technological integration, stakeholder involvement, customer perceptions, and sustainability metrics. Articles lacking academic rigor or relevance to the hospitality sector were excluded to support the paper's focus and credibility.

DISCUSSION

OBJECTIVE-01: TO EVALUATE EFFECTIVE STRATEGIES FOR IMPLEMENTING SUSTAINABILITY ACROSS HOTEL OPERATIONS

Sustainability in hotel management involves integrating practices that reduce environmental impact, enhance operational efficiency, and improve the guest experience.

Evaluating effective strategies for implementing sustainability requires an understanding of various hotel functions and their contribution to environmental, social, and economic outcomes.

- **Energy Management:** One of the most crucial aspects of sustainability in hotel operations is energy management. Studies, such as Rahimi and Gunlu (2016), have highlighted the integration of smart systems, like IoT-enabled devices, for energy monitoring. These systems help track energy use in real-time, allowing hoteliers to find areas for improvement. For instance, implementing automated lighting and HVAC systems based on occupancy reduces energy consumption, making it both environmentally friendly and cost-effective.
- **Waste Reduction:** Effective waste management practices are essential for sustainability. Implementing zero-waste initiatives, such as composting organic waste and recycling materials, can significantly reduce the environmental footprint. Sloan et al. (2015) explore such initiatives, suggesting that zero-waste practices should be a standard in eco-conscious hotels.
- **Sustainable Sourcing:** Another strategy for sustainability in hotels is sourcing eco- friendly materials and products. Hotels that adopt sustainable sourcing practices, such as using organic and locally produced food (Hwang & Ok, 2013), not only reduce their environmental impact but also contribute to the local economy. Sourcing materials that are renewable and energy-efficient (e.g., LED lighting and sustainable linens) reduces resource consumption.
- **Staff Training and Engagement:** Effective staff training programs, as suggested by Kasim (2009), are essential to ensure that employees are knowledgeable about sustainability goals and practices. Employees play a critical role in the success of sustainability initiatives, and proper training ensures they contribute actively to green practices.
- **Challenges:** Despite the effectiveness of these strategies, hotels often face barriers such as high first investments in sustainable technologies, the need for specialized staff, and the lack of standardization across the industry. Small hotels or those in developing economies may struggle to implement these strategies due to budget constraints and a lack of access to sustainable technologies.

OBJECTIVE-02: TO ADDRESS REGIONAL AND ECONOMIC BARRIERS TO SUSTAINABILITY

Sustainability in hotel operations can be hindered by regional and economic factors that influence the ability of hotels to adopt green practices. These barriers can vary greatly depending on the geographic location, economic conditions, and infrastructure available in each region.

- **Economic Barriers:** Many hotels, particularly in developing regions, face financial constraints that make it difficult to invest in sustainability. The high first cost of sustainable technologies (such as solar panels, energy-efficient systems, or water conservation technologies) is a significant barrier. Mihalic (2016) discusses how financial constraints in developing economies, coupled with a lack of access to green technology, create a unique set of challenges. Hotels in these regions may also face higher

operational costs, which make sustainable practices seem less financially workable.

- **Regional Barriers:** Regional factors such as local climate, available infrastructure, and government policies can affect the implementation of sustainability initiatives. In some regions, the lack of renewable energy sources or unreliable power grids can make it difficult for hotels to rely on clean energy. Additionally, the absence of supportive policies or government incentives can discourage hoteliers from adopting sustainable practices. According to Gössling et al. (2018), government support such as tax breaks or eco-certifications can encourage the adoption of green practices in the hotel sector.
- **Cultural and Behavioural Barriers:** Cultural attitudes and behaviours also play a role in the successful implementation of sustainability initiatives. In some regions, there may be limited public awareness or a lack of community support for sustainable practices. Hotels may struggle to motivate customers or local communities to engage in sustainability programs if these practices are not deeply embedded in the local culture.
- **Challenges:** Addressing these barriers requires tailored strategies that account for local contexts. Economic and regional differences mean that a "one-size-fits-all" approach may not be effective. Financial constraints and the availability of green technologies will vary, so solutions must be adaptable to each hotel's situation.

RECOMMENDATIONS

FOR EVALUATING EFFECTIVE STRATEGIES FOR IMPLEMENTING SUSTAINABILITY

- **Invest in Scalable and Cost-Effective Technologies:** Hotels should explore technologies that offer scalable and cost-effective solutions, particularly for energy and water management. For example, energy-efficient lighting and low-flow water fixtures can be implemented in stages, allowing hotels to reduce costs without requiring large upfront investments.
- **Implement Green Certifications and Sustainable Sourcing Practices:** Hotels should seek certifications such as ISO 14001 or Green Globe to prove their commitment to sustainability and improve operational standards. They should also prioritize sourcing local, organic, and sustainable products to reduce their carbon footprint and support local economies.
- **Encourage Employee and Customer Engagement:** Set up training programs for employees that focus on sustainability initiatives and create customer awareness campaigns that highlight the benefits of eco-friendly practices. Engaging customers with loyalty programs or incentives for sustainable behaviours (e.g., reusing towels) can also foster long-term commitment to sustainability.

FOR ADDRESSING REGIONAL AND ECONOMIC BARRIERS TO SUSTAINABILITY

- **Leverage Government Support and Incentives:** Hotels should explore government programs that offer financial incentives for adopting sustainable practices, such as tax credits or grants for renewable energy projects. Collaboration with local government bodies can also help streamline regulatory processes and provide guidance on implementing sustainability in specific regions.
- **Develop Financial Models to Support Small Hotels:** For hotels in developing economies or those with limited financial resources, a combination of microfinancing, partnerships, and grants could help mitigate financial barriers. Small hotels could also consider incremental improvements, starting with low-cost, high-impact sustainability measures like waste reduction and water conservation.
- **Foster Collaboration with Local Communities:** Hotels should work closely with local communities to foster understanding and support for sustainability practices. By integrating local knowledge and resources, hotels can implement sustainability initiatives that are culturally proper and more likely to succeed. This includes working with local suppliers who use sustainable practices and engaging community stakeholders in decision-making.

CONCLUSION

The hotel industry is increasingly adopting sustainability practices, but the process of implementation stays complex due to various operational, regional, and economic challenges. Effective strategies such as investing in technology, engaging stakeholders, and adopting green certifications are key to enhancing sustainability across hotel operations. However, addressing barriers such as financial constraints, regional infrastructure limitations, and cultural differences is essential for ensuring that sustainability becomes a universal practice, not just for hotels in developed regions.

By investing in scalable technologies, fostering stakeholder collaboration, and adapting sustainability strategies to local contexts, the hotel industry can continue to make significant strides toward a more sustainable future. The future of sustainable hotel management depends on a collective effort to overcome existing challenges and create innovative, environmentally and economically viable solutions.

REFERENCES

1. Chan, E. S. W., Lam, J. S. L., & Hsu, C. H. C. (2013). The impact of green certifications on hotel operations. *International Journal of Hospitality Management, 34*, 240-248. https://doi.org/10.1016/j.ijhm.2013.03.004
2. Chen, Y., & Peng, L. (2020). Renewable energy adoption in hotels: A study on reducing carbon footprints through solar and wind energy systems. *Renewable Energy, 146*, 1350-1360.
3. Chung, K. C. (2019). Green marketing orientation: Achieving sustainable development in green hotel management. *Journal of Hospitality Marketing & Management, 29*(6), 722- 738.
4. Dolnicar, S., & Grün, B. (2009). Environmentally friendly tourists: What do we know and what do we need to know? *Journal of Sustainable Tourism, 17*(3), 285-302.
5. Epstein, M. J., & Buhovac, A. R. (2014). Implementing and measuring corporate social responsibility: A guide to best practice. *Routledge*.
6. Font, X., Garay, L., & Jones, S. (2012). Sustainable tourism certification in the hotel industry. *Annals of Tourism Research, 39*(1), 270-290.
7. Gössling, S., Hall, C. M., & Weaver, D. (2018). Sustainable tourism futures: Perspectives on the global industry. *Routledge*.
8. Han, H., Hsu, L. T., & Sheu, C. (2011). Application of the theory of planned behaviour to green hotel choice: Testing the effect of environmental-friendly activities. *Tourism Management, 32*(5), 1056-1064.
9. Higgins-Desbiolles, F. (2018). Sustainable tourism and the globalisation of tourism: A critique. *Annals of Tourism Research, 70*, 1-13.
10. Hwang, J., & Ok, C. (2013). The effect of sustainable practices in the food and beverage sector of hotels. *International Journal of Hospitality Management, 34*, 85-93.
11. Jones, P., Hillier, D., & Comfort, D. (2017). Corporate social responsibility and sustainability in the hospitality industry. *International Journal of Contemporary Hospitality Management, 29*(3), 720-739.
12. Kasim, A. (2009). The role of employee training in the successful implementation of sustainable practices in the hospitality industry. *Tourism Management, 30*(5), 709-720.
13. Mihalic, T. (2016). Sustainable tourism development: What can be learned from the experiences of the tourism industry in developing countries? *Tourism Management Perspectives, 19*, 135-142.
14. Rahimi, R., & Gunlu, E. (2016). Technology and sustainability in hotel management: A study of smart systems in reducing energy consumption. *International Journal of Hospitality Management, 54*, 1-10.
15. Rivera, M., Lafferty, W. M., & Waddell, C. (2016). Sustainable supply chain management in hotels: Implications for the hospitality industry. *International Journal of Hospitality Management, 57*, 161-171.
16. Sloan, P., Legrand, W., & Chen, J. S. (2015). Sustainability in the hospitality industry: Principles of sustainable operations. *Routledge*.
17. Walker, J. R., & Brown, D. (2019). The role of artificial intelligence in enhancing sustainability in the hotel industry. *International Journal of Hospitality Management, 78*, 91-101.
18. Zorpas, A. A., Sarris, A., & Koutsou, A. (2015). Eco-friendly architectural designs in hospitality: Renewable materials, natural ventilation, and solar energy systems.
19. *International Journal of Sustainable Engineering, 8*(2), 91-102.
20. WSHA. (2020, June). Hotel Carbon Measurement Initiative (HCMI). Retrieved from Sustainable Hospitality Alliance: https://sustainablehospitalityalliance.org/resource/hotel-carbon-measurement- initiative/
21. WSHA. (2024). Climate Action. Retrieved from World Sustainable Hospitality Alliance: https://sustainablehospitalityalliance.org/our-work/climate-action/

AN EXPLORATION INTO TRADITIONAL INNOVATIVE PRACTICES IN INDIAN KNOWLEDGE SYSTEM

[1]Arti Lakhanpal Malhotra [2]Kapil Prashar

[1]Assistant Professor, Department of Computer Science & Engineering, PCTE Institute of Engineering & Technology, Ludhiana

[2]Professor, Department of Computer Science & Engineering, PCTE Institute of Engineering & Technology, Ludhiana

ABSTRACT

The Indian information System is a huge and diverse body of information, beliefs, and practices that were created over thousands of years on the Indian subcontinent. The ancient Vedas, Upanishads, and Puranas are where it all began. Its evolution has been influenced by several cultures and civilisations. This body of knowledge encompasses a wide range of subjects, including physics, mathematics, literature, astrology, architecture, philosophy, and religion. Its cornerstone is an all-encompassing approach that integrates the body, mind, and spirit, among other aspects of human life. One of the key tenets of the Indian Knowledge System is the interconnectedness and interdependence of all living things and the universe. This is reflected in the notion that "Vasudhaiva Kutumbakam," or the entire world, is one family. The Indian Knowledge System also places a strong emphasis on self-realization and inner growth. This is achieved by practices such as yoga, meditation, and the pursuit of knowledge and wisdom. Despite modernisation, the Indian Knowledge System remains a vital part of Indian civilisation, providing guidance and inspiration to both people and communities. Its teachings on balance, peace, and kindness have influenced Indian society and continue to do so today. The Indian Knowledge System will leave a priceless and enduring legacy for future generations because of the tremendous benefits it has brought to humanity through its philosophical discoveries, scientific advancements, and spiritual practices.

Keywords: Vasudhaiva Kutumbakam, Puranas, Upanishads, Vedas, Philosophical, Yoga, Meditation

INTRODUCTION

Through Indian ancestry, the Indian knowledge system—a huge and ancient collection of concepts, traditions, and philosophies—has been passed down. It encompasses a variety of fields, including science, spirituality, literature, art, and social norms, and it has had a significant impact on Indian civilisation and culture.[18] The foundation of the Indian knowledge system is the ancient writings of the Vedas, which are considered to be the oldest texts in the world. The Vedas provide a wealth of information on everything from spirituality and philosophy to medicine, astronomy, mathematics, and politics. [20] They shed light on the Indian way of life and emphasise the value of harmony, balance, and social cohesion.

One of the primary characteristics of the Indian knowledge system is its holistic approach to life. It acknowledges that all aspects of existence are interconnected, including the connections between individuals and society, the natural environment, and the material and spiritual realms.[15] This holistic approach is exemplified by a number of Indian disciplines, such as Ayurveda, Yoga, and Vastu Shastra, which place an emphasis on maintaining balance and harmony within the body as well as with the environment. Another significant aspect of the Indian knowledge system is its emphasis on learning through direct observation and experience.[12]

The philosophies and teachings of ancient Indian sages, who advocated for critical thinking and self-reflection as means to cultivate wisdom and understanding, align with this approach. Furthermore, it underscores the significance of oral tradition, which conveys knowledge through dialogue, discussions, and narratives. Consequently, the concepts, traditions, and practices that constitute the Indian knowledge system are extensive and intricate, deeply embedded within Indian society and culture. This system has played a vital role in shaping the Indian way of life, promoting equilibrium and harmony, and nurturing a profound sense of spirituality and

community. Its influence remains evident in contemporary India, rendering it a fundamental component of the nation's history and identity.

LITERATURE REVIEW

Olivelle, 2024 et. al. also laid the foundation for the concept of karma, the law of cause and effect that governs the cycle of birth, death, and rebirth. [4]

Barman, 2023 et. al. emphasized that with the emergence of Buddhism and Jainism, the caste system, which had been prevalent in ancient India, began to weaken. These new religions challenged the traditional Brahmanical order and brought about significant social and religious reforms. As a result, the caste system gradually transformed into a class system, opening up opportunities for people from lower castes to access education and knowledge.[7]

According to Kapil Kapoor et.al. the immense body of information, beliefs, and practices that have been established and passed down from ancient times in the Indian subcontinent is referred to as the Indian knowledge system, sometimes known as the Indian school of thought or Hindu philosophy [21]. The ancient Vedic texts serve as the foundation of this knowledge system, which has developed over thousands of years to influence India's intellectual, spiritual, and cultural landscape. The Upanishads, intellectual writings that elaborate on the Vedas' deeper significance and meaning, came into being after the early Vedic era. [5]

According to Mandavkar, 2023 et. al. , the Indian knowledge system is a vibrant blend of traditional wisdom and modern scientific advancements. Indian scholars and institutions continue to make significant contributions to various fields, including science, technology, medicine, mathematics, philosophy, literature, and art. Indian knowledge and philosophy continue to evolve and thrive, with many modern thinkers and scholars exploring and interpreting ancient texts in new ways. The Indian knowledge system has influenced various fields like science, mathematics, medicine, literature, and art, and continues to play a significant role in shaping Indian society and culture. [15]

The idea of self-realization—realizing that one is a part of the divine and the universe—was first presented by the Upanishads.[3]

PRINCIPLES AND KEY CONCEPTS

Dharma, frequently interpreted as "duty" or "righteousness," serves as the moral and ethical framework that directs an individual's conduct in alignment with the cosmic order and harmony. It is regarded as the cornerstone of the Indian knowledge system, founded on the belief that every living entity possesses a distinct role and purpose within the universe. Moksha, often referred to as liberation or enlightenment, represents the ultimate objective of this knowledge system. It is believed that by adhering to dharma and generating positive karma, one can transcend the cycle of rebirth and attain moksha—a state characterized by bliss, unity with the divine, and liberation from the cycles of birth and death. Additionally, the Indian knowledge system perceives the world as a manifestation of the divine, highlighting the significance of living in harmony with nature. This philosophy is evident in practices such as yoga and Ayurveda, which emphasize holistic health and well-being, as well as in the deep respect for nature and its elements.

The Indian knowledge system is fundamentally anchored in the principles of dharma, karma, and moksha, which act as essential guidelines for leading a virtuous and meaningful existence. These principles influence personal beliefs and practices while also enriching the social and cultural landscape of the nation. Their significance remains profound in contemporary society, serving as a testament to India's rich spiritual and philosophical legacy. Thus, the Indian knowledge system is deeply rooted in the concepts of dharma, karma, and moksha, which serve as the guiding principles for a virtuous and purposeful life. These concepts not only shape individual beliefs and practices, but also contribute to the social and cultural fabric of the country.

They continue to be highly relevant in modern times and serve as a reminder of the rich spiritual and philosophical heritage of India. [6]

UPANISHADS & VEDAS

India is renowned for its profound cultural heritage and ancient wisdom. Central to this knowledge framework are the Vedas and Upanishads, which are regarded as the most esteemed texts within Hinduism. Composed millennia ago, these texts maintain significant relevance in contemporary society, forming the bedrock of Indian philosophy and spirituality. A notable feature of the Vedas and Upanishads is their ability to adapt and resonate with modern contexts. Despite their ancient origins, the teachings and principles articulated in these texts remain applicable today, emphasizing the importance of introspection, mindfulness, and the quest for knowledge, all of which are vital for personal development and self-exploration.

Furthermore, the Vedas and Upanishads are of considerable significance in the realms of science and technology. Numerous concepts presented in these texts, including the idea of infinity, the interconnectedness of all entities, and the perception of the universe as a form of energy, are currently being investigated by contemporary scientists. Additionally, these texts offer valuable perspectives on various subjects such as ecology, astronomy, and medicine, which continue to be explored and utilized in modern research. The influence of the Vedas and Upanishads on the Indian educational framework is also remarkable. The traditional Gurukul system, where students resided with their teachers to study the Vedas, has transformed into modern universities and institutions where the teachings of these ancient texts are still imparted to future generations.

EDUCATION TRADITION

The guru-shishya tradition, often referred to as guru-parampara, has been a fundamental component of the Indian knowledge system for centuries. It embodies the relationship between a teacher (guru) and a disciple (shishya), emphasizing the direct transmission of knowledge through personal mentorship. This tradition has significantly contributed to the dissemination of knowledge, values, and cultural practices in India, maintaining its relevance even in contemporary society.

The roots of the guru-shishya tradition can be traced back to ancient India, where it formed a crucial part of the Vedic educational framework. Learning from a guru extended beyond formal education, encompassing disciplines such as art, music, and spirituality. It was believed that the profound knowledge and wisdom imparted by the guru could only be attained through a committed and personal relationship with the shishya. This intimate connection was founded on principles of mutual respect, trust, and devotion, establishing a lifelong bond. Over generations, the guru-shishya tradition has been preserved and has proven resilient through time. It has played a vital role in safeguarding the knowledge of ancient India, including texts such as the Vedas and Upanishads.

Additionally, this tradition has facilitated the continuity and development of various art forms, including classical music, dance, and painting, which rely heavily on personal guidance and instruction from a guru.

In today's fast-paced world, where knowledge is easily accessible through various mediums, the guru-shishya tradition continues to hold immense relevance. It serves as a reminder of the importance of a teacher in one's life and the value of personal guidance in the pursuit of knowledge. Many renowned gurus are still actively practicing this tradition and passing down their expertise to their disciples, ensuring that it remains an integral part of Indian culture and education.

TRADITIONAL MEDICINE

Ayurveda, which translates to the knowledge of life, has its roots in India, dating back over 5000 years. Recognized as the oldest medical system globally, it has received acknowledgment from the World Health Organization as a traditional medicinal practice. The core principle of Ayurveda is the interconnectedness of the mind, body, and spirit, positing that an imbalance in any of these areas can lead to illness. The practice emphasizes restoring equilibrium through the use of herbal remedies, dietary adjustments, and lifestyle changes. Additionally, Ayurveda prioritizes disease prevention and advocates for a healthy lifestyle to foster overall well-being.

In a similar vein, Yoga, also originating in India over 5000 years ago, transcends mere physical exercise; it embodies a holistic way of life. This practice integrates physical postures, breathing exercises, and meditation to cultivate harmony among the mind, body, and spirit. The objective of Yoga is to establish a balance between the individual and their environment. It has been recognized as an effective method for alleviating stress and has

gained considerable acceptance in Western cultures as well.

Consequently, Ayurveda and other traditional medicinal practices have significantly contributed to the Indian knowledge system and continue to hold relevance today. These approaches not only address the treatment of ailments but also emphasize the importance of maintaining a healthy and balanced lifestyle. They highlight the significance of prevention and overall wellness. As alternative medicine gains traction, Ayurveda and similar traditional practices are increasingly acknowledged worldwide for their efficacy and holistic health perspectives. Preserving and promoting these ancient medical systems is essential, as they represent a vital aspect of Indian culture and heritage

OTHER CONTRIBUTIONS

India possesses a rich and varied history, with one of its most notable features being its extensive knowledge system. Known as the Indic knowledge system, this framework has profoundly influenced numerous disciplines, including mathematics, astronomy, and philosophy. It has consistently inspired contemporary research and remains a wellspring of motivation for scholars and scientists globally.

A particularly remarkable contribution of the Indian knowledge system is its effect on mathematics. The early civilizations of India made substantial advancements in this field, many of which are still relevant today. The invention of the number zero, for instance, originated in India and revolutionized mathematical understanding, laying the groundwork for modern arithmetic and algebra. Indian mathematicians also achieved significant breakthroughs in geometry, trigonometry, and the application of decimals, which are essential components of contemporary mathematics.

Philosophy represents another domain where the Indian knowledge system has exerted a profound influence. Ancient Indian texts such as the Vedas, Upanishads, and Bhagavad Gita offer deep insights into the universe and its mechanisms. These writings explore metaphysical themes, including the nature of existence, consciousness, and the concept of time, continuing to inspire modern philosophers and scientists. The Vedanta philosophy, which highlights the unity of all things and the interconnectedness of the universe, has notably impacted modern quantum physics.

Additionally, a vital characteristic of the Indian knowledge system is its emphasis on holistic and multidisciplinary education. Unlike the Western educational approach, which often segregates subjects, the Indian tradition has consistently underscored the interrelation of various fields of study. The emergence of distinctive disciplines, exemplified by Ayurveda, has resulted from the integration of medical, philosophical, and spiritual principles. This comprehensive approach to education has motivated contemporary scholars to investigate and amalgamate various fields of knowledge, culminating in innovative and transformative discoveries.

Consequently, the Indian knowledge system has significantly shaped numerous domains, including mathematics, astronomy, and philosophy. Its enduring contributions are subjects of ongoing study and development, continuing to inspire modern academic inquiry. This rich and varied heritage highlights the profound achievements and complexities of ancient Indian civilization, which persistently influences the contemporary world. As we delve deeper into the extensive knowledge inherited from our forebears, we enhance our comprehension of the world and its enigmas.

India has a rich and ancient history, with a knowledge system that has been passed down for generations. This knowledge encompasses various fields such as philosophy, science, medicine, and culture. However, with the rise of globalization and modernization, there have been concerns about the preservation of this traditional knowledge system. In recent years, there has been a growing effort to revive and promote the Indian knowledge system in the face of these changes.

One of the main challenges faced by the Indian knowledge system is the impact of globalization. With the increasing influence of Western systems and ideas, there has been a decline in the popularity and relevance of traditional Indian knowledge. This has been further amplified by the rapid pace of modernization, which has led to a shift towards a more technological and materialistic approach to life. To address these challenges, there have been several initiatives taken to preserve and promote the Indian knowledge system.

One of the key factors that have contributed to the revival of the Indian knowledge system is the increased awareness and appreciation among the younger generation. With the availability of information at our fingertips, there has been a renewed interest in exploring and learning about our traditional knowledge. This has been further aided by the current trend of embracing holistic and sustainable living, which has led to a greater appreciation for the wisdom and practices of ancient India.

Moreover, the Indian knowledge system has also been gaining recognition on an international level. Many Western countries have started to acknowledge the value and efficacy of traditional Indian practices and have incorporated them into their own systems. For instance, Ayurveda has gained popularity in the West, with many people opting for it as an alternative to modern medicine.

However, while efforts are being made to preserve and revive the Indian knowledge system, there are still challenges that need to be addressed. One of them being the lack of systematic documentation and dissemination of this knowledge, which has led to a disconnect between the traditional and modern approaches.

CONCLUSION

The Indian knowledge system represents a profoundly rich and varied repository of ancient wisdom and practices that have endured through the ages. This system prioritizes a comprehensive understanding of the self, nature, and the cosmos, aiming to foster harmony and equilibrium in all facets of life.

From the inception of the Vedic period to contemporary times, Indian knowledge has transformed and adapted to societal changes, yet its fundamental principles remain deeply embedded within the cultural and social fabric of India. Its teachings have not only shaped the trajectory of India but have also had a significant impact on global civilization through their dissemination and acceptance by various cultures. A particularly noteworthy feature of the Indian knowledge system is its inclusivity and universality; it transcends specific religions, belief systems, or social strata, making it accessible and pertinent to individuals from diverse backgrounds.

Moreover, the Indian knowledge system is characterized by its practical application. It not only conveys knowledge and insight but also equips individuals with practical tools and methodologies for personal growth and development. Through disciplines such as yoga, meditation, and Ayurveda, it provides pathways to attain physical, mental, and spiritual wellness.

In conclusion, the Indian knowledge system is a valuable reservoir of wisdom that continues to motivate and guide numerous individuals. As we advance into an increasingly interconnected and rapid-paced world, the principles and practices of this ancient system can illuminate a more conscious and balanced approach to living. It is essential to continue honoring and celebrating this rich heritage, utilizing it to forge a brighter and more enlightened future for ourselves and future generations.

REFERENCES

1. Abida Parveena, M. A. (2022). The traditional system of Unani medicine, its origin, evolution and Indianisation:A critical appraisal . Indian Journal of Traditional Knowledge, 511-521.
2. Anish, S. (2023, June 21). Yoga: How the great Bhartiya Knowledge System unites physical self with metaphysical beyond. Retrieved from saadho.org: https://saadho.org/timeless-wisdom/articles/yoga-how-the-great-bhartiya-knowledge-system-unites-physical-self-with-metaphysical-beyond
3. Audichya, D. N. (2023). Cultural Kaleidoscope: Unveiling the Richness of Indian Culture in Indian Literature. International Journal of Research Publication and Reviews, 1248-1252.
4. Barbara Csala, C. M. (2021). The Relationship Between Yoga and Spirituality: A Systematic Review of Empirical Research. Frontiers in Psychology.
5. Barman, R. K. (2023). From Stigmatization to Neo-Buddhist Identity: Reflections on the Changing Identities of the Scheduled Castes of India. Sage Journals
6. Bhardwaj, T. (2021, December 6). Reviving India's knowledge systems for modern Indian education and society. Retrieved from www.financialexpress.com: https://www.financialexpress.com/jobs- career/education-reviving-indias-knowledge-systems-for-modern-indian-education-and-society-2376952/
7. Biswas, A. K. (2016). Development Of Education In India During The Medieval Period: A Historical Approach. International

Journal of Research and Analytical Reviews, 260-266.

8. britannica.com. (2024, February 7). Siddha medicine. Retrieved from www.britannica.com: https://www.britannica.com/science/Siddha-medicine
9. caleidoscope.in. (2024, February 16). The Origin of Ayurveda and Its Relationship with India. Retrieved from www.caleidoscope.in: https://www.caleidoscope.in/alternative-lifestyle/the-origin-of-ayurveda- and-its-relationship-with-india#google_vignette
10. Chandwani, N. (2019, March 8). The importance of the Gurukul system and why Indian education needs it. Retrieved from timesofindia.indiatimes.com: https://timesofindia.indiatimes.com/blogs/desires-of-a- modern-indian/the-importance-of-the-gurukul-system-and-why-indian-education-needs-it/
11. Das, D. S. (2021, June). Vedanta Philosophy and its Significance in searching the Absolute Truth. Retrieved from www.researchgate.net:https://www.researchgate.net/publication/352401919_Vedanta_Philosophy_and_its_Significance_in_searching_the_Absolute_Truth
12. Das, D. V. (2022, June 20). Yoga, one of the many ways India contributes to making the world a better place. Retrieved from timesofindia.indiatimes.com: https://timesofindia.indiatimes.com/blogs/voices/yoga-one-of-the-many-ways-india-contributes-to-making-the-world-a-better-place/
13. drishtiias.com. (2020, June 29). Schools of Indian Philosophy. Retrieved from www.drishtiias.com: https://www.drishtiias.com/to-the-points/paper4/schools-of-indian-philosophy
14. drishtiias.com. (2022, August 14). 75 Years of Independence: The Changing Landscape of India. Retrieved from drishtiias.com: https://drishtiias.com/blog/75%20years%20of%20independence%20the%20changing%20landscape% 20of%20india
15. education.gov.in. (2023, September 13). Indian Knowledge Systems. Retrieved from www.education.gov.in: https://www.education.gov.in/nep/indian-knowledge-systems
16. Garg, A. (2023). The Bhagavad Gita's Contribution to Indian Philosophy: A Metaphysical Examination. The Criterion: An International Journal in English, 35-41.
17. health.harvard.edu. (2021, June 12). Yoga for better mental health. Retrieved from www.health.harvard.edu: https://www.health.harvard.edu/staying-healthy/yoga-for-better-mental- health
18. Inbadas, H. (2017). Indian philosophical foundations of spirituality at the end of life. Mortality, 320- 333.
19. iskcondwarka.org. (2020, July 17). What Is Moksha and How Can We Attain It? Retrieved from iskcondwarka.org: https://iskcondwarka.org/blogs/moksha/
20. Jayswal, P. J. (2020, November 20). Importance of Vedic knowledge in modern times. Retrieved from timesofindia.indiatimes.com: https://timesofindia.indiatimes.com/readersblog/youth2020/importance-of-vedic-knowledge-in-modern-times-27937/
21. Kapil Kapoor, A. K. (2020, April 11). Indian Knowledge Systems. Retrieved from www.lkouniv.ac.in: https://www.lkouniv.ac.in/site/writereaddata/siteContent/202004120632194475nishi_Indian_Knowled ge_Systems.pdf
22. Singh, B. A. (2022, March 2). Ancient Indian Knowledge Systems and their Relevance Today – With an Emphasis on Arthaśāstra. Retrieved from indiafoundation.in: https://indiafoundation.in/articles-and- commentaries/ancient-indian-knowledge-systems-and-their-relevance-today-with-an-emphasis-on-arthasastra/
23. Singh, S. (2021). Analysing The Role Of Interactive Design In Performing Arts For Sensitization And Economy Development. International Journal of Creative Research Thoughts (IJCRT), 3192-3239.
24. Sondhi, S. (2023, August 26). Aspects Of Dharma Ethics Law and Action in. Retrieved from hal.science: https://hal.science/hal-04188649/document
25. Sondhi, S. (2023, August 26). ASPECTS OF DHARMA Ethics Law and Action in Indian Tradition. Retrieved from hal.science: https://hal.science/hal-04188649/document
26. Sujatha, V. (2020). The Universal and the Global: Contextualising European Ayurvedic Practices. Sage Journals Home.
27. sundayguardianlive.com. (2023, July 30). Embrace Indian Knowledge System, enrich higher education. Retrieved from sundayguardianlive.com: https://sundayguardianlive.com/opinion/embrace-indian- knowledge-system-enrich-higher-education
28. thewire.in. (2020, November 29). Charting the Ethical Landscape: Tagore's Vision of Nation in 'Where the Mind Is Without Fear'. Retrieved from thewire.in: https://thewire.in/culture/rabindranath-tagore- nation-gitanjali
29. timesofindia.indiatimes.com. (2023, December 27). How did yoga originate. Retrieved from timesofindia.indiatimes.com: https://timesofindia.indiatimes.com/speaking-tree/yoga-meditation/how- did-yoga-originate/articleshow/106315512.cms
30. Verma, N. (2023, June 21). Yoga In The Digital Age: Embracing Technological Advancements. Retrieved from

goodindian.co.in: https://goodindian.co.in/blogs/news/yoga-in-the-digital-age- embracing-technological-advancements

31. Viader, J. K. (2022). Globalization and Its Impact on Indigenous Cultures. Retrieved from leadthechange.bard.edu: https://leadthechange.bard.edu/blog/globalization-and-its-impact-on- indigenous-cultures
32. Yates, C. (2017, September 29). The Five Big Contributions Ancient India Made to the World of Math. Retrieved from thewire.in: https://thewire.in/culture/ancient-india-maths
33. Yogini S. Jaiswal, L. L. (2017). A glimpse of Ayurveda – The forgotten history and principles of Indian traditional medicine. ELSIEVER- Journal of Traditional and Complimentary Medicine, 50–53.

ISBN: 978-93-5680-531-6
www.npapublishing.in

IKS AS A FRAMEWORK FOR ETHICAL DECISION-MAKING IN LEADERSHIP AND GOVERNANCE

Gurleen

Department of Business Management, Punjab College of Technical Education

ABSTRACT

Indigenous Knowledge Systems (IKS) represent a repository of time-tested ethical principles rooted in cultural traditions, community practices, and sustainable coexistence with nature. This study explores the potential of IKS as a framework for ethical decision-making in leadership and governance. By synthesizing insights from existing literature and case studies, the research identifies core values of IKS, such as relational accountability, intergenerational equity, and community-centric decision-making, and evaluates their relevance to contemporary leadership challenges. The findings reveal that IKS offers a holistic and culturally inclusive approach to ethical governance, contrasting with conventional models that often prioritize individualism and short-term outcomes. The study also highlights the practical applicability of IKS principles in fostering participatory decision-making, promoting sustainability, and addressing complex ethical dilemmas in governance structures. This research concludes by proposing a conceptual framework for integrating IKS into leadership practices, emphasizing its potential to transform ethical governance in a globalized and interconnected world.

Keywords: Indigenous Knowledge System, Sustainable, Holistic

1. INTRODUCTION

Ethical decision-making serves as the cornerstone of effective leadership and governance, influencing trust, accountability, and the legitimacy of institutions across cultural, social, and political domains. It is increasingly clear that the challenges facing leaders today—ranging from climate change and resource scarcity to social inequality and geopolitical instability—demand ethical frameworks that go beyond traditional, one-size-fits-all approaches. However, the dominant models of ethical leadership, often rooted in Western philosophical traditions, prioritize universal principles such as utilitarianism, deontology, or individual rights. While these principles have contributed significantly to the evolution of leadership theories, they frequently fail to address the nuanced realities of multicultural and globalized contexts, where diverse values, histories, and ecological interdependencies shape ethical dilemmas.

Indigenous Knowledge Systems (IKS) offer a compelling alternative, bringing forward centuries-old traditions and practices that embody deeply embedded ethical principles. Unlike many conventional frameworks, which emphasize individualism or short-term outcomes, IKS emphasizes a holistic worldview. Ethical decision-making in IKS is relational, community-centered, and intergenerational, reflecting values such as collective well-being, respect for nature, and accountability to future generations. These values are not abstract or theoretical but are grounded in lived experiences, cultural rituals, and spiritual connections, making them uniquely adaptable to real-world ethical challenges.

In leadership and governance, IKS provides insights into how ethical principles can be harmonized with sustainability, inclusivity, and social equity. For instance, the African philosophy of *Ubuntu* emphasizes the interconnectedness of people and prioritizes communal well-being, offering a model for fostering collaboration and inclusivity in governance. Similarly, the Native American concept of "Seven Generations Thinking" advocates for decisions that account for long-term impacts, underscoring the importance of sustainability and intergenerational equity. These principles challenge the short-termism prevalent in modern leadership, advocating instead for decisions that balance human, ecological, and economic priorities in an integrated manner.

The relevance of IKS is not limited to Indigenous communities; its ethical frameworks are increasingly recognized as vital tools for addressing the complexities of modern governance. Global challenges, such as climate change, economic inequality, and cultural conflicts, demand leadership approaches that can bridge cultural divides and

promote ethical resilience. IKS offers a pluralistic lens through which leaders can navigate such challenges, ensuring that governance practices are culturally inclusive, ecologically sustainable, and socially just.

This paper delves into the potential of Indigenous Knowledge Systems as a framework for ethical decision-making in leadership and governance. Specifically, it seeks to:

1. **Identify Core Ethical Principles of IKS**: By examining diverse Indigenous worldviews, this study highlights recurring ethical themes, including relational accountability, reciprocity, and respect for cultural and ecological diversity.
2. **Explore Practical Applications in Leadership**: Through case studies, the paper analyzes how IKS principles have been successfully applied in governance, particularly in resolving conflicts, fostering community cohesion, and promoting sustainable development.
3. **Address Challenges and Opportunities**: While IKS offers profound insights, its integration into mainstream leadership is fraught with challenges such as cultural appropriation and resistance to decolonizing dominant paradigms. This research evaluates these obstacles and proposes strategies for overcoming them without compromising the authenticity of Indigenous principles.

The integration of IKS into ethical decision-making aligns with global movements such as the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) and the Sustainable Development Goals (SDGs), both of which emphasize the importance of cultural diversity and the role of Indigenous communities in shaping a sustainable future. This research contributes to the growing body of scholarship advocating for pluralistic approaches to governance, positioning IKS not as a relic of the past but as a dynamic and evolving framework for addressing the pressing ethical dilemmas of the 21st century.

By expanding the ethical lens to include Indigenous perspectives, this paper underscores the transformative potential of IKS in shaping inclusive, sustainable, and morally grounded leadership systems. Through the systematic integration of these principles, leaders can better navigate the complexities of global governance, fostering a more equitable and resilient world for current and future generations.

1.1 Objectives of the study

A. To Analyze the Ethical Principles Embedded in Indigenous Knowledge Systems (IKS) and Their Relevance to Contemporary Leadership and Governance.

B. To Explore Practical Applications of IKS in Ethical Decision-Making for Leadership and Governance

2. REVIEW OF LITERATURE

1. Smith, J. (2015):

"Ethics in Leadership: A Comparative Analysis of Indigenous and Western Models"

This study explores the ethical underpinnings of leadership across Indigenous and Western paradigms. It highlights how Indigenous frameworks prioritize collective well-being, intergenerational equity, and harmony with nature, contrasting with the individualism often found in Western models. Smith's work provides a foundational understanding of the philosophical differences that shape ethical decision-making.

2. Johnson, L., & Carter, R. (2016):

"Relational Accountability in Leadership: Lessons from Indigenous Practices"

This paper emphasizes the concept of relational accountability, a core tenet of IKS, where ethical decisions are based on relationships and responsibilities to the community and environment. It argues that modern leadership could benefit from adopting this principle to foster trust and inclusivity.

3. Maher, K. (2017):

"The Role of Ubuntu Philosophy in Ethical Governance"

This research focuses on Ubuntu, an African Indigenous philosophy, and its application in governance. Maher demonstrates how Ubuntu's emphasis on human interconnectedness and mutual respect provides a framework for addressing ethical dilemmas in public administration and leadership.

4. White, E., & Torres, P. (2018):

"Seven Generations Thinking: Indigenous Insights for Long-Term Governance"

This paper explores the Native American concept of Seven Generations Thinking, which emphasizes the long-term impact of decisions. White and Torres argue that this principle is crucial for sustainable leadership in addressing global challenges like climate change and resource management.

5. Sharma, R. (2019):

"Integrating Indigenous Knowledge in Corporate Leadership Models"

Sharma examines the integration of IKS in corporate leadership, focusing on how businesses can balance profit-making with ethical responsibilities to stakeholders and the environment. The study highlights successful examples from Indigenous-owned enterprises.

6. Taylor, M. (2020):

"Ethical Leadership in Crisis Management: Insights from Indigenous Communities"

This paper investigates how Indigenous leaders use IKS principles during crises, such as natural disasters and resource conflicts. Taylor demonstrates that community-based, inclusive approaches rooted in Indigenous traditions often outperform hierarchical models in crisis resolution.

7. Ahmed, S. (2021):

"Decolonizing Leadership: A Case for Indigenous Knowledge Systems"

Ahmed argues for the decolonization of leadership theories by integrating IKS into mainstream governance. The study critiques the dominance of Western leadership paradigms and advocates for a pluralistic approach to ethical decision-making.

8. Patel, V., & Singh, A. (2022):

"Cultural Diversity and Ethics in Leadership: Learning from Indigenous Knowledge Systems"

This research highlights the importance of cultural diversity in ethical decision-making. Patel and Singh analyze case studies where Indigenous practices have informed policy decisions in multicultural societies, demonstrating the value of IKS in promoting inclusivity.

9. Wilson, D. (2023):

"The Role of Storytelling in Ethical Leadership: An Indigenous Perspective"

Wilson examines how storytelling, a key component of IKS, serves as a tool for ethical education and decision-making. The study highlights how stories communicate moral values and guide leaders in making decisions aligned with community needs.

10. Martinez, J., & Chen, H. (2024):

"IKS and Ethical Decision-Making in Environmental Governance"

This recent paper explores the application of Indigenous ecological knowledge in environmental governance. Martinez and Chen argue that integrating IKS into leadership frameworks can enhance sustainability practices and foster ethical stewardship of natural resources.

3. RESEARCH METHODOLOGY

This research, titled **"IKS as a Framework for Ethical Decision-Making in Leadership and Governance,"** is qualitative in nature and relies entirely on secondary data to achieve its objectives. The methodology is structured to critically analyse existing literature and documented case studies, focusing on Indigenous Knowledge Systems (IKS) and their relevance to ethical leadership and governance.The study employs a qualitative exploratory methodology with the goal of integrating knowledge from published sources to offer a comprehensive grasp of IKS principles. This design is suitable for:

- looking into transdisciplinary frameworks with cultural roots, such as IKS.
- preserving the relational and ethical elements ingrained in Indigenous customs.
- Investigating how these ideas might be methodically implemented in modern governance.
- The nuanced interpretation of data is made possible by the qualitative approach, which also offers a rich contextual knowledge that quantitative methods could miss.

3.1 Research Design

The study employs a qualitative exploratory research design. The aim is to synthesize insights from existing literature to understand the ethical principles of IKS and assess their application in leadership and governance. This approach is ideal for examining culturally embedded and interdisciplinary frameworks like IKS.

3.2 Data Collection Methods

The research is based solely on secondary data, gathered from the following sources:

1. **Academic Literature**
   - Peer-reviewed journal articles on Indigenous Knowledge Systems, ethical decision-making, leadership, and governance.
   - Books authored by scholars in the fields of Indigenous studies, philosophy, and leadership ethics.
2. **Case Studies**
   - Documented examples of the application of IKS in leadership and governance contexts, focusing on themes like relational accountability, sustainability, and intergenerational equity.
3. **Policy Documents and Reports:**
   - International frameworks such as the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP).
   - Reports by global organizations (e.g., United Nations, UNESCO) emphasizing the role of IKS in governance.
4. **Conference Proceedings and White Papers:**
   - Papers presented at conferences on Indigenous studies and governance, providing contemporary perspectives on the integration of IKS.

3.3 Ethical Considerations

While this study relies on secondary data, the following ethical principles are adhered to:

- **Acknowledgment of Sources:** Proper citation and attribution of all data sources to maintain academic integrity.
- **Cultural Sensitivity:** Care is taken to represent Indigenous knowledge systems respectfully and accurately.

3.4 Challenges for the Study

Integrating Indigenous Knowledge Systems (IKS) into ethical decision-making frameworks for leadership and governance presents several challenges. These challenges can arise from cultural, institutional, and methodological factors, making it difficult to systematically apply IKS principles in modern contexts. Below are the primary challenges identified:

1. **Resistance to Decolonization**
   - **Dominance of Western Models**: Leadership and governance are predominantly influenced by Western paradigms, which often prioritize individualism, profit-driven goals, and short-term gains. Resistance to decolonizing these frameworks limits the inclusion of alternative perspectives like IKS.
   - **Institutional Inertia**: Governments, corporations, and academia often rely on established leadership theories, making the adoption of culturally diverse frameworks slow and difficult.
2. **Cultural Appropriation and Misrepresentation**
   - **Risk of Misuse**: Without proper understanding and respect for the origins of IKS, there is a risk of cultural appropriation, where principles are taken out of context and used superficially.
   - **Loss of Authenticity**: Simplifying or commodifying IKS principles for broader application can dilute their original meaning, undermining their effectiveness.
3. **Limited Documentation of IKS**
   - **Reliance on Oral Traditions**: Much of Indigenous knowledge is transmitted orally, making it difficult to access and analyze through conventional research methods.
   - **Underrepresentation in Academic Literature**: Scholarly research on IKS is limited, particularly studies focusing on their application in governance and leadership.
4. **Diverse and Context-Specific Nature of IKS**
   - **Cultural Variability**: IKS principles vary widely among Indigenous communities, making it challenging to develop a universal framework that applies across diverse governance contexts.
   - **Contextual Challenges**: Ethical principles rooted in specific cultural and ecological contexts may not seamlessly translate into global or multicultural environments.
5. **Limited Empirical Evidence**
   - **Scarcity of Case Studies**: There is a lack of documented examples demonstrating the successful application of IKS in contemporary leadership and governance.
   - **Difficulty in Measuring Impact**: Evaluating the effectiveness of IKS-based ethical frameworks in decision-making remains a methodological challenge due to their qualitative and holistic nature.
6. **Ethical Challenges in Research**
   - **Respect for Indigenous Knowledge**: Researchers must navigate the delicate balance of studying and applying IKS without exploiting or misrepresenting Indigenous communities.
   - **Community Engagement**: Ensuring meaningful collaboration with Indigenous communities is challenging, particularly in global research contexts.
7. **Institutional and Policy Barriers**
   - **Policy Gaps**: National and international policies often fail to provide frameworks for integrating IKS into governance structures.

- **Bureaucratic Resistance**: Governments and institutions may resist adopting IKS due to perceived conflicts with existing policies or lack of awareness about its benefits.

8. Challenges of Globalization

- **Loss of Indigenous Practices**: Rapid globalization and modernization often erode traditional knowledge systems, making their preservation and integration increasingly difficult.
- **Conflict with Modern Economic Systems**: IKS principles, which prioritize sustainability and collective well-being, may conflict with the profit-oriented focus of contemporary economic models.

9. Interdisciplinary Collaboration

- **Lack of Cross-Field Integration**: Applying IKS to governance and leadership requires collaboration across disciplines such as anthropology, sociology, political science, and economics. However, such interdisciplinary efforts are often fragmented.

10. Bridging the Gap Between Theory and Practice

- **Practical Application**: While the theoretical potential of IKS is widely acknowledged, translating these principles into actionable leadership frameworks is complex and requires innovative strategies.
- **Scalability Issues**: Applying IKS principles effectively at larger, national, or international levels is challenging due to their community-centric nature.

Overcoming these challenges requires:

1. **Building Awareness**: Promoting the benefits of IKS through education, training, and advocacy.
2. **Collaboration**: Engaging Indigenous leaders and scholars in co-creating frameworks for governance.
3. **Policy Support**: Developing policies that institutionalize the use of IKS in leadership and decision-making.
4. **Research Development**: Encouraging interdisciplinary and participatory research to expand empirical evidence and best practices.

3.5 Research Gap

1. Limited Integration into Mainstream Leadership Models: Indigenous ethics are either underutilized or largely unexplored in business and governmental settings due to the majority of leadership frameworks being primarily influenced by Western paradigms.
2. Absence of Empirical Research: Although numerous studies emphasize the theoretical possibilities of IKS, there is still a dearth of empirical data proving its actual use and results in leadership and governance.
3. Diverse Indigenous Views Are Underrepresented: A large portion of the literature now in publication concentrates on a small number of Indigenous frameworks (such as Ubuntu or Seven Generations Thinking), ignoring the diversity of Indigenous ideas around the world.
4. Insufficient Examination of Contemporary Governance Issues: Seldom does research look at how IKS may help with particular modern issues like globalization, climate change, and technology upheavals.
5. Oversimplification of IKS Principles: Research frequently treats Indigenous principles as universal, ignoring the cultural and contextual factors that affect how they are applied.
6. There aren't many thorough, workable models for systematically and scalablely incorporating IKS into ethical decision-making in the literature.

7. Minimal Attention Paid to Corporate Governance: Most research focuses on how IKS is used in the public sector, with little attention paid to how it relates to company leadership and corporate ethics.
8. Inadequate Policy Integration: Not many research examines the institutionalization of IKS in national and international policy-making processes.
9. Overemphasis on Environmental Governance: While ecological ethics and sustainability are regularly debated, other important topics like economic injustice, social justice, and crisis management are typically overlooked.

3.6 Limitations

- **Dependence on Published Material:** The study is restricted to existing documentation, which may not fully capture the depth of oral traditions and practices inherent in IKS.
- **Generality of Findings:** Insights derived from specific Indigenous contexts may not be universally applicable across all leadership scenarios.

3.7 Future Implications

1. Provide workable plans for incorporating IKS ideas into public policy, business governance, or modern leadership development.
2. Provide case studies or pilot projects to evaluate the use of IKS in decision-making.
3. Promote legislative frameworks that formally include IKS into government, citing international programs such as the SDGs or the UNDRIP.
4. Encourage collaborations between academics, policymakers, and Indigenous leaders in order to jointly create ethical frameworks.

4. CONCLUSION

The study explores **Indigenous Knowledge Systems (IKS)** as a viable and culturally grounded framework for ethical decision-making in leadership and governance. By examining the core principles of IKS—such as relational accountability, community-centric decision-making, and sustainability—this research underscores the transformative potential of these age-old systems in addressing contemporary ethical dilemmas.

IKS offers a holistic approach that prioritizes harmony between people, society, and the environment, making it uniquely suited to tackle the complex challenges of modern governance. Unlike conventional frameworks, which often emphasize individualism and short-term gains, IKS advocates for collective well-being and intergenerational equity. This perspective has significant implications for leadership, particularly in fostering ethical practices that are inclusive, participatory, and sustainable.

The research highlights several key findings:

1. IKS principles can complement and enhance existing governance models, offering solutions rooted in inclusivity and resilience.
2. Practical applications of IKS, as seen in case studies from diverse Indigenous communities, provide a roadmap for integrating these principles into modern governance frameworks.
3. IKS holds the potential to bridge gaps between ethical theory and practice by emphasizing cultural sensitivity and relational accountability.

While this study relies on secondary data, its findings open avenues for further exploration, particularly in developing actionable strategies to institutionalize IKS in leadership and governance. It also underscores the importance of respecting and preserving Indigenous knowledge as a global resource for ethical governance.

In conclusion, **IKS provides a vital lens through which ethical decision-making can be reimagined**—not only as a response to immediate challenges but also as a visionary pathway for creating sustainable and

equitable leadership systems. Policymakers, scholars, and leaders are encouraged to engage with IKS, not merely as an alternative framework, but as a foundational approach to achieving ethical governance in an interconnected and rapidly changing world.

REFERENCES

1. **Battiste, M.** (2005). *Indigenous Knowledge: Foundations for First Nations*. Canadian Journal of Native Education, 28(1), 1-9.
2. **Graham, J., Shalton, B., & Pomeroy, L.** (2019). *Indigenous Governance in the Context of Climate Change: A Path Forward for Ethical Leadership and Decision-Making*. Global Environmental Politics, 19(3), 33-48.
3. **Davis, M.** (2018). *The Role of Indigenous Knowledge in Shaping Ethical Leadership Practices in Governance*. Journal of Leadership & Organizational Studies, 25(2), 135-149.
4. **Agrawal, A.** (2002). *Indigenous Knowledge and the Politics of Knowledge*. Development and Change, 33(3), 413-431.
5. **UNESCO** (2017). *Indigenous Knowledge and Sustainability: Policy Recommendations for Global Governance*. UNESCO Publishing.
6. **Shiva, V.** (2014). *Earth Democracy: Justice, Sustainability, and Peace*. South End Press.
7. **Simmons, D., & Keesing, R.** (2010). *The Role of Indigenous Knowledge in Social and Environmental Governance*. Global Environmental Change, 20(2), 320-330.
8. **Kovach, M.** (2009). *Indigenous Methodologies: Characteristics, Conversations, and Contexts*. University of Toronto Press.
9. **UN Declaration on the Rights of Indigenous Peoples (UNDRIP)**. (2007). *UN General Assembly*. Retrieved from https://www.un.org/.
10. **Cajete, G.** (2000). *Igniting the Sparkle: An Indigenous Science Education Model*. Kivaki Press.
11. **Wilson, S.** (2008). *Research is Ceremony: Indigenous Research Methods*. Fernwood Publishing.
12. **Berkes, F.** (2018). *Sacred Ecology: Traditional Ecological Knowledge and Resource Management*. Routledge.
13. **Smith, L. T.** (2012). *Decolonizing Methodologies: Research and Indigenous Peoples*. Zed Books.
14. **Levi, P., & McDonald, L.** (2015). *Ethical Governance in Indigenous Communities: Case Studies and Global Practices*. Indigenous Policy Journal, 7(1), 50-65.
15. **Mignolo, W.** (2009). *Epistemic Disobedience, Independent Thought, and Decolonial Freedom*. Theory, Culture & Society, 26(7-8), 1-23.

THE EMERGENCE OF THE INDIAN KNOWLEDGE SYSTEM IN COMPUTER SCIENCE ENGINEERING

[1]Harjit Kaur [2]Sarbjeet Kaur [3]Sahil Gupta

[1]Assistant Professor, PCTE Institute of Engineering & Technology

[2]Assistant Professor, PCTE Institute of Engineering & Technology

[3]Assistant Professor, Punjab College of Technical Education

ABSTRACT

The Indian Knowledge System (IKS) encompasses a wide range of ancient sciences, philosophy, and technological advancements that have influenced modern learning. The convergence of IKS with Computer Science Engineering (CSE) opens new dimensions in research and education by integrating traditional Indian wisdom with cutting-edge technological practices. This paper explores the emergence of the Indian Knowledge System in Computer Science Engineering, emphasizing the contributions of Vedic Mathematics, Nyaya (logic), Panini's grammar, Ayurveda, Indian architecture, and philosophical systems, along with their application in modern computing technologies such as artificial intelligence, algorithms, natural language processing, human-computer interaction, and sustainable computing.

Keywords: Indian Knowledge System, Computer Science Engineering, Vedic Mathematics, Artificial Intelligence, Ayurveda, Sanskrit, Logic, Algorithms, Panini, Nyaya, Sustainable Computing

1. INTRODUCTION

The Indian Knowledge System (IKS) is one of the oldest and most comprehensive systems of knowledge. It encompasses various fields such as mathematics, philosophy, linguistics, architecture, and medicine, many of which have become relevant to modern Computer Science Engineering (CSE). While the focus of CSE has traditionally been on Western scientific methods, the recent emphasis on cross-disciplinary approaches has prompted academia to explore how ancient Indian knowledge can be embedded in the field of modern computing.

This paper delves into the historical roots of IKS, its relevance to Computer Science, and how traditional Indian methodologies are emerging as important tools for modern problem-solving in CSE.

2. VEDIC MATHEMATICS AND COMPUTATIONAL EFFICIENCY

Vedic Mathematics, an ancient system of mathematics, is known for its computational simplicity and mental arithmetic techniques. Its methods for solving complex arithmetic operations efficiently through mental shortcuts are highly relevant to algorithmic design. The algorithms derived from Vedic Mathematics can improve computational speed, reduce time complexity, and provide alternative strategies for optimization.

2.1 Applications in Algorithm Design

Vedic algorithms, such as Urdhva-Tiryagbhyam (vertical and crosswise multiplication), can be directly applied to optimize existing computational methods in CSE. These algorithms offer promising results in fields like digital signal processing, error detection in computing, and efficient hardware design for faster computations.

3. SANSKRIT AND NATURAL LANGUAGE PROCESSING

The structured nature of Sanskrit, with its precise grammar defined by Panini's Ashtadhyayi, has drawn considerable interest in Natural Language Processing (NLP). Panini's work is comparable to formal grammars in computer science, where the rules-based system of language construction aids in linguistic modeling, machine translation, and semantic analysis.

3.1 Paninian Grammar and Machine Learning

The highly logical framework of Paninian grammar presents a robust foundation for syntactic parsing in NLP applications. Its potential in developing more precise language models can improve machine learning algorithms, especially in tasks related to language understanding, speech recognition, and text generation.

4. NYAYA AND TARKA SHASTRA IN ARTIFICIAL INTELLIGENCE

Indian logical traditions, particularly Nyaya and Tarka Shastra, offer profound insights into reasoning and inference, which are central to artificial intelligence (AI). These ancient systems of logic emphasize deductive and inductive reasoning, providing a philosophical and practical framework for decision-making processes in AI systems.

4.1 Ethical AI and Decision-Making

Integrating the ethical dimensions of Nyaya into AI can help build responsible AI systems that prioritize fairness and transparency. The Tarka Shastra's methodology of structured debate and inquiry could inspire models for ethical AI development and machine reasoning, ensuring that AI systems operate within defined ethical frameworks.

5. INDIAN ARCHITECTURE AND ALGORITHMS

Indian architecture, known for its symmetry, recursive patterns, and fractal-like structures, offers inspiration for modern algorithm design. These principles, evident in temple architecture and Indian geometric art, have parallels with recursive algorithms and data structures like trees and graphs, which are fundamental to computer science.

5.1 Fractal Geometry and Graphics

The fractal patterns observed in ancient Indian temple architecture, such as the step-wells of Gujarat or the designs of South Indian temples, can be applied in computer graphics, visual simulations, and game development. This connection between traditional art and computational algorithms demonstrates how cultural heritage can inform advanced technical applications.

6. AYURVEDA AND DATA SCIENCE

Ayurveda, the ancient Indian medical system, is based on a comprehensive classification of human bodies (doshas), diseases, and treatments. Its classification techniques can inspire data science models, particularly in clustering algorithms, personalized medicine, and healthcare analytics.

6.1 Healthcare and Predictive Analytics

The Ayurvedic approach of identifying individual physiological types is an example of early personalized healthcare, which aligns with modern trends in health informatics. Data-driven models in health-related AI systems can use this knowledge to create personalized treatment recommendations and predictive models for patient care.

7. HUMAN-COMPUTER INTERACTION AND INDIAN CULTURE

The integration of Indian cultural elements into human-computer interaction (HCI) can create more culturally inclusive technologies. The use of traditional Indian art forms and gestures, such as those from Bharatanatyam (an Indian classical dance), offers new opportunities for gesture-based computing and user interface design.

7.1 Cultural Computing and UX Design

Incorporating Indian cultural symbols, gestures, and storytelling in UX/UI design creates interfaces that are intuitive for users from Indian cultural backgrounds. This cultural computing approach helps in designing localized digital systems for broader social inclusion, fostering interaction design that is culturally sensitive and technologically advanced.

8. SUSTAINABILITY IN COMPUTING AND INDIAN PHILOSOPHICAL INSIGHTS

Indian philosophical traditions emphasize sustainable living, interconnectedness, and balance, which align with the goals of sustainable computing. By integrating these philosophies, computer scientists can develop energy-efficient algorithms and green computing practices that minimize the ecological impact of technology.

8.1 Green Data Centers and Eco-Friendly Algorithms

Inspired by the Indian emphasis on environmental sustainability, there is growing interest in developing energy-efficient data centers and low-power computing systems. Computational approaches derived from these principles offer a unique perspective on reducing the carbon footprint of large-scale computing infrastructure.

9. IKS IN COMPUTER SCIENCE CURRICULUM DEVELOPMENT

The emergence of IKS in CSE education is not limited to research but can also enrich the academic curriculum. Introducing courses on Vedic Mathematics, Paninian Grammar, Nyaya logic, and Indian art forms in computer science departments can bridge traditional knowledge with modern technology.

9.1 Project-Based Learning and Interdisciplinary Research

IKS can be implemented through project-based learning, where students work on interdisciplinary projects that combine traditional knowledge systems with modern computing techniques. For example, developing AI-driven tools for Ayurvedic diagnostics or using Indian architectural principles to design efficient algorithms can become part of the learning process.

10. CONCLUSION

The integration of the Indian Knowledge System in Computer Science Engineering offers a rich and innovative framework for advancing both fields. By applying ancient Indian wisdom to modern computational problems, the boundaries of research in AI, algorithms, NLP, HCI, and sustainable computing are expanded. This synthesis of tradition and technology not only provides new tools and methods but also fosters a deeper appreciation for India's intellectual heritage within the global technology landscape.

REFERENCES

1. Datta, B., Singh, A. N. (1962). *History of Hindu Mathematics*. Asia Publishing House.
2. Subhash Kak. (2009). *Panini and Formal Language Theory*. Presented at Conference on Indic Studies.
3. Radhakrishnan, S. (1923). *Indian Philosophy*. Oxford University Press.
4. Dandekar, R. N. (1979). *Nyaya-Vaisheshika: The Indian Tradition of Logic*. Poona University Press.
5. Bag, A. K. (1979). *History of Technology in Ancient India*. Indian National Science Academy.
6. Khirwadkar, A. (2010). *Emerging Paradigms in ICT for Development and Indian Knowledge Systems*. National Seminar on ICT in Development.
7. Rajaraman, V. (2019). *History of Computing in India (1955–2010)*. IEEE Computer Society.
8. Sinha, A., & Parida, A. (2014). *Fractal Geometry in Indian Architecture*. International Journal of Engineering Research and Applications, 4(5), 52-57.
9. Mahulikar, S. P. (2012). *Ayurveda and Systems Biology: An Integrative Approach Towards Personalized Medicine*. Current Science, 102(11), 1406-1415.
10. Kulkarni, G. V., & Patwardhan, B. (2013). *Ayurvedic Genomics: Establishing a Genetic Basis for Personalized Ayurveda*. Evidence-Based Complementary and Alternative Medicine, 2013, 249563.
11. Chakraborty, P. (2015). *Vedic Mathematics and Its Application to Computer Science*. International Journal of Computer Science and Information Technology Research, 3(2), 244-249.
12. Singhal, D., & Agarwal, M. (2017). *Exploring the Role of Nyaya in Machine Learning Ethics*. Proceedings of the National Conference on AI Ethics.
13. Rao, S. (2016). *Sanskrit and Computational Linguistics: Panini's Influence on Language Processing Algorithms*. Journal of Indian Science and Technology, 9(2), 23-35.

14. Sharma, S., & Tiwari, R. (2014). *Gesture-Based Computing: Bharatanatyam Mudras as an Input Interface*. International Journal of Human-Computer Interaction, 5(4), 157-165.

15. Ananthakrishnan, K. (2010). *Fractal Patterns in Indian Temple Architecture and Modern Algorithmic Design*. Journal of Computational Geometry, 10(3), 35-47.

16. Sarukkai, S. (2009). *Indian Logic and its Applications in Artificial Intelligence*. In *Logic, Language, and Computation* (pp. 45-65). Springer.

17. Chandrashekar, R. (2020). *Green Computing Inspired by Indian Philosophy*. International Journal of Sustainable Computing, 7(1), 12-21.

18. Joshi, D. (2022). *Teaching Indian Knowledge Systems in Engineering Education: A Multidisciplinary Approach*. Journal of Engineering Education Transformations, 35(2), 20-28.

IMPACT OF NEW EDUCATION POLICY -2020 ON HIGHER EDUCATION

[1]Rashmi Gujrati [2]Ameet Sao

[1]Professor -Director-IQAC, Punjab College of Technical Education Ludhiana Punjab

[2]National Institute of Construction Management and Research, Bahadurgarh

ABSTRACT

Education plays a very important role in this scenario of contingences. The New Education Policy announced surrounding the world due to the challenges posed by Covid19 pandemic. The announcement of NEP 2020 was purely unexpected by many. The changes that NEP 2020 has recommended were something that many educationists never saw coming. Though the education policy has impacted school and college education equally, this article mainly focuses on NEP 2020 and its impact on Higher Education. This paper also outlines the salient features of NEP and analyses how they affect the existing education system.

Keywords: New Education Policy, Higher Education, Covid-19

I. INTRODUCTION

The National Policy on Education (NPE) is a policy formulated by the Government of India to promote education amongst India's people. The policy covers elementary education to colleges in both rural and urban India. The first NPE was promulgated by the Government of India by Prime Minister Indira Gandhi in 1968, the second by Prime Minister Rajiv Gandhi in 1986, and the third by Prime Minister Narendra Modi in 2020.

The National Education Policy 2020 (NEP 2020), which was approved by the Union Cabinet of India on 29 July 2020, outlines the vision of India's new education system. The new policy replaces the previous National Policy on Education, 1986. The policy is a comprehensive framework for elementary education to higher education as well as vocational training in both rural and urban India. The policy aims to transform India's education system by 2021. The language policy in NEP is a broad guideline and advisory in nature; and it is up to the states, institutions, and schools to decide on the implementation. The NEP 2020 enacts numerous changes in India's education policy. It aims to increase state expenditure on education from around 4% to 6% of the GDP as soon as possible.

In January 2015, a committee under former Cabinet Secretary T. S. R. Subramanian started the consultation process for the New Education Policy. Based on the committee report, in June 2017, the draft NEP was submitted in 2019 by a panel led by former Indian Space Research Organisation (ISRO) chief Krishnaswamy Kasturirangan. The Draft New Education Policy (DNEP) 2019, was later released by Ministry of Human Resource Development, followed by a number of public consultations. The Draft NEP had 484 pages. The Ministry undertook a rigorous consultation process in formulating the draft policy: "Over two lakh suggestions from 2.5 lakh gram panchayats, 6,600 blocks, 6,000 Urban Local Bodies (ULBs), 676 districts were received." The vision of the National Education Policy is:

"National Education Policy 2020 envisions an India-centric education system that contributes directly to transforming our nation sustainably into an equitable and vibrant knowledge society by providing high-quality education to all."

Quality higher education must aim to develop individuals who are excellent, thoughtful, wellrounded, and creative. It must enable a person to study one or more specialized areas of interest at an in-depth level and develop character, ethical and constitutional values, intellectual curiosity, scientific temper, creativity, service spirit, and the skills of the 21st century across a range of fields, including sciences, social sciences, the arts, humanities, languages, personal, technological the vocational subjects. The new education policy brings some

fundamental changes to the current system, and the key highlights are multidisciplinary universities and colleges, with at least one in or near every district, revamping student curricula, pedagogy, evaluation, and support for enhanced student experience, establishing a National Research Foundation to support excellent peer-reviewed work and effectively seed study at universities and colleges.

The main problems faced by the Indian higher education system includes enforced separation of qualifications, early specialization and student streaming into restricted research areas, less focus on research at most universities and schools, and lack of competitive peer-reviewed academic research funding and large affiliated universities leading to low levels of undergraduate education.

Institutional restructuring and consolidation aim to end the fragmentation of higher education by transforming higher education institutions into large multidisciplinary, creating wel rounded and innovative individuals, and transforming other countries educationally and economically, increasing the gross enrolment ratio in higher education, including vocational training, from 26.3% (2018) to 50% by 2035.

Holistic and multidisciplinary education should strive in an integrated way to improve all human capacities-mental, cultural, social, physical, emotional, and moral. In the long term, such a comprehensive education shall be the method for all undergraduate programs, including those in medical, technical, and vocational disciplines. Optimal learning environments and support for students offer a holistic approach including adequate curriculum, interactive pedagogy, consistent formative assessment, and adequate support for students.

OBJECTIVES OF THE STUDY

The primary objective of this research is to study the impact of New Education Policy 2020 on higher education. The study also outlines the salient features of NEP and analyses how they affect the existing education system.

RESEARCH METHODOLOGY

This research is a descriptive study. The necessary secondary data was collected from various websites including those of Government of India, magazines, journals, other publications, etc.

This data was then analysed and reviewed to arrive at the inferences and conclusions.

II. SALIENT FEATURES OF NEP RELATED TO HIGHER EDUCATION

The new NEP has been introduced with an aim to formalize changes in the system from school level to college/university level. Keeping in mind the developing scenario, education content henceforth, will focus on key-concepts, ideas, applications and problem-solving angles. The National Education Policy is expected to bring positive and long-lasting impact on the higher education system of the country. The fact that foreign universities will be allowed to open campuses in India is a commendable initiative by the government. This will help the students experience the global quality of education in their very own country. The policy of introducing multi-disciplinary institutes will lead to a renewed focus on every field such as arts, humanities and this form of education will help students to learn and grow holistically. Thus, students will be equipped with stronger knowledge base.

The introduction of single common entrance test is another positive step which will reduce the stress of multiple competitive exams and ease off the pressure of preparing for so many of them. It will also ensure a level playing ground for all student applicants going forward. Establishing Academic Bank of Credit (ABC) is definitely a robust idea to store the academic credits that students earn by taking courses from various recognized higher education institutions. A student can earn scores by completing a course and these will be credited to the ABC account. One can then transfer these credits if he/she decides to switch colleges. If a student ever drops out for some reasons, these credits will remain intact which means he/she can come back years later and pick up from where the student had left.

The new higher education regulatory structure will ensure that distinct administrative, accreditation, financing, and academic standard-setting roles are performed by separate, autonomous, and empowered bodies. These four structures will be established as four independent verticals within a single umbrella institution, India’s Higher

Education Commission (HECI). There are a lot of reforms and new developments which have been introduced by NEP in the higher education sector. Some of the salient features are:

Single regulatory body for higher education

The NEP aims to establish Higher Education Commission of India which will be the single regulatory body except for legal and medical education.

Multiple entry and exit programme

There will be multiple entry and exit options for those who wish to leave the course in the middle. Their credits will be transferred through Academic Bank of Credits.

Technique based option for adult learning through apps, TV channels

Quality technology-based options for adult learning such as apps, online courses/modules, satellite-based TV channels, online books, and ICT-equipped libraries and Adult Education Centres, etc. will be developed.

E-courses to be available in regional languages

Technology will be part of education planning, teaching, learning, assessment, teacher, school, and student training. The e-content to be available in regional languages, starting with 8 major languages – Kannada, Odia, Bengali among others to join the e-courses available in Hindi and English.

Foreign universities to set-up campuses in India

World's top 100 foreign universities will be facilitated to operate in India through a new law. According to the HRD Ministry document, "such (foreign) universities will be given special dispensation regarding regulatory, governance, and content norms on par with other autonomous institutions of India."

Common entrance exam for all colleges

The common Entrance exam for all higher education institutes to be held by National Testing Agency (NTA). The exam will be optional.

A Higher Education Council of India (HECI) will be set up to regulate higher education. The council's goal will be to increase gross enrollment ratio. The HECI will have 4 verticals:

National Higher Education Regulatory Council (NHERC), to regulate higher education, including teacher education, while excluding medical and legal education.

National Accreditation Council (NAC), a "meta-accrediting body".

Higher Education Grants Council (HEGC), for funding and financing of universities and colleges. This will replace the existing National Council for Teacher Education, All India Council for Technical Education and the University Grants Commission.

General Education Council (GEC), to frame "graduate attributes", namely the learning outcomes expected. It will also be responsible in framing a National Higher Education Qualification Framework (NHEQF). The National Council for Teacher Education will come under the GEC, as a professional standard setting body (PSSB).

III. DETAILED ANALYSIS OF IMPACT OF NEP ON HIGHER EDUCATION

Regulatory System of Higher Education

A significant change in NEP 2020 is the proposal to set up the Higher Education Commission of India (HECI), as an umbrella body for higher education, excluding medical and legal education. This will usually bring out a question that what will happen to the present UGC and

AICTE? HECI is aiming at reforming the higher education sector; the Bill will separate the Academic and Funding aspects of the sector. According to the new Bill, HECI will not have any financial powers. The funding

processes which were handled by the University Grants Commission (UGC) will be taken care by the Ministry of Education, previously known as the Ministry of Human Resource Development (MHRD). This change however is expected to clear the regulatory mess in India's Higher Education system. HECI is expected to have four independent verticals - National Higher Education Regulatory Council (NHERC) for regulation, General Education Council (GEC) for standard-setting, Higher Education Grants Council (HEGC) for funding, and National Accreditation Council (NAC) for accreditation. To have uniformity in education standards, a single umbrella body was always a requirement and this has been a vision of numerous educationists. This is considered as the right step in streamlining education policy. However, to ensure quality of higher education, institutes must be measured based on relevant parameters like research, industry linkages, placements and academic excellence, etc. If the HECI can manage this, the benefits to its biggest stakeholder, the youth of India, might be significant.

Graded Accreditation and Graded Autonomy

The concept of "empowerment and autonomy to innovate" is one of the key features in NEP 2020 which supports a "phasing out" strategy from Affiliated Colleges to Autonomous Institutions. The increased flexibility offered to autonomous institutions also gives hope in curriculum enrichment. It also says that with appropriate accreditations, Autonomous degreegranting Colleges could evolve into Research-intensive or Teaching-intensive Universities, if they so aspire. The announcement of setting up Multidisciplinary Education and Research Universities (MERUs) in the country gives more hope. These institutions will be at par with the existing IITs and IIMs and will aim to showcase multidisciplinary education for the Indian students.

Another important change the NEP 2020 suggests that the National Testing Agency will serve as a premier, expert, autonomous testing organization to conduct entrance examinations for undergraduate and graduate admissions and fellowships in Higher Education Institutions. The high quality, range, and flexibility of the NTA testing services will enable most universities to use these common entrance exams - rather than having hundreds of universities each devising their own entrance exams - thereby drastically reducing the burden on students, universities and colleges, and the entire education system. It will be left up to individual universities and colleges to use NTA assessments for their admissions. It also surely helps the students to easily transfer their degrees and credits to universities abroad.

Internationalisation at home

NEP 2020 also allows foreign universities and colleges to come to India and this brings out a challenge for the native institutions to improve the quality of education provided by them. The Indian higher education sector is buzzing all around as the opportunity of paving the way for foreign universities to set up campuses in the country. India has one of the largest networks of higher education systems in the world, with more than 900 universities and 40,000 colleges. But GER (Gross Enrolment Ratio) of India in higher education is 26.3%, which is significantly low when compared to other BRICS countries like Brazil (50%) or China (51%), and very much lower when compared with European and North American nations which would be more than 80%. India must achieve a significant growth in the area of global higher education for obtaining a sustainable economic growth, which should not be driven by natural resources, but by knowledge resources. As per the reports, India will need another more than 1,500 new higher education institutions by 2030 to accommodate a huge inflow of students, that's why the Indian government wants to promote FDIs (Foreign Direct Investment) and open up the ECB (External Commercial Borrowing) route to strengthen the capital investment for the education sector.

The ministry is also trying to boost India's image as an education center because already more than 7 Lakhs of Indian students are studying abroad. So, the intention of this policy is that, allowing foreign universities will enable world-class education available locally at a significantly lower cost without travelling and will considerably reduce the human capital migrating to other countries for study and job prospects. According to the different global surveys, cross-border education is beneficial for the economy and brings a wider level of global awareness, culturally perceptive, and competitiveness. Foreign collaborations enable local institutes to design their curriculum in alignment with international pedagogy and offer a diverse portfolio of subjects and specialization to students.

More Holistic and Multidisciplinary Education

The NEP 2020 claims that, a holistic and multidisciplinary education would aim to develop all capacities of human beings -intellectual, aesthetic, social, physical, emotional, and moral in an integrated manner. Such an education will help develop well-rounded individuals that possess critical 21st century capacities in fields across the arts, humanities, languages, sciences, social sciences, and professional, technical, and vocational fields; an ethic of social engagement; soft skills, such as communication, discussion and debate; and rigorous specialization in a chosen field or fields. The NEP 2020 envisions one large multidisciplinary Higher Education Institution (HEI) in or near every district, by 2030.

Towards the attainment of such a holistic and multidisciplinary education, the flexible and innovative curricula of all HEIs shall include credit-based courses and projects in the areas of community engagement and service, environmental education, and value-based education. Environment education will include areas such as climate change, pollution, waste management, sanitation, conservation of biological diversity, management of biological resources and biodiversity, forest and wildlife conservation, and sustainable development and living. Value-based education will include the development of humanistic, ethical, Constitutional, and universal human values of truth (satya), righteous conduct (dharma), peace (shanti), love (prem), nonviolence (ahimsa), scientific temper, citizenship values, and also lifeskills; lessons in seva/service and participation in community service programmes will be considered an integral part of a holistic education.

As the world is becoming increasingly interconnected, Global Citizenship Education (GCED), a response to contemporary global challenges, will be provided to empower learners to become aware of and understand global issues and to become active promoters of more peaceful, tolerant, inclusive, secure, and sustainable societies. Finally, as part of a holistic education, students at all HEIs will be provided with opportunities for internships with local industry, businesses, artists, crafts persons, etc., as well as research internships with faculty and researchers at their own or other HEIs/research institutions, so that students may actively engage with the practical side of their learning and, as a by-product, further improve their employability.

The structure and lengths of degree programmes

In the context of the National Education Policy 2020 scheme, any undergraduate degree in any institution will be of duration of three or four years. One can leave the degree within this period. Any educational institution will have to give to the student a diploma degree after the student completes two years of study, a degree after the student completes three years of study and a certificate to those students who complete one year of study in any professional or vocational course of their choice. The Government of India will also help in establishing an Academic Bank of Credit for storing the academic scores digitally. This will enable the institutions to count the credit at the end and put it in the degree of the student. This will be helpful for those individuals who might have to leave the course mid-way. They can start the course later on from where they left off and not start from the beginning once again. Even though NEP 2020 says that Higher education institutions will be given the freedom to start PG courses there may be some difficulty in designing One Year PG Degree for students who have completed 4 Year UG Degree and a Two Year PG Degree for students who have completed 3 Year UG Degree.

IV. CONCLUSION

The policy introduces a whole gamut of changes and reads largely as a very progressive document, with a firm grasp on the current socio-economic landscape and the prospect of future uncertainty. Education for a new generation of learners has to essentially engage with the increasing dematerialisation and digitalisation of economies, which requires a completely new set of capabilities in order to be able to keep up. This seems to be an even more vital perquisite now, with the trend towards digitalisation and disruptive automation being quickened by the pandemic. Overall, the NEP 2020 addresses the need to develop professionals in a variety of fields ranging from Agriculture to Artificial Intelligence. India needs to be ready for the future. And the NEP 2020 paves the way ahead for many young aspiring students to be equipped with the right skillset.

The new education policy has a laudable vision, but its strength will depend on whether it is able to effectively integrate with the other policy initiatives of government like Digital India, Skill India and the New Industrial Policy to name a few, in order to effect a coherent structural transformation. Hence, policy linkages can ensure

that education policy addresses to and learns from Skill India's experience in engaging more dynamically with the corporate sector to shape vocational education curriculum in order to make it a success. There is also a necessity for more evidence-based decision-making, to adapt to rapidly evolving transmutations and disruptions. NEP has reassuringly provisioned for real-time evaluation systems and a consultative monitoring and review framework. This shall empower the education system to constantly reform itself, instead of expecting for a new education policy every decade for a shift in curriculum. This, in itself, will be a remarkable achievement.The NEP 2020 is a defining moment for higher education. Effective and time-bound implementation is what will make it truly path-breaking.

REFERENCES

1. Aithal, P. S.; Aithal, Shubhrajyotsna (2019). "Analysis of Higher Education in Indian National Education policy proposal 2019 and its implementation challenges".
2. International Journal of Applied Engineering and Management Letters. 3 (2): 1–35. SSRN 341751
3. https://www.orfonline.org/expert-speak/national-education-policy-2020-policy-times/
4. https://www.highereducationdigest.com/the-impact-of-national-education-policy-2020-onprofessional-education/
5. http://bweducation.businessworld.in/article/NEP-2020-Impact-On-Higher-Education-/07-08-2020305999/
6. https://timesofindia.indiatimes.com/readersblog/theaitics/implications-of-the-national-educationpolicy-2020-on-higher-education-in-india-2-24729/
7. https://www.hindustantimes.com/india-news/pm-modi-s-address-at-conclave-on-transformationalreforms-in-higher-education-under-national-education-policy-highlights/storydehOW8q8ZRrONbbFSRjg0H.html

IMPACT OF BLENDED LEARNING ON ASPIRANTS: A STUDY IN LUDHIANA

[1]Khushboo Singh [2]Prabhneet Kaur

[1]Assistant professor, Punjab College of Technical Education, Ludhiana

[2]Assistant professor, Punjab College of Technical Education, Ludhiana

ABSTRACT

This study primarily focuses on examining the impact of blended learning on the academic performance and engagement of aspirants in Ludhiana. It also seeks to explore the challenges and perceptions related to this learning method.

The study adopts a quantitative research design, utilizing a structured questionnaire as the primary data collection tool. The questionnaire was distributed to respondents via Google Forms, ensuring accessibility and convenience. Convenience method was employed to select participants, with a total sample size of 151 respondents.

Research Limitations: The study's focus on Ludhiana provides valuable localized insights into blended learning, and the use of online tools ensures broad accessibility. While the sample reflects respondents willing to engage digitally, it highlights the perspectives of tech-savvy aspirants effectively.

Keywords: Blended learning, aspirants, educational impact, digital tools, self-paced learning, student engagement, personalized learning.

INTRODUCTION

UNDERSTANDING BLENDED LEARNING

Blended learning is a pedagogical approach that merges the strengths of traditional classroom-based instruction with the flexibility and convenience of online learning. This hybrid model has gained substantial traction in educational settings, particularly as institutions strive to accommodate diverse learning preferences and demands (Graham, 2006). learning allows for a more individualized and flexible approach to education, especially in the context of aspirants who are preparing for competitive exams, professional certifications, or skill-based programs. (Bonk and Graham, 2006)

The rise of digital technologies and the widespread adoption of internet-based learning tools have enabled learners to access high-quality educational resources irrespective of geographical limitations. Blended learning optimizes the use of technology while still maintaining the important interpersonal interactions that are often seen as essential in traditional learning settings. (Garrison and Kanuka, 2004). By offering a combination of face-to-face interactions and virtual learning environments, blended learning supports various learning styles and ensures that students can engage with content in multiple ways.

EVOLUTION OF BLENDED LEARNING IN ASPIRANT EDUCATION

The concept of blended learning is not new. Over the last few decades, educational technologies have continually evolved, leading to the development of hybrid models that balance digital learning with in-person teaching. the evolution of blended learning has been greatly influenced by advancements in Learning Management Systems (LMS), virtual classrooms, and collaborative tools that allow for seamless interaction between instructors and students. Moskal et al. (2013). This evolution aligns with the growing need for more personalized, flexible educational pathways, especially in the context of aspirants who are preparing for highly competitive exams, such as entrance exams for universities, medical or engineering fields, civil services, and professional certifications. Research on the impact of blended learning on student performance has revealed promising results. Students who

engaged in blended learning performed better than their peers in fully face-to-face or fully online environments. Means et al. (2013).

ENGAGEMENT AND MOTIVATION IN BLENDED LEARNING ENVIRONMENTS

The integration of multimedia resources—such as videos, simulations, and interactive quizzes—provides a more engaging and dynamic learning experience (Koedinger et al., 2015). These tools are valuable for aspirants preparing for competitive exams, as they can reinforce theoretical knowledge with practical applications.

However, student motivation remains a critical factor for success in blended learning environments. Motivation can be categorized into intrinsic and extrinsic forms. Aspirants who are intrinsically motivated—those who are driven by a genuine interest in the subject matter or a personal goal—are more likely to benefit from blended learning models. On the other hand, extrinsic motivation, such as the desire to succeed in an exam or gain certification, can also drive learners to engage more deeply with online learning resources. Deci and Ryan (2000)

ONLINE LEARNING

Online learning leverages digital platforms to deliver education, enabling learners to access content asynchronously. This method caters to non-traditional learners, such as working professionals or individuals with geographic or scheduling constraints. It promotes flexibility and cost-efficiency, though it demands self-motivation and reliable technological infrastructure.

KEY BENEFITS OF ONLINE LEARNING

- **Cost Efficiency:** Reduces expenses associated with physical learning spaces, travel, and printed materials.
- **Scalability:** Online platforms can accommodate large numbers of learners without geographical limitations.
- **Flexibility:** Asynchronous learning allows learners to study at their own pace, fitting education into their personal schedules.
- **Consistent Quality:** Standardized course materials ensure uniformity, reducing instructor biases and disparities in teaching styles.
- **Global Access to Expertise:** Learners can connect with instructors and subject matter experts worldwide, regardless of location.

REVIEW OF LITERATURE

Atashinsadaf A. et. al (2024) The COVID-19 pandemic has significantly impacted nursing education, necessitating a shift from traditional face-to-face classes to online learning. Research has shown that while online learning offers flexibility and convenience, it also presents issues such as technical difficulties, reduced engagement, and feelings of isolation among students. Additionally, the fear of contracting COVID-19 continues to influence students' preferences for online education despite vaccination efforts.

Ojumder Bithi et al. (2024) The COVID-19 pandemic has necessitated a sudden shift from online to offline learning in higher education institutions worldwide, including Bangladesh. This has impacted students' perspectives, preparedness, and overall learning experience. Studies have highlighted the importance of face-to-face interaction, with many students emphasizing the irreplaceable value of in-person contact. However, financial barriers and technological issues, such as internet access and signal strength, have posed significant challenges

Shetty Aditya et al. (2024) The COVID-19 pandemic has necessitated a rapid shift to online education, presenting both opportunities and challenges. Studies have highlighted issues such as internet accessibility, reduced engagement, and the effectiveness of online instruction for practical subjects. Research also indicates that while teachers have adapted to online teaching, they miss the classroom interaction.

Erizar et. al. (2024) Research on blended learning highlights its growing momentum in higher education, particularly in integrating online components with traditional face-to face instruction. Studies have shown that blended learning can be as effective in terms of student achievement, as evidenced by findings from multiple universities in Aceh, Indonesia. This research underscores the potential of blended education to maintain educational quality while offering flexibility.

Aha Susanta & Mondal Sohini (2023) Pre-pandemic, students favored outdoor activities, social gatherings, and cinema. Post-pandemic, there's a marked increase in online entertainment consumption, such as streaming services, online gaming, and virtual social interactions. This shift highlights the pandemic's impact on leisure activities, driven by restrictions and safety concerns.

Xin Zhao and Wenchao Xue (2023) The transition from offline to online education for international students at British universities highlights several challenges. Studies indicate that students faced difficulties readjusting to in-person learning environments, managing time effectively, and overcoming language barriers. The transition also posed challenges in terms of social integration and adapting to different teaching styles.

Riaz Fatima et. Al. (2023) The COVID-19 pandemic has significantly altered the educational landscape, compelling students to adapt to online learning. Studies have shown mixed perceptions of online education, with some students reporting higher satisfaction and better performance, while others faced challenges such as reduced engagement and feelings of isolation. Research indicates that factors such as access to technology, self-discipline, and quality of instruction play crucial roles in the effectiveness of online learning.

R. Arun et. al. (2023) Research on the influence of online education on the behavioral patterns of university students in India reveals significant impacts. Studies highlight that while online learning offers flexibility and accessibility, it also poses challenges like reduced engagement, technical issues, and isolation. These factors can affect students' academic performance and learning behaviors.

Bhojwani Rishika et. al. (2023): Research on students' perceptions of online and offline education highlights that online learning is valued for its flexibility and accessibility, allowing students to balance personal and professional commitments. However, challenges such as reduced engagement and isolation persist. Offline education is preferred for its direct interaction, structured environment, and immediate feedback, which are crucial for grasping complex management concepts.

Suryawanshi et al. (2023) This research highlights the strengths and challenges of online and offline learning. Online methods offer flexibility but lack face-to-face interaction, while offline settings provide engagement but are less adaptable. A blended approach combines these strengths for effective learning. It supports diverse teaching practices and learning needs.

Das Arani et al. (2023) The shift to online medical education in India during COVID-19 ensured continuity but impacted hands-on training. Balancing digital tools with traditional methods can address this gap. A blended approach ensures comprehensive medical education. It also prepares institutions for future disruptions.

Pal Mihika & Pal Tapas (2022) Students in Delhi NCR faced challenges transitioning back to offline classes post-COVID. Adapting to structured schedules and health concerns were major issues. The convenience of online learning hindered this adjustment. Effective strategies are needed to ease such transitions.

Nivedhya PS et al. (2022) The pandemic-driven shift to online learning caused anxiety and a lack of structure for students. Safety concerns limit a full return to traditional methods. Student satisfaction and instructor training are vital for successful online education. Technology can enhance collaboration and evaluation.

Prabhakar E Manoj et al. (2022) Medical students prefer a mix of online flexibility and offline interaction. Understanding diverse preferences is crucial for designing effective curricula. Blended learning ensures student satisfaction and better outcomes. It strikes a balance between innovation and tradition.

Talekar Radhika (2022) Online tertiary education during COVID-19 raised dropout concerns due to engagement and tech access issues. Tailored strategies are needed to mitigate these risks. Understanding factors influencing dropouts is critical. Both online and offline methods require targeted improvements.

Kashinath K. & Raju R. L. N. (2022) Online English learning in Telangana provides flexibility but lacks interaction, unlike offline methods. Offline models offer immersion but struggle with tech integration. A balanced approach utilizing strengths of both can improve outcomes. Designing such programs is essential for success.

Grover Anu et al. (2022) Online learning offers flexibility but poses challenges like isolation and tech issues. Students miss the structured environment of offline classes. Hybrid strategies can address shortcomings of both modes. This ensures better student satisfaction and outcomes.

Maya Madhavan et al. (2022) Kerala students appreciated online learning's convenience but valued offline interaction. Transitioning back to in-person classes required significant adjustment. Hybrid models combining online and offline benefits are recommended. These can improve the overall learning experience.

Mondal Hime et al. (2021) Medical students prefer face-to-face lectures for direct feedback but value online flexibility. Each method has unique benefits and challenges. Balanced programs integrating both can enhance learning. This approach optimizes satisfaction and outcomes.

Chitra Jeba et al. (2021) Students faced anxiety returning to offline classes during the pandemic due to health and schedule concerns. Despite this, they valued social and academic benefits of face-to-face learning. Strategies to ease transitions must prioritize student well-being and success.

RESEARCH METHODOLOGY

OBJECTIVES OF THE STUDY

a) To study the impact of blended learning on aspirants

b) To analyze aspirants' preferences and experiences regarding blended learning.

RESEARCH POPULATION

The research population for this study comprises aspirants from various educational institutions of Ludhiana. The aspirants include school students, graduates, post graduates and students preparing for various competitive exams.

SAMPLING TECHNIQUE

Convenience sampling technique was employed to select a representative group of aspirants from various educational institutions in Ludhiana.

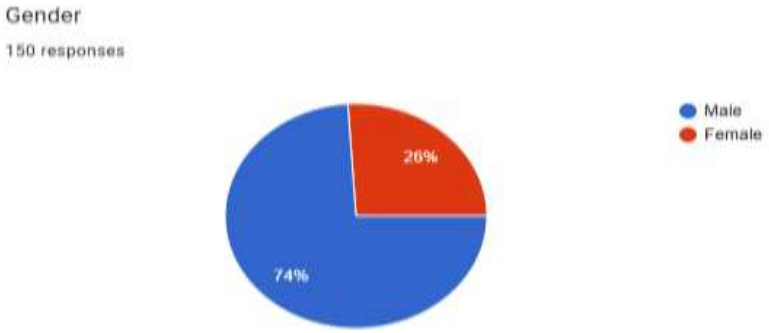
SAMPLE SIZE

A total of 151 aspirants from Ludhiana were included in the sample size.

RESEARCH TOOL

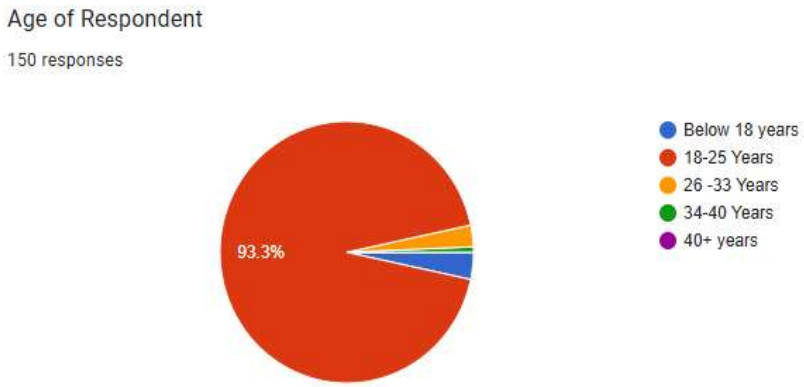
This experiment employed a self-designed questionnaire as the primary research tool. It was structured using a five-point Likert scale to accurately capture respondents' opinions and perceptions, with the following response options: Strongly agree, Agree, Neutral, Disagree, and Strongly disagree.

ANALYSIS AND INTERPRETATION

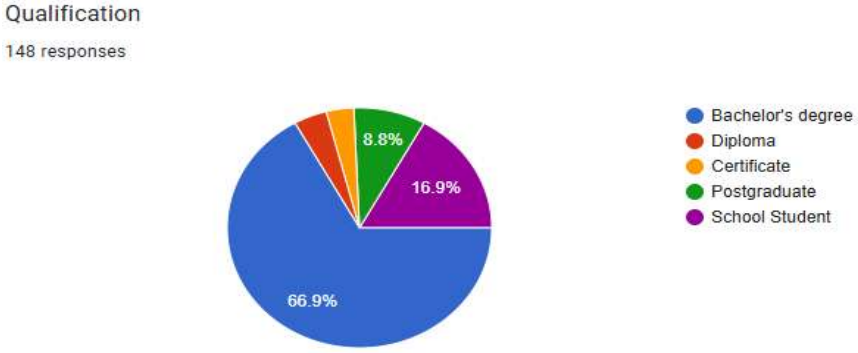


ISBN: 978-93-5680-531-6
www.npapublishing.in

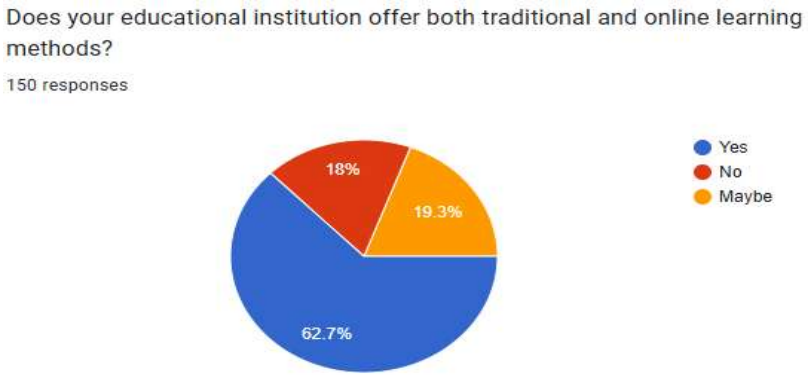
The survey on aspirants reveals a notable gender distribution, with 74% of the respondents identifying as male and 26% as female.



93% of respondents lie within the 18-25 age group, 2.7% in the 26-33 years range, 5% of respondents under 18 years and 0.7% in the 34-40 years range, suggesting that while blended learning may be relevant for older aspirants, it is less commonly utilized or less accessible for these groups.



66.9%, hold a bachelor's degree, diploma (4.1%), a certificate (3.4%), or postgraduate studies (8.8%), suggesting that while blended learning is also appealing to individuals with these qualifications, its reach is more concentrated among those with a bachelor's degree.



62.7%, confirm that their educational institution offers both traditional and online learning methods, 18%, report that their educational institution does not offer both learning methods, 19.3% of respondents answered "maybe," suggesting uncertainty about the availability of blended learning options at their institutions.

STATEMENT ANALYSIS

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Blended learning has made it easier for me to understand tough topics.	25.3%	40.7%	32%	6.7%	3.3%
I feel more interested in my studies because of blended learning methods.	16.8%	46.3%	33.6%	6%	4.7%
Mixing online and in-person learning has boosted my overall grades.	21.3%	43.3%	33.3%	5.3%	4%
Blended learning lets me learn at my own speed, helping me understand better.	18.2%	44.6%	33.1%	5.4%	4.1%
I think blended learning gives me more chances to talk to my teachers.	15.4%	51%	30.2%	5.4%	5.4%
Using videos and other media in blended learning has made learning more enjoyable.	20.8%	47%	32.9%	3.4%	4%
The flexibility of blended learning helps me manage my study time more effectively.	18.1%	46.3%	34.9%	6.7%	4%
I feel more motivated to participate in class activities due to the blended learning approach.	16.3%	43.5%	36.1%	7.5%	4.8%
Blended learning has positively impacted my critical thinking skills.	15.4%	45%	36.9%	5.4%	3.4%
The availability of online resources in blended learning has enriched my knowledge base.	22.3%	45.9%	30.4%	6.8%	3.4%
I receive more timely feedback on my work in a blended learning setting.	13.7%	40.4%	39.7%	11%	4.1%
The collaborative aspects of blended learning have improved my teamwork skills.	14.8%	43.6%	36.2%	10.7%	5.4%
Blended learning strategies have helped me develop better problem-solving abilities.	20.1%	45%	32.9%	7.4%	5.4%
I prefer blended learning over traditional classroom learning due to its effectiveness in enhancing my learning outcomes.	15.4%	42.3%	33.6%	9.4%	8.7%

1. **Blended learning has made it easier for me to understand tough topics.** 66% of respondents (25.3% Strongly Agree, 40.7% Agree) report that blended learning has made complex concepts easier to understand. However, 32% remain neutral, and 10% express doubts, indicating that some students may find this method less effective.

2. **I feel more interested in my studies because of blended learning methods.** 63.1% of respondents (16.8% Strongly Agree, 46.3% Agree) feel more engaged due to blended learning. 33.6% remain neutral, while 10.7% (6% Disagree and 4.7% Strongly Disagree) report a lack of engagement.

3. **Mixing online and in-person learning has boosted my overall grades.** 64.6% (21.3% Strongly Agree, 43.3% Agree) believe that blended learning has positively impacted their academic performance. However, 33.3% remain neutral, and a minority (9.3% Disagree or Strongly Disagree), signaling that blended learning not have improved performance for all students.

4. **Blended learning lets me learn at my own speed, helping me understand better.** 62.8% (18.2% Strongly Agree, 44.6% Agree) feel that blended learning offers the flexibility to learn at their own pace thus improving their understanding. 33.1% are neutral, while 9.5% (5.4% Disagree, 4.1% Strongly Disagree) may struggle with the pacing.

5. **I think blended learning gives me more chances to talk to my teachers.** 67.8% (20.8% Strongly Agree, 47% Agree) report that multimedia use in blended learning improves their learning experience. However, 32.9% are neutral, and 7.4% (3.4% Disagree, 4% Strongly Disagree) do not feel the same level of benefit.

6. **Using videos and other media in blended learning has made learning more enjoyable.** 63.1% (14.8% Strongly Agree, 48.3% Agree) believe they retain information better through blended learning. A notable

29.5% remain neutral, and 15.1% (10.7% Disagree, 4% Strongly Disagree) may not see a significant difference from traditional methods.

7. **The flexibility of blended learning helps me manage my study time more effectively.** 64.4% (18.1% Strongly Agree, 46.3% Agree) feel that the flexibility offered by blended learning aids time management. However, 34.9% remain neutral, and 11.1% (6.7% Disagree, 4% Strongly Disagree) express challenges in managing their time effectively.
8. **I feel more motivated to participate in class activities due to the blended learning approach.** 59.8% (16.3% Strongly Agree, 43.5% Agree) feel more motivated to engage in class activities. However, 36.1% remain neutral, and 12.3% (7.5% Disagree, 4.8% Strongly Disagree) are less motivated.
9. **Blended learning has positively impacted my critical thinking skills.** 60.4% (15.4% Strongly Agree, 45% Agree) believe that blended learning enhances critical thinking. However, 36.9% remain neutral, and 8.8% (5.4% Disagree, 3.4% Strongly Disagree) may not feel the same benefit.
10. **The availability of online resources in blended learning has enriched my knowledge base.** 68.2% (22.3% Strongly Agree, 45.9% Agree) appreciate the availability of online resources. However, 30.4% remain neutral, and 10.2% (6.8% Disagree, 3.4% Strongly Disagree) do not find the online resources particularly helpful.
11. **I receive more timely feedback on my work in a blended learning setting.** 54.1% (13.7% Strongly Agree, 40.4% Agree) receive more timely feedback. However, 39.7% are neutral, and 15.1% (11% Disagree, 4.1% Strongly Disagree) report receiving slower feedback.
12. **The collaborative aspects of blended learning have improved my teamwork skills.** 58.4% (14.8% Strongly Agree, 43.6% Agree) believe that the collaborative aspects of blended learning improve teamwork skills. However, 36.2% are neutral, and 16.1% (10.7% Disagree, 5.4% Strongly Disagree) may not experience effective collaboration.
13. **Blended learning strategies have helped me develop better problem-solving abilities.** 65.1% (20.1% Strongly Agree, 45% Agree) feel that blended learning has enhanced their problem-solving skills. However, 32.9% are neutral, and 12.8% (7.4% Disagree, 5.4% Strongly Disagree) report little improvement in problem-solving abilities.
14. **I prefer blended learning over traditional classroom learning due to its effectiveness in enhancing my learning outcomes.** 57.7% (15.4% Strongly Agree, 42.3% Agree) prefer blended learning, suggesting it is perceived as more effective in improving learning outcomes. However, 33.6% remain neutral, and 18.1% (9.4% Disagree, 8.7% Strongly Disagree) prefer traditional methods.

CONCLUSIONS AND SUGGESTIONS

The survey shows students generally view blended learning positively, citing improvements in understanding, engagement, and performance. The flexibility to learn at their own pace and the use of online resources are beneficial. However, challenges with motivation, collaboration, and feedback remain, with some students expressing dissatisfaction or neutrality. Educational institutions should improve collaboration in blended learning by promoting structured group work and interactive sessions. Enhancing feedback timeliness and quality is crucial for student development. Institutions must refine the balance between online and in-person learning, provide instructor training, and optimize multimedia tools to support motivation, engagement, and overall learning outcomes for all students.

REFERENCES

1. Arun, R., Natarajan, S., Sampath, K., Thoti, K. K., Mahalakshmi, R., & Sivaperumal,K. (2024). The Influence of Online Education on the Behavioral Patterns of University Students in India. *Advancements in Communication and Systems, SCRS, India*, 335-348.
2. Atashinsadaf, A., Ramezani-Badr, F., Long, T., Imanipour, M., & Amini, K. (2024). Facilities, challenges, attitudes, and preferences of nursing students related to e- learning in the Covid-19 pandemic in Iranian context: a cross-sectional study. *BMC Medical Education*, *24*(1), 50.
3. Bhojwani, R., Gupta, D. R., & Agarwal, N. S. (2023). A STUDY OF THE PERCEPTION OF STUDENTS TOWARD PURSUING ONLINE AND OFFLINE HIGHER MANAGEMENT EDUCATION. *The Online Journal of Distance Education and e-Learning*, *11*(2).
4. Bosco, R. J., Rizvana, S., Abinaya, G. P., Abinaya, M., Abinaya, S. M., Chacko, A. E., & Adhithiyan, K. (2023). THE PREFERENCE OF LEARNING METHODS AND THE UTILITY AND USEFULNESS OF LEARNING METHODS AMONG MEDICAL STUDENTS IN SOUTH INDIA: A CROSS-SECTIONAL STUDY. *Global Journal of Public Health Medicine*, *5*(2), 853-864.
5. Chawla, M., Khan, M. N., & Pandey, A. (2019). Demographics and Preference for Online Buying: An Exploratory Study of University Students. *Review of Professional Management*, *7*(2), 31-43
6. Chitra, J., Anoop, A., & Haldankar, A. (2021). Students Perception on Resumption of Offline Classes During the Pandemic Using College Reopening Survey Questionnaire. *Indian Journal of Physical Therapy and Research*, *3*(2), 76-82.
7. Das, A., Printhviraj, M., Patel, S. K., Mirdha, M., & Rath, R. S. (2023). The offline- to-online shift of medical education during COVID-19 pandemic: A mixed method study of medical teachers and students from India.
8. Devrani, V., Bhadula, R. C., Thapliyal, B. L., & Singh, S. J. (2020). Role of Online– Education and Perceptions of Students, Teachers & Parents. *International Journal of Management*, *11*(9).
9. Erizar, E., Marzuki, A. G., Hidayati, T., Juliana, R., & Yulia, A. (2024). The Impact of Online Learning on Undergraduate English Students' Achievement. *Journal of English Education and Teaching*, *8*(2), 288-302.
10. Grover, A., Ahlawat, P., & Yadav, R. (2022). A study to assess the preferences regarding online classes during Covid-19 among students studying at selected colleges of Haryana. *Age (in years)*, *17*(20), 21-24.
11. Gupta, S., Dabas, A., Swarnim, S., & Mishra, D. (2021). Medical education during COVID-19 associated lockdown: faculty and students' perspective. *Medical Journal Armed Forces India*, *77*, S79-S84.
12. Hasan, N., & Khan, N. H. (2020). Online teaching-learning during covid-19 pandemic: students' perspective. *The Online Journal of Distance Education and e- Learning*, *8*(4), 202-213.
13. Kashinath, K., & Raju, R. (2023). Empirical research on the effectiveness online and offline classes of English language learning based on student's perception in Telangana Schools. *International Journal of Modern Education and Computer Science*, *15*(2), 40.
14. Maya, M., Anjana, V. M., & Mini, G. K. (2022). University students' perceptions of shifting between online and offline learning: lessons from Kerala, India. *Asian Association of Open Universities Journal*, *17*(3), 213-228.
15. Mondal, H., Mondal, S., & Swain, S. M. (2021). A nationwide online survey on comparative preference of face-to-face lecture, online synchronous, and asynchronous learning in Indian undergraduate medical students. *Journal of Nature and Science of Medicine*, *4*(3), 288-295.
16. Mojumder, B., Uddin, M. J., & Dey, K. (2024). Perspectives, Preparedness and Challenges of the Sudden Shifting of Online to Offline Learning in Higher Education in Bangladesh
17. Nivedhya, P. S., Malik, S., Mishra, D. K., Paul, D., & Nagarkar, J. (2023). Learners' Perception Towards the Shift from Offline to Online Pedagogy and Factors Affecting it. *Int. J. Emerg. Technol. Learn.*, *18*(6), 190-201.
18. PAL, M., & PAL, T. CHALLENGES FACED BY UNIVERSITY-LEVEL STUDENTS OF DELHI NCR DUE TO THE SUDDEN TRANSITION FROM ONLINE MODE OF EDUCATION TO OFFLINE MODE OF EDUCATION. *PBME*, 11
19. Rahman, A. (2021). Using students' experience to derive effectiveness of COVID- 19-lockdown-induced emergency online learning at undergraduate level: Evidence from Assam, India. *Higher Education for the Future*, *8*(1), 71-89
20. Rao, L. N., Shetty, A., Pai, V., Natarajan, S., Baliga, M. S., Wahjuningrum, D. A., ... & Pawar, A. M. (2024). Perceptions and challenges of online teaching and learning amidst the COVID-19 pandemic in India: a cross-sectional study with dental students and teachers. *BMC Medical Education*, *24*.

21. Riaz, F., Mahmood, S. E., Begum, T., Ahmad, M. T., Al-Shaikh, A. A., Ahmad, A.,& Khan, M. S. (2023). Students' preferences and perceptions regarding online versus offline teaching and learning post-COVID-19 lockdown. *Sustainability*, *15*(3), 2362.

22. Saha, S., & Mondal, S. (2023). An in-depth analysis of the Entertainment Preferences before and after Covid-19 among Engineering Students of West Bengal. *International Research Journal on Advanced Science Hub*, *5*(03).

23. Shanta, S. A. (2021). Student performance evaluation between offline and online pedagogy: A critical analysis with possible suggestions. *Journal of Management Info*, *8*(4), 231-252.

24. Sharma, M., & Sharma, M. Impact of online and offline teaching on student performance during COVID-19 pandemic: A case study.

25. Souza, R. G. D. Comparison and effectiveness of classroom and online learning in the background of COVID19: A case study on a tier ii engineering institute.

26. Suryawanshi, S. J., & Talekar, M. R. AN EMPIRICAL ASSESSMENT OF ONLINE AND OFFLINE LEARNING TO FACILITATE INNOVATIVE TEACHING LEARNING PRACTICES.

27. Talekar, R. (2022). Comparative Analysis of Dropout Rate in Tertiary Education in Online and Offline Mode in Mumbai. *Available at SSRN 4466082*

28. Tewari, A. N. U. R. A. G., Bansal, A., Ranjan, R. A. J. I. V., Tripathi, R. A. H. U. L., & Dhanasekaran, S. R. (2020). Generation Z pharmacy students' discernment and inclination towards online education in India during the COVID-19 pandemic. *International Journal of Pharmaceutical Research*, *1*, 2321-2327.

29. Thakar, S., Sharma, S., Anuradha, K. P., Shivalingesh, K. K., Uppal, M. K., Mishra, S., & Pokharel, P. (2022). Assessing the Sudden Shift From Classroom to Online Learning Due to the COVID-19 Pandemic: Students' Perspective. *Journal of Indian Association of Public Health Dentistry*, *20*(4), 432-438.

30. Tikadar, S., & Bhattacharya, S. (2019). How Do They Use Their Smartphones: A Study on Smartphone Usage by Indian Students. In *Human-Computer Interaction– INTERACT 2019: 17th IFIP TC 13 International Conference, Paphos, Cyprus, September 2–6, 2019, Proceedings, Part III 17* (pp. 132-151). Springer International Publishing.

31. Zhao, X., & Xue, W. (2023). From online to offline education in the post-pandemic era: Challenges encountered by international students at British universities. *Frontiers in Psychology*, *13*, 1093475

A STUDY ON THE IMPACT OF FINANCIAL INCLUSION POLICY ON BPL FAMILIES OF LUDHIANA DISTRICT OF PUNJAB

[1]Prabhneet Kaur [2]Khushboo Singh

[1]Assistant Professor, Punjab College of Technical Education, Ludhiana

[2]Assistant professor, Punjab College of Technical Education, Ludhiana

ABSTRACT

Financial Inclusion, a process of contribution of unprivileged people in the development of the country. To check the level of financial inclusion of rural areas of Ludhiana district, this study was conducted. The main purpose of this study was to check the awareness and availability of financial products and secondly to check how demographic factors affect the level of financial inclusion. This study was done on the concept of financial inclusion in BPL families of Ludhiana district. To check the level of financial inclusion, data was collected from both males and females. Data was collected from 200 people comprising 145 males and 55 females. Correlation was applied to check the result. The study thus concluded that the demographic factors, gender, age, income and occupation had a positive correlation with the type of account people operated, mode of availing loan and use of net banking app source of knowledge about new scheme. Many people already knew about new financial inclusion schemes as started by the govt. When we talk about the awareness about the financial inclusion, most people knew about ATM facility, net banking and govt schemes. People are getting full benefits from the schemes launched by the govt time to time.

INTRODUCTION

India is proud of its widespread and strong financial system, that has actually helped to fuel the country's economic growth over the past 20 years. However, a sizable portion of the population still does not have access to official financial services. The main objective of financial inclusion is to increase the number of people worldwide who have affordable access to basic financial services. Financial inclusion pertains to aimed at rendering financial goods and services inexpensive and available to every person and enterprise, irrespective of their individual wealth or corporate scale. The main purpose of the financial inclusion is to remove all possible hindrances that prevent people from engaging with the financial industry and utilizing its services to better their lives. We also refer to it as inclusive finance. Providing low-cost credit for personal, business, and other uses, bank accounts for savings and transactional purposes, financial advice services, life and non-life insurance facilities, etc. are all essential components of financial inclusion.

DEFINITIONS

- Financial inclusion may be defined as the process of ensuring access to financial services and timely and adequate credit where needed by vulnerable groups such as weaker sections and low-income groups at an affordable cost

  (The Committee on Financial Inclusion, Chairman: Dr. C. Rangarajan).

- Financial Inclusion, broadly defined, refers to universal access to a wide range of financial services at a reasonable cost. These include not only banking products but also other financial services such as insurance and equity products

  (The Committee on Financial Sector Reforms, Chairman: Dr. Raghuram G. Rajan).

Financial inclusion safeguards low-income people' financial assets and other resources in emergency situations by enclosing them within the boundaries of the official banking system. By making formal credit easily accessible, financial inclusion also lessens the likelihood that predatory moneylenders will take advantage of weaker groups of people.

Financial inclusion serves as a very necessary aspect in seven goals of Sustainable Development from 17 total no. of goals. The G20 reconfirmed its commitment to putting the G20 High-Level Principles for Digital Financial Inclusion into practice and pledged to promote financial inclusion globally.

In order to increase financial inclusion in the nation, RBI has eliminated all regulatory barriers and implemented a bank-led strategy. Additionally, in order to meet the desired results, RBI has improved the regulatory landscape and given banks institutional support to help them advance their financial inclusion initiatives. The Reserve Bank of India created a composite Financial Inclusion Index (FI-Index) to measure the level of financial inclusion throughout the nation in conjunction with the relevant parties, including the government. The FI-Index was first released in August 2021 for the fiscal year that ends in March 2021. The 97 parameters that make up the Index are responsive to factors such as service quality, availability and utilization, and ease of access. The Quality component, which measures the quality of financial inclusion as indicated by consumer protection, financial literacy, and disparities and service shortcomings, is one of the Index's distinctive features.

FINANCIAL INCLUSION INDEX

The Financial Inclusion Index (FI-Index), designed collaboratively by government and sectoral regulators, measures banking, insurance, postal services, pensions, and investments. It ranges from 0 (complete exclusion) to 100 (full inclusion), analysing Access (35%), Usage (45%), and Quality (20%) through 97 parameters. Quality considers service gaps, literacy, and protection. The FI-Index has no base year and tracks stakeholders' collective progress. Scores rose from 43.4 in March 2017 to 60.1 in March 2023, with notable contributions from Usage and Quality improvements. The FI-Index is updated annually in July.

INITIATIVES OF INDIAN GOVERNMENT

The Indian government has launched a number of exclusive programs to promote financial inclusion. The main target of these schemes is to uplift the backward people i.e. financially weaker people. Following extensive preparation and study by numerous financial specialists and legislators, the government introduced programs with the focus on financial inclusion. These programmes were introduced in a variety of years.Nation's financial inclusion initiatives:

- Pradhan Mantri Jan Dhan Yojana (PMJDY)
- Atal Pension Yojana (APY)
- Pradhan Mantri Vaya Vandana Yojana (PMVVY)
- Stand Up India Scheme
- Pradhan Mantri Mudra Yojana (PMMY)
- Pradhan Mantri Suraksha Bima Yojana (PMSBY)
- Sukanya Samriddhi Yojana
- Jeevan Suraksha Bandhan Yojana
- Credit Enhancement Guarantee Scheme (CEGS) for Scheduled Castes (SCs)
- Venture Capital Fund for Scheduled Castes under the Social Sector Initiatives
- Varishtha Pension Bima Yojana (VPBY)

The major role of financial inclusion is to involve the poor or underprivileged people of the economy in the strengthening of the finance sector of the nation. It is done to ensure the growth of a country when people deprived of such services are given these efficiently.

MEANING OF BPL FAMILIES

BPL refers to a level set up by the government of India, to determine the households or the families that live below the set level of poverty. The government thus is involved in establishing various schemes and programmes to give them the basic amenities of life.

To measure the poverty in our economy, a method was introduced in 2006 but amended several times to clear the loopholes.

The term is also used to define an economic situation to maintain a basic standard of living.

REVIEW OF LITERATURE

Vinay Kandpal (2024). The research was conducted to know the perspectives of bankers towards financial inclusion. For this purpose, data was taken from 32 bankers working in both public as well as private banks of India. Thematic analysis was done to reach the conclusion. The findings concluded that accessibility, usage, affordability and availability have great impact on financial inclusion. Awareness of financial products actually help protect customers from cyber scams.

Rajalaxmi Singh, et al (2024). The research was done to check the determinants of financial inclusion in India. A survey was conducted by taking data from 17 states of India. The research concluded that Urban areas comprising of rich educated people are more financially included in financial inclusion index as compared to the rural areas in these states. Thus, South and North Eastern states have better financial inclusion index and other regions lag behind.

Indrajeet Kumar (2024). Bihar, as recognised as one of the poorest states of India, was taken into account for this study. It evaluates the National Strategy for Financial Inclusion (NSFI) 2019–2024 and addressed various drawbacks as suffered in Bihar. Interviews were conducted to assess the data from various households and bank managers. It concluded that demographic factors like gender, age, social groups etc and other factors like insufficient income, lengthy documentation procedures etc are still existing in Bihar that reduces the importance of financial inclusion.

Asha Prasuna et al (2024). The main objective of this study was to understand the level of financial inclusion index across various states of India. For this, data of 2 decades was taken and comparative analysis was made between rural and urban financial inclusion levels. The results showed that per capita income, share of total population in urban and rural areas, number of factories etc. had a significant impact on this index.

Lee *et al*, 2023 This research paper analyzed the bond between Poverty reduction and digital financial inclusion by using the data from Chinese province from 2011- 2019. The study reached the point that digital financial inclusion can contribute to decrease the poverty level and secondly the result of quantile regression varied when the effect of DIFI on poverty alleviation was measured depending upon the total number of people below poverty line.

Thathsarani *et al*, 2022 Research, undertaken in Sri Lanka to explore the following: How digital financing effected and mediated financial inclusion and SME performance and how Technology Acceptance Model (TAM) impact these relationships. For this, data collected from 366 owners and managers of Small and medium sized enterprises through questionnaires. The study concluded that there was a positive impact of performance of SME on the pillars of financial inclusion i.e. consumption, access and quality of financial products and services. The simplicity in using the technology also influenced the availability of financing and performance of SME.

Jungo *et al*, 2022 The study investigated the relationship among financial inclusion, market structure and financial stability. For this, 2 differentiated samples were taken. First from 31 countries in Latin America and The Caribbean (LAC) and secondly from 41 countries in Sub Saharan Africa (SSA) from 2005-2018. The main conclusion derived from this study was that ultimately people would be benefitted from higher level of financial inclusion as they would have more fair access to financial services. Thus, it would ensure stability in banking sector in future.

Ramzan *et al,* 2021 This research paper analyzed the impact of Corporate Social Responsibility (CSR) on the financial inclusion, financial stability and financial performance. For this purpose, 20 Pakistani commercial banks were selected and thus data was then collected from them for the period varying from 2008-2017. The study concluded that high leverage positively affected both financial inclusion and stability but negatively impacted the tangibility of assets.

Hong Vo *et al,* 2021 The study was undertaken to look upon the link between market stability and financial inclusion, data from 3071 banks in Asian region was collected. GMM approach (Generalized Method of Moments) was used to find the results. The paper concluded, financial inclusion not only increased the savings and investment level in the whole economy but also promoted stability in financial sector.

Koomson *et al,* 2021 Study was undertaken in Ghana to study the effect of financial inclusion on energy poverty. Data was collected in 2 rounds and multidimensional measures were taken to analyze this impact. The study thus looked that the percentage of families that were energy poor fell from 81% to 80% and the standard deviation decreased to 1.556. The results came out with the fact that there was more stability in the families ran by males and due to reduction in energy poverty, financial inclusion was improved.

Mishra et-al, 2021 Study was undertaken in Sisilo village, Bhubaneswar, India. Aim included the study of factors that contributed to financial literacy and financial inclusion among the women of self- help groups. A sample of 100 women was taken from age groups 18-59 through questionnaires and this data was analyzed through factorial analysis. Conclusion-There were 3 main factors that impacted education level, family income and awareness of insurance and banking products that includes level of risk, availability of banks, knowledge of products and insurance schemes. Some factors also serve as obstacles namely distrust in Financial Inclusion, improper guidance, gender inequality etc.

Khera *et al,* 2021. This study used the cross- sectional instrument variable procedure to clearly concluded that digital financial inclusion had favorable effect on the growth of GDP from 2011-2018. The study revealed the fact that digital financial inclusion fostered economic growth. There were mainly 2 contributors that helped in reaching the results. Firstly, conducting cross country examination of digital financial inclusion and secondly, exploring the variables that influenced digital financial inclusion.

Ozili *et al,* 2021. This study was undertaken to examine the link between financial inclusion and financial risk. As a result of which, the study concluded that higher the financial inclusion, more would be the financial risk in developing nations wherein in case of developed economies, more financial inclusion resulted in lesser financial risk. The study had also established the link between digital financial products and ownership of formal accounts. The results had shown that the use of digital financial products with formal ownership accounts reduced insolvency risk and improved the efficiency of financial sector in developing nations.

Nguyen, *et al,*2020. This study was based on the measurement of financial inclusion among various developing nations. The data collected from Financial Access Survey (FAS) of IMF and Global Findex database of World Bank from the period 2012-18. For this purpose, the data was collected from 40 emerging economies for variables of usage, availability and access. Principal Component Analysis (2 stages) method was used to construct composite index. For this technique, the indicators were normalized to have the values between 0 and 1. 1 implied financial inclusion whereas 0 implied financial exclusion. The study concluded that there existed a positive correlation between financial inclusion and these 3 factors namely availability, access and usage. In Accordance with the study, Mauritius had highest level of financial inclusion and Tanzania was at the least level of financial inclusion.

Sultana Afsana, *et al* 2020. The aim of 0paper was to analyze the role of Indian post offices in financial inclusion. So, secondary data was collected from the annual reports, websites of Indian post and journals etc. The findings were starting Indian post Payments Banks (IPPB) to serve people deprived of banking services and creating strong networks in rural areas to provide affordable financial services.

Koomson *et al,* 2020. The study analyzed how households' poverty was influenced by financial inclusion. So, an index was created and the data was taken from the 7th round of Ghana Living Standards Survey in 2016-2017. The findings revealed that 23.4 % were classified as poor and approximately 51% became impoverished. The study

also brought up the fact that the families that were run by females showed decline in poverty level, as a result of which financial inclusion improved.

Omar *et al,* 2020. Research paper looked upon the reasons, implications and results of financial inclusion on income disparity in 116 emergent nations. The data collected from 2004- 2016 and the effect on poverty was investigated. The research concluded that per capita real GDP and ratio of internet users had a favorableinfluence on the level of financial inclusion and the factors like size of population, inflation and disparity in income had negative effect.

Demir *et al,* 2020. The study investigated the relationship among financial inclusion, FinTech and inequality for income for 140 countries from data collected through the surveys of Global Findex. Quantile regression was used to find out the gaps between nations and different degrees of income disparity. The study revealed that Fintech indirectly reduced the income inequality. Financial inclusion thus had an influential impact that decreased income disparity.

Ha Lee *et al,* 2019. The study was undertaken to examine the link among sustainability, efficiency and financial inclusion. For this, 31 Asian countries were taken as sample from 2004- 2016. The study revealed that financial inclusion had an influential and favorable effect on financial sustainability and negative impact on financial efficiency. The results were estimated through FGLS (Feasible Generalized Least Squares).

RESEARCH METHODOLOGY

SCOPE OF STUDY

The study is taken to ensure the availability and demographic factors i.e. income, occupation, age, education, gender influencing financial inclusion services to BPL families of rural areas of Ludhiana district.

RESEARCH GAP

Previous studies focussed more on schemes of banks or government and this study helped in diverting the attention on individuals of BPL families by collecting data from them and then analysing it for fulfilling our objectives.

Most of the studies are concentrated to other geographical parts of Punjab whereas this study focussed on rural areas of Ludhiana district.

NEED OF THE STUDY

This study is conducted to investigate the level of awareness regarding financial services among people of BPL families in the rural areas Ludhiana district.

This study is undertaken in order to check whether financial inclusion services are available to BPL families of Ludhiana district.

This work was done to recognise different demographic factors affecting financial inclusion services and products in rural areas of Ludhiana district.

OBJECTIVES

- To study the availability and awareness of financial inclusion policies of banks in various villages of Ludhiana.
- To investigate the demographic factors (age, gender, occupation, and income) influencing financial inclusion in BPL families of rural area in Ludhiana district.

AREA OF RESEARCH

This study was conducted in the rural areas of Ludhiana district of Punjab state

SAMPLING TECHNIQUE

Convenience Sampling technique was applied to take samples out of total population.

ISBN: 978-93-5680-531-6
www.npapublishing.in

Data was collected from the people having age more than 18 years.

Both males and females were the part of this study.

SAMPLE SIZE

A sample of 200 were taken. Out of which 145 were males and 55 were females.

RESEARCH DESIGN

The study was developed on the following flow chart:

- Sampling plan
- Questionnaire design
- Data collection
- Analysis of data
- Results and interpretation

DATA COLLECTION

The data for analysis will be collected through

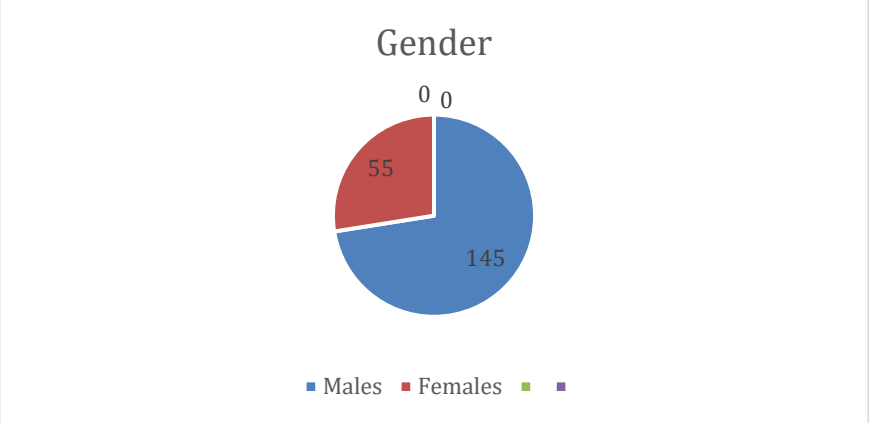
- **Primary data:** The primary data was gathered through personal interview from the people of rural area, then questionnaires were filled to maintain record of their data.
- **Secondary data:** The source of secondary data was journals, magazines, previous research papers, govt. official websites and surveys etc.

DATA INTERPRETATION

The study was conducted in rural areas of Ludhiana district mentioned above. Demographic factor, Gender was taken to check how many males and females knew about financial inclusion.

1. Classification on the basis of gender

Figure 1



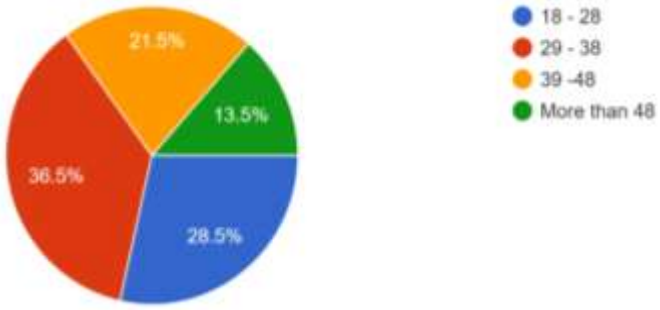
The above chart showed that in the study, there were 145 males and 55 females which implies that males.

2. Age of respondents

The age of the samples is recorded and shown in the table below:

ISBN: 978-93-5680-531-6
www.npapublishing.in

Figure 2

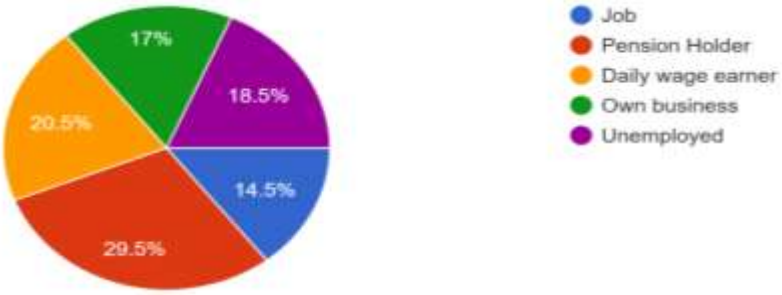


It is way much clear that out of 200 respondents, 28.5% of the population belonged to the age group ranging from 18- 28 years of age. 36.5%, 21.5% and 13.5% belonged to the age groups of 29-38 years, 39-48 years and more than 48 years of age respectively.

3. Occupation of respondents

The occupation was divided into 5 categories. Below shows the table;

Figure 3

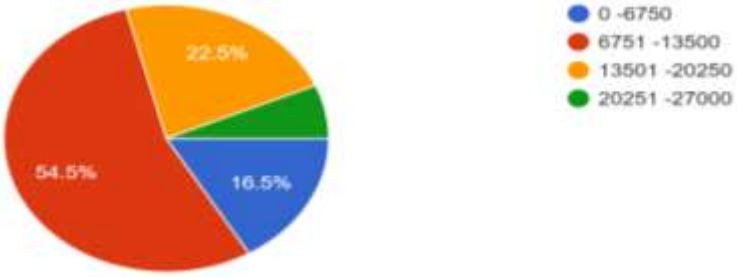


The above table and pie chart showed that a total of 14.5% population is doing job, 29.5% is pension holder, 20.5% population is daily wage earner, 17% of population is having their own business and rest 18.5% of the population was unemployed.

4. Income Per annum of population

The BPL families refer to those whose family income is less than or up to Rs 27000 per annum. Thus, the income of the respondent is divided and shown below.

Figure 4



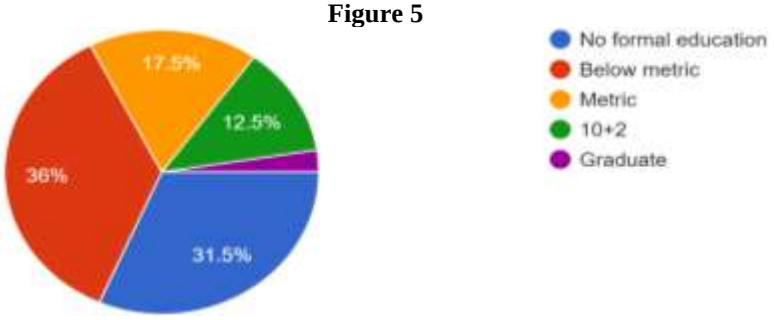
From the above chart and table, it is clear that 16.5% of the population is earning less than Rs 6750. 54.5 % of the population is earning between Rs 6751 to Rs 13500 per annum. 22.5 % of the population is earning between Rs 13500 to Rs 20250 per annum and remaining 6.5 % population is earning between Rs 20251 to Rs 27000.

ISBN: 978-93-5680-531-6
www.npapublishing.in

5. Education of the respondents

To record the education of the employees, the education was categorized into 5 groups as mentioned below.

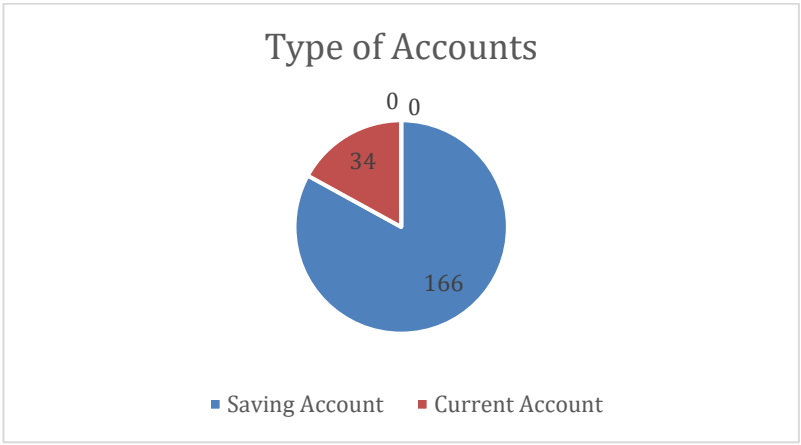
Figure 5



The above table showed that out of 200 respondents, 31.5% do not had any formal education, 36%, 17.5% and 12.5% comprised of the population having education below metric, metric and 12th respectively. The remaining population 2.5% is graduated.

6. Type of Account used regularly

2 types were discussed in the questionnaire to check which account people use regularly.

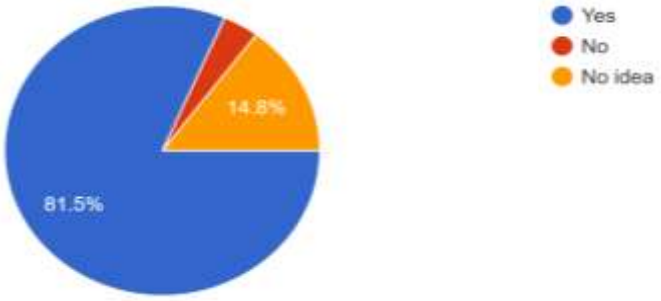


From above, a total of 166 individuals comprising of 83% of the population had saving account whereas 17% of the population i.e. 34 individuals had current account.

7. Availability of ATMs in your area

Questionnaire has been designed in such a way to know whether people know about availability of ATM service in their area or not.

Figure 7



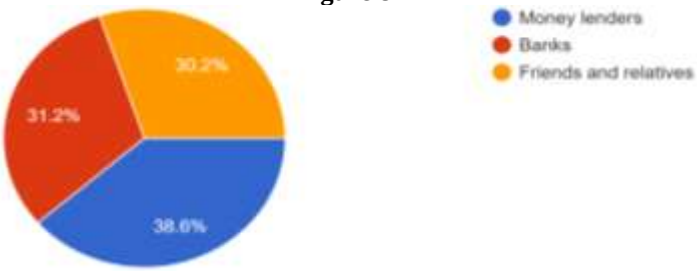
ISBN: 978-93-5680-531-6
www.npapublishing.in

Out of total population, 154 individuals know about ATM services whereas 15% of the population do not know whether ATM services are available in their area or not. About 4% of the population said that ATM services were not available in their area.

8. Source of loan

Loans are an important part for financial help. Data is collected in a way to know how these people avail the facility of loan.

Figure 8



From the collected data, it is clear that in rural areas, people usually took loans from the money lenders that comprises of 38.6% of the population. Remaining population avail the loan from banks comprising 31% from banks and 30% from friends and relatives.

9. Awareness about govt schemes.

Govt of India forms and implements various schemes time to time so that the financially ignored people could also maximum benefit and country can become financially strong. Following table shows the schemes of the govt:

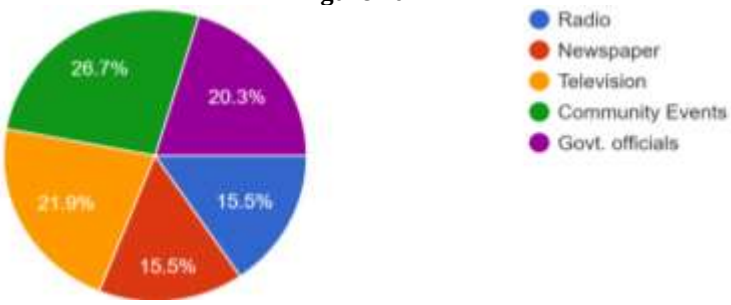
Figure 9

Maximum people know about Pradhan Mantri Mudra Yojana in the rural areas and taking maximum benefit out of this scheme and the people are aware about other schemes of the govt also.

10. Medium of Awareness

This question relates to the fact as how new govt schemes reach the people of rural area i.e. people living below poverty line. To accomplish our purpose, various sources of information were taken and data was collected.

Figure 10



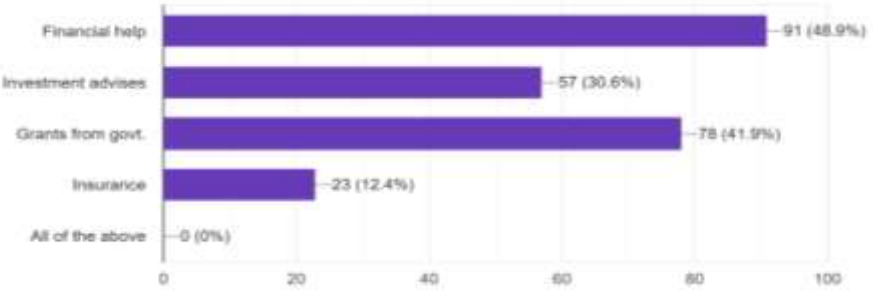
ISBN: 978-93-5680-531-6
www.npapublishing.in

The above data shows that people got the maximum information about the scheme from community events comprising of about 26 %. radios and newspaper comprise of 15.5% each. Rest includes sources like television, govt officials etc.

11. Benefits yielded

This question deals with the benefits that people had while using these financial services.

Figure 11

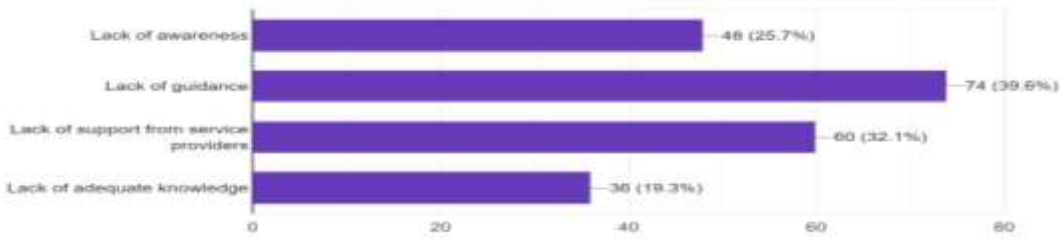


The above figure showed that approx. 50% of the population has taken the benefit of financial help under the said schemes. 41% from the grants of the govt., around 30% from investment advisers and 12% from the insurance.

12. Challenges faced

People faced various challenges while using the services. Questionnaire was designed to collect the data as what challenges were faced by the people. Following table shows the challenges faced.

Figure 12

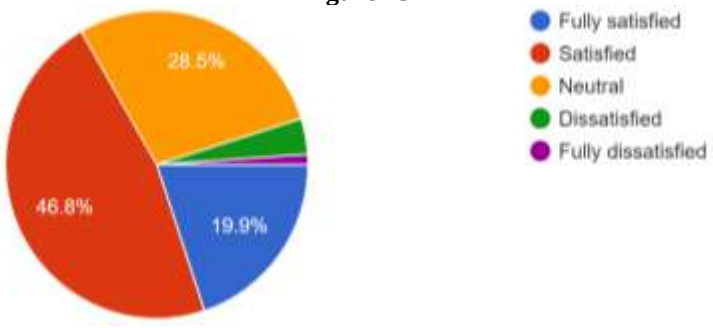


The maximum challenge people faced was lack of guidance with approx. 40% followed by 32% from lack of support from service provider.

13. Satisfaction level

The satisfaction level is also being discussed in the questionnaire.

Figure 13

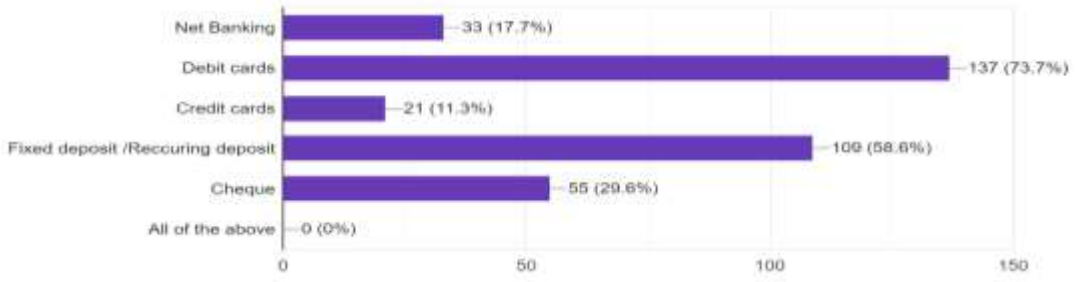


Satisfaction level is being studied where maximum population opted for satisfied option with 46.8% followed by 28.5% people who were neutral in their responses.

14. Awareness about services offered by bank

The questionnaire also deals with the awareness about the service as offered by the banks. These are as follows.

Figure 14

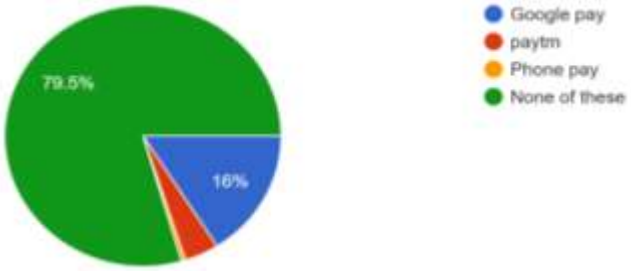


The above data showed that maximum people are aware of debit cards with 73.7% followed by 58% in fixed and recurring deposit and least in credit cards.

15. App used for net banking

As maximum people are aware of net banking, this data shows maximum people use which app for net banking.

Figure 15



16% of the population is using google pay whereas maximum people do not use any net banking app.

CONCLUSION AND FINDINGS

The basis of this study is the concept of financial inclusion in BPL families of Ludhiana district. To check the financial inclusion level, the data was gathered from both males and females. 200 samples were collected comprising 145 males and 55 females. Correlation was applied to check the result. The study thus concluded that the demographic factors, gender, age, income and occupation had a positive correlation with the type of account people operated, mode of availing loan and use of net banking app source of knowledge about new scheme. Most of the population was aware of new financial inclusion schemes as launched by the govt. When we talk about the awareness about the financial inclusion, most of the people knew about ATM facility, net banking and govt schemes. People are getting full benefits from the schemes launched by the govt time to time.

REFERENCES

1. Demir, A., Pesqué-Cela, V., Altunbas, Y., &Murinde, V. (2022). Fintech, financial inclusion and income inequality: a quantile regression approach. The European Journal of Finance, 28(1), 86-107.
2. Jungo, J., Madaleno, M., & Botelho, A. (2022). The effect of financial inclusion and competitiveness on financial stability: Why financial regulation matters in developing countries. Journal of Risk and Financial Management, 15(3), 122.
3. Kandpal, V. (2024). Dimensions of financial inclusion in India: a qualitative analysis of bankers' perspective. *Qualitative Research in Financial Markets*, *16*(4), 660-679.

4. Khera, P., Ogawa, M. S., & Sahay, M. R. (2021). *Is digital financial inclusion unlocking growth?* International Monetary Fund.

5. Koomson, I., & Danquah, M. (2021). Financial inclusion and energy poverty: Empirical evidence from Ghana. Energy economics, 94, 105085.

6. Koomson, I., Villano, R. A., & Hadley, D. (2020). Effect of financial inclusion on poverty and vulnerability to poverty: Evidence using a multidimensional measure of financial inclusion. Social Indicators Research, 149(2), 613-639.

7. Kumar, I. (2024). Banking services and financial inclusion in India's poorest regions. *Journal of Banking Regulation*, *25*(2), 145-159.

8. Le, T. H., Chuc, A. T., & Taghizadeh-Hesary, F. (2019). Financial inclusion and its impact on financial efficiency and sustainability: Empirical evidence from Asia. Borsa Istanbul Review, 19(4), 310-322.

9. Lee, C. C., Lou, R., & Wang, F. (2023). Digital financial inclusion and poverty alleviation: Evidence from the sustainable development of China. *Economic Analysis and Policy*, *77*, 418-434.

10. Mishra, D. K., Malik, S., Chitnis, A., Paul, D., & Dash, S. S. (2021). Factors contributing to financial literacy and financial inclusion among women in Indian SHGs. *Universal Journal of Accounting and Finance*, *9*(4), 810-819.

11. Omar, M. A., & Inaba, K. (2020). Does financial inclusion reduce poverty and income inequality in developing countries? A panel data analysis. Journal of economic structures, 9(1), 37.

12. Ozili, P. K. (2018). Impact of digital finance on financial inclusion and stability. Borsa Istanbul Review, 18(4), 329-340Park

13. Ozili, P. K. (2021). Has financial inclusion made the financial sector riskier? *Journal of Financial Regulation and Compliance*, *29*(3), 237-255.

14. Prasuna, A., Kasturi, A., & Annemalla, R. (2024). Unveiling the factors influencing financial inclusion in India: a comprehensive analysis. *Cogent Economics & Finance*, *12*(1), 2381682.

15. Ramzan, M., Amin, M., & Abbas, M. (2021). How does corporate social responsibility affect financial performance, financial stability, and financial inclusion in the banking sector? Evidence from Pakistan. Research in International Business and Finance, 55, 101314.

16. Singh, R., & Mallick, H. (2024). Financial inclusion in India: an analysis from the user-side perspective. *International Journal of Social Economics*.

17. SULTANA, A. (2020). Role of Indian Postal Service Sector in Financial Inclusion with Special Consideration to India Post Payments Bank (IPPB). *PalArch's Journal of Archaeology of Egypt/Egyptology*, *17*(7), 5959-5966

18. Thathsarani, U. S., & Jianguo, W. (2022). Do Digital Finance and the Technology Acceptance Model Strengthen Financial Inclusion and SME Performance. Information, 13(8), 390.

19. Vo, D. H., Nguyen, N. T., & Van, L. T. H. (2021). Financial inclusion and stability in the Asian region using bank-level data. Borsa Istanbul Review, 21(1), 36-43.

20. Vo, D. H., Nguyen, N. T., & Van, L. T. H. (2021). Financial inclusion and stability in the Asian region using bank-level data. *Borsa Istanbul Review*, *21*(1), 36-43.

INDIAN KNOWLEDGE SYSTEM IN PHARMACEUTICAL SCIENCES

[1]Yashima Jain [2]Harmeet Singh

[1,2]PCTE Group of Institutes, Ludhiana

The Indian Knowledge System (IKS) in pharmaceutical sciences encompasses a rich tradition of herbal medicine, holistic healing practices, and a deep understanding of human biology that dates back thousands of years. Rooted in ancient texts such as the Ayurveda, Siddha, and Unani systems, this knowledge is predicated on the principles of balance, preventive healthcare, and the use of natural substances to promote well-being. IKS emphasizes the holistic nature of health, integrating physical, mental, and spiritual aspects, which results in a comprehensive approach to treatment and disease prevention.

Pharmaceutical sciences in India have evolved to incorporate traditional practices with modern scientific methodologies, facilitating the development of novel drugs and therapeutics. The resurgence of interest in herbal formulations and traditional remedies has led to a growing body of research aimed at validating and integrating IKS into contemporary medical practices. Additionally, initiatives by the Indian government to promote traditional medicine have propelled the global recognition of IKS as a source of innovative pharmaceutical solutions. By leveraging ancient wisdom alongside modern technology, the Indian Knowledge System is positioned to significantly contribute to the global pharmaceutical landscape, addressing challenges related to drug discovery, sustainable practices, and health disparities. This fusion of tradition and science holds promise for the future of healthcare.

Keywords: Indian Knowledge System, Traditional practices, Ayurveda, Unani, Siddha

1. INTRODUCTION

The growing interest in holistic and sustainable healthcare solutions has spotlighted the value of Indigenous Knowledge Systems (IKS) in pharmaceutical sciences. IKS encompasses the accumulated knowledge, skills, and practices developed over centuries by indigenous communities to address health and disease. These systems have been instrumental in identifying bioactive compounds that serve as the foundation for many modern drugs, such as quinine, aspirin, and artemisinin.

However, the integration of IKS into mainstream pharmaceutical research is fraught with challenges, including biopiracy, intellectual property rights (IPR) issues, and the risk of cultural erasure. By acknowledging and respecting these knowledge systems, pharmaceutical sciences can achieve significant breakthroughs in drug discovery, sustainable resource use, and culturally sensitive healthcare practices.

2. HISTORICAL BACKGROUND

Indigenous knowledge has shaped healthcare practices across civilizations. Ancient systems, such as Traditional Chinese Medicine (TCM), Ayurveda, and African traditional medicine, have relied on natural products for treatment. For instance:

- **Ayurveda**, originating in India over 5,000 years ago, emphasizes the use of plant-based remedies like turmeric and neem for their antimicrobial and anti-inflammatory properties.[1]
- **Traditional Chinese Medicine** integrates herbs such as ginseng and ephedra into therapeutic practices, many of which inform modern drug development.
- **African traditional medicine** involves the use of plants like the African cherry (Prunus africana) for treating malaria and prostate disorders.[2]

Colonial histories often disrupted these practices, marginalizing IKS in favor of Western medical paradigms. Despite these challenges, the knowledge persisted, underpinning the discovery of essential drugs like artemisinin, derived from Artemisia annua, used in malaria treatment.[3]

3. INTEGRATION OF IKS IN PHARMACEUTICAL SCIENCES

IKS has become a critical component in pharmaceutical research, particularly in ethnopharmacology and drug discovery. Integration occurs through:

a. Ethnopharmacological Studies

Ethnopharmacology investigates the medicinal use of plants by indigenous communities. For example:

- The development of **paclitaxel (Taxol)**, an anti-cancer drug, was inspired by the traditional use of Pacific yew tree bark by Native American tribes.[4]

b. Natural Product Research

Pharmaceutical companies and researchers often collaborate with indigenous communities to identify bioactive compounds. The neem tree (Azadirachta indica), revered in Indian traditional medicine, has led to the development of insecticides, antifungals, and other products.

c. Biodiversity Conservation and Sustainable Use

IKS emphasizes sustainable harvesting, ensuring the preservation of medicinal plants. For instance, community-based conservation initiatives in Amazonian forests have safeguarded biodiversity while supporting local health systems.

4. GOVERNMENT INITIATIVES

Governments worldwide have recognized the need to protect and integrate IKS into national healthcare frameworks. Key initiatives include:

a. **Legal Frameworks for IPR Protection**

The **Convention on Biological Diversity (CBD)** and its **Nagoya Protocol** seek to ensure that benefits derived from IKS are shared equitably with indigenous communities.

b. **Research and Development Programs**

Countries like India have established bodies such as the **Traditional Knowledge Digital Library (TKDL)**, which documents indigenous medicinal practices to prevent biopiracy. Similarly, South Africa's **Indigenous Knowledge Systems Policy** promotes the integration of traditional knowledge into national research agendas

c. **Global Collaborations**

Organizations like the **World Health Organization (WHO)** have initiated programs to validate and integrate traditional medicine into global health policies, ensuring cultural and scientific integrity.

5. CHALLENGES AND FUTURE DIRECTIONS

a. **Challenges**

1. **Documentation and Preservation**: Many IKS are oral traditions, making them vulnerable to loss as elder practitioners pass away.
2. **Biopiracy**: The commercial exploitation of indigenous resources without fair compensation remains a significant issue. For instance, the patenting of basmati rice and neem by multinational corporations sparked international disputes.
3. **Ethical Concerns**: Integrating IKS often involves navigating cultural sensitivities, particularly regarding sacred practices or plants.
4. **Scientific Validation**: Bridging the gap between traditional knowledge and modern scientific methods requires rigorous validation, which can be resource-intensive.

b. **Future Directions**

1. **Community-Driven Research**: Empowering indigenous communities to lead research efforts ensures ethical practices and equitable benefits.
2. **Technology Integration**: Digital tools such as blockchain can secure IPR for indigenous communities while enabling transparent benefit-sharing models.
3. **Interdisciplinary Collaborations**: Partnerships between ethnobotanists, pharmacologists, and policy-makers can foster holistic approaches to integrating IKS.
4. **Policy Innovations**: Strengthening global frameworks to prevent biopiracy and support equitable resource sharing is essential for sustainable integration.[7]

5. CONCLUSION

The integration of Indigenous Knowledge Systems into pharmaceutical sciences offers transformative potential for global healthcare. By respecting and collaborating with indigenous communities, researchers can harness centuries-old wisdom to develop innovative, sustainable, and culturally appropriate therapies. Overcoming challenges such as biopiracy and ethical dilemmas requires coordinated efforts across governments, academia, and industry. With robust policies and interdisciplinary collaboration, IKS can play a pivotal role in shaping the future of medicine.

6. REFERENCES

1. Convention on Biological Diversity. (1992). *Text of the Convention on Biological Diversity*. Retrieved from https://www.cbd.int
2. Heinrich, M., & Gibbons, S. (2001). Ethnopharmacology in drug discovery: An analysis of its role and potential contribution. *Journal of Pharmacy and Pharmacology*, *53*(4), 425-432.
3. World Health Organization. (2013). *WHO Traditional Medicine Strategy 2014-2023*. Geneva: WHO Press.
4. Traditional Knowledge Digital Library. (n.d.). *About TKDL*. Retrieved from https://www.tkdl.res.in
5. Zhang, A. L., & Xue, C. C. (2010). Integrating traditional medicine into modern medical practice. *Complementary Therapies in Medicine*, *18*(4), 199-207.
6. Sharma, P. H., & Singh, S. (2020). Integrating Ayurveda with Modern Medicine: A Global Perspective. *Journal of Ethnopharmacology*, 267, 113520.
7. Kumari, G., & Nair, A. (2021). Evolution of Indian Herbal Medicine: Challenges and Opportunities. *Pharmaceutical Biology*, 59(1), 180-189.

ISBN: 978-93-5680-531-6
www.npapublishing.in

INDIAN KNOWLEDGE SYSTEM: BASED APPROACHES TO LEADERSHIP: ETHICAL AND HOLISTIC PERSPECTIVES

Amit Sethi

Associate Professor, Punjab College of Technical Education, Ludhiana

The Indian Knowledge System (IKS) offers a rich, time-tested framework for leadership grounded in ancient philosophical and cultural traditions. Rooted in texts such as the Vedas, Upanishads, Bhagavad Gita, and Arthashastra, IKS provides a holistic perspective on leadership that integrates ethical values, self-awareness, social responsibility, and sustainability. This research paper explores the integration of Indian Knowledge Systems (IKS) in contemporary leadership, focusing on ethical and holistic approaches. The paper examines key principles include the concepts of *dharma* (righteous duty), *yoga* (self-discipline and mindfulness), and *artha* (prosperity through ethical means) which provide a foundation for ethical leadership that transcends personal gain and promotes fairness, integrity, and social responsibility. Additionally, the holistic leadership model in IKS emphasizes the balance of mind, body, and spirit, fostering resilience and emotional intelligence among leaders. While integrating IKS into modern leadership practices presents challenges, such as the complexity of its ancient texts, perceived irrelevance in the contemporary business world, and the lack of standardized implementation frameworks, these obstacles are outweighed by significant opportunities. IKS-based leadership offers a pathway to corporate social responsibility, environmental sustainability, and inclusive leadership that promotes long-term organizational success while benefiting society. Furthermore, the paper highlights real-life case studies from organizations like Tata Group, Amul, and the Art of Living Foundation, demonstrating the practical application of IKS principles in fostering ethical and holistic leadership. As the global business environment continues to evolve, IKS can play a crucial role in guiding leaders toward practices that are both successful and socially responsible.

Keywords: Indian Knowledge System, Ethical Leadership, Holistic Leadership, Dharma, , Ethical Decision-making, Sustainability, Indian Philosophy

1. INTRODUCTION

Leadership has been a cornerstone of human progress, shaping societies, organizations, and civilizations across history. In the contemporary era, leadership is often discussed in terms of styles, theories, and competencies developed through empirical studies and Western philosophical traditions. However, leadership is not a concept confined to modern frameworks or Western paradigms. The Indian Knowledge System (IKS), rooted in ancient Indian philosophy and spiritual traditions, offers a profound, ethical, and holistic perspective on leadership that is increasingly relevant in today's complex and interconnected world.

The Indian Knowledge System represents a body of wisdom encompassing ancient texts such as the Vedas, Upanishads, Mahabharata, Ramayana, and Arthashastra, alongside practices like yoga and Ayurveda. These sources are deeply imbued with ethical principles and holistic approaches to life and governance. At its core, IKS advocates for a leadership style that harmonizes personal excellence with collective welfare, individual ethics with universal values, and material success with spiritual fulfilment. This integrative approach to leadership is a much-needed counterbalance in a world grappling with moral crises, short-termism, and environmental challenges.

Ethical leadership, as emphasized in Indian philosophy, is underpinned by concepts such as *Dharma* (righteousness or duty), *Karma* (action and accountability), and *Ahimsa* (non-violence). Leaders are viewed not merely as decision-makers but as custodians of societal well-being who act with integrity, compassion, and foresight. The holistic dimension of Indian leadership thought stems from the recognition of interconnectedness—between individuals, communities, and the environment—and the importance of aligning actions with the greater good.

This paper explores Indian Knowledge System-based approaches to leadership from ethical and holistic perspectives, emphasizing their timeless relevance and potential to address contemporary challenges. It seeks to bridge the gap between ancient wisdom and modern leadership paradigms by delving into the philosophical foundations, key principles, and practical applications of IKS in leadership contexts.

1.1 Relevance of the Indian Knowledge System in Leadership Studies

Leadership today faces unprecedented challenges, ranging from globalization and rapid technological advancements to social inequalities and ecological degradation. Conventional leadership models, while valuable, often fall short in addressing the complexities of these challenges due to their overemphasis on material success, competition, and short-term gains. The Indian Knowledge System offers a unique perspective by focusing on ethical considerations, inner transformation, and sustainability. It advocates for a leadership model that is as much about being as it is about doing—a paradigm shift that resonates with the evolving demands of modern society.

Moreover, the increasing globalization of businesses and cross-cultural interactions necessitates a leadership approach that is inclusive and adaptable. IKS provides a treasure trove of insights into cross-cultural leadership through its universal principles of harmony, balance, and respect for diversity. For instance, the idea of *Vasudhaiva Kutumbakam* (the world is one family) encapsulates a global mindset essential for leaders navigating multicultural environments.

1.2 Ethics and Leadership: The Indian Paradigm

Ethics lies at the heart of Indian leadership philosophy. Unlike many modern frameworks where ethics is often treated as an adjunct to leadership, IKS integrates ethics as a foundational principle. The concept of *Dharma* serves as a guiding framework for leaders, emphasizing duties and responsibilities over rights and entitlements. A leader's actions are expected to align with universal moral principles, ensuring fairness, justice, and the greater good.

The Bhagavad Gita, one of the seminal texts of Indian philosophy, offers profound insights into ethical leadership. Through the dialogue between Lord Krishna and Arjuna, the Gita addresses the dilemmas leaders face, emphasizing the importance of selflessness, courage, and adherence to one's duties. Krishna's advice to Arjuna to act without attachment to the outcomes (*Nishkama Karma*) underscores a leadership ethic that prioritizes process and purpose over personal gain.

1.3 Holistic Perspectives in Leadership

The Indian Knowledge System's holistic approach to leadership is rooted in its emphasis on interconnectedness and balance. This perspective transcends the compartmentalization often seen in Western leadership models, advocating for an integration of the physical, mental, emotional, and spiritual dimensions of human existence. The *Triguna* theory—Sattva (harmony), Rajas (activity), and Tamas (inertia)—provides a psychological framework for understanding leadership styles and behaviors, encouraging leaders to cultivate a *Sattvic* nature characterized by wisdom, balance, and self-control.

Yoga and meditation, integral components of IKS, further contribute to holistic leadership by fostering self-awareness, emotional intelligence, and resilience. A leader who is attuned to their inner self is better equipped to navigate external complexities and inspire others through authenticity and clarity of purpose.

1.4 Leadership Lessons from Ancient Indian Texts

Indian epics and scriptures are replete with leadership narratives and role models that illustrate the application of ethical and holistic principles. In the *Ramayana*, Lord Rama epitomizes the ideal leader who prioritizes duty and justice, even at personal cost. His leadership is characterized by compassion, humility, and unwavering commitment to *Dharma*. Similarly, the *Mahabharata* offers rich lessons on leadership through its diverse characters and their choices. While Krishna's strategic acumen demonstrates the importance of adaptability and vision, Yudhishthira's adherence to truth and righteousness highlights the ethical dimensions of leadership.

Chanakya's *Arthashastra*, a treatise on governance and administration, provides a pragmatic approach to leadership rooted in ethical pragmatism and long-term planning. Chanakya's emphasis on foresight, strategic thinking, and stakeholder engagement remains relevant for contemporary leaders navigating complex environments.

1.5 Bridging Ancient Wisdom with Modern Leadership Practices

One of the most compelling aspects of the Indian Knowledge System is its adaptability to modern contexts. While the philosophical underpinnings of IKS are ancient, their application in leadership is timeless. For example, the principles of *Dharma* and *Karma* can inform corporate social responsibility initiatives, while the holistic practices of yoga and mindfulness are increasingly recognized as tools for enhancing workplace well-being and productivity.

Prominent Indian leaders like Mahatma Gandhi, Swami Vivekananda, and APJ Abdul Kalam exemplify the application of IKS principles in modern leadership. Gandhi's philosophy of non-violent resistance (*Ahimsa*) and truth (*Satya*) offers a model for ethical leadership, while Kalam's emphasis on vision, integrity, and innovation reflects the holistic spirit of IKS.

2. REVIEW OF LITERATURE

Shankar Kumar Lal et al. (2024) explored the integration of the Indian Knowledge System (IKS) into higher education, emphasizing its role in promoting sustainable development and holistic values. They discussed the challenges of incorporating traditional philosophies into contemporary frameworks and provided case studies highlighting IKS's relevance to ethical leadership and ecological balance

Shazia Amani (2024) examined the integration of IKS in modern education following the National Education Policy (NEP) 2020. The study highlighted how traditional Indian philosophies like dharma (righteous conduct) and satya (truth) could transform leadership models by embedding ethical and value-based principles into decision-making processes. This aligns with promoting holistic education to prepare ethical leaders

Tiwari (2023) emphasized the broader applications of Indian knowledge systems, such as their ability to offer innovative solutions for personal and professional development. This work supports the argument that ethical leadership inspired by traditional Indian texts can address modern challenges through holistic approaches.

Indian texts highlight the importance of ethical leadership through self-awareness and moral discipline. The *Bhagavad Gita* advocates for a leader to act selflessly, focusing on the well-being of all stakeholders, rather than personal gains. This ethical approach is echoed in modern leadership studies, linking moral accountability with long-term organizational success **(Amrita University, 2023)**

Bhawuk (2022) contributed a theoretical model focusing on sāttvika leadership, an Indian perspective grounded in virtues like compassion, humility, and ethical responsibility. This work provides a foundation for discussing how ancient texts like the Bhagavad Gita inform leadership styles centered on balance and self-regulation in complex organizational contexts

Research on the **National Education Policy (NEP) 2020** in the International Journal for Multidisciplinary Research outlined its acknowledgment of IKS as a foundation for leadership training. The policy's emphasis on ethical and interdisciplinary learning fosters leaders equipped for modern challenges while respecting traditional values

IKS promotes a holistic leadership model that addresses physical, emotional, intellectual, and spiritual dimensions. Practices such as yoga, meditation, and mindfulness—which are integral to Indian traditions—have been adopted globally to enhance leadership effectiveness. Research shows that these practices improve cognitive function, decision-making, and resilience in high-pressure environments. The integration of these methods has shown measurable benefits in corporate settings **(Amrita University, 2023; IJERED, 2024)**

Leadership Lessons from the Arthashastra the *Arthashastra* remains a cornerstone of IKS-based leadership studies. Its strategies for statecraft, warfare, and economic policies emphasize adaptability and strategic thinking.

The text introduces concepts like servant leadership, encouraging leaders to prioritize the welfare of their subjects and employees, which aligns with modern leadership models focused on employee engagement and ethical **governance (Mahesh et al., 2023)**

Modern Applications and Challenges While IKS offers a robust theoretical framework, its application in contemporary leadership faces challenges, such as integrating traditional values in a fast-paced, globalized economy. However, the adaptability of IKS principles provides solutions for ethical dilemmas, cultural conflicts, and organizational sustainability **(Amrita University, 2023)**

3. OBJECTIVES OF THE PAPER

This paper aims to:

1. To explore the ethical dimensions of leadership as articulated in the Indian Knowledge System.
2. To analyze the holistic approaches to leadership rooted in Indian philosophy.
3. To draw connections between ancient Indian principles and contemporary leadership challenges.

4. DISCUSSION

4.1 Ethical Perspectives in Leadership

Ethical leadership, grounded in the Indian Knowledge Systems (IKS), is inherently tied to the philosophical and moral teachings embedded in ancient Indian texts and traditions. At the core of this ethical framework is *Dharma*—a guiding principle of righteousness, duty, and moral responsibility. Leaders following the IKS tradition are expected to act in ways that are consistent with the collective good, ensuring that their decisions benefit not only their immediate teams or organizations but also society at large. The concept of *Dharma* emphasizes that leadership is not just about achieving success but about doing so in a way that upholds values such as truth, justice, and fairness.

One of the most significant contributions of IKS to ethical leadership is the philosophy of *Karma Yoga*, as articulated in the *Bhagavad Gita*. Karma Yoga teaches that leaders should focus on their actions rather than being attached to the outcomes. This detachment prevents ego-driven decisions, allowing leaders to make choices based on ethical considerations and the welfare of others. The teachings of the *Bhagavad Gita* highlight the importance of selflessness, where leadership is viewed as a service to others rather than a means of personal gain. This principle ensures that leaders are not motivated solely by power, prestige, or material rewards, but rather by the desire to serve and uplift others.

Furthermore, ethical leadership in IKS is characterized by a deep commitment to human values such as compassion, humility, and integrity. These values are fundamental to the way leaders approach their responsibilities and interact with others. By embodying virtues like compassion (*Karuna*) and humility (*Vinaya*), leaders are able to foster trust, respect, and collaboration within their teams. The ethical framework of IKS provides leaders with the tools to navigate complex ethical dilemmas by ensuring that their actions align with a higher sense of duty and moral purpose.

At its core, IKS-based leadership is not just about achieving tangible results but about fostering an environment where ethical principles are embedded in the organizational culture. Leaders are encouraged to act as moral exemplars, demonstrating ethical conduct in their daily interactions and decisions. By doing so, they inspire those around them to act with similar integrity, thereby promoting a culture of ethical behavior that permeates the entire organization.

4.2 Holistic Approaches to Leadership

In addition to its emphasis on ethical values, IKS offers a holistic approach to leadership, which integrates multiple dimensions of human experience—physical, mental, emotional, and spiritual. This approach recognizes that effective leadership is not solely about intellectual or professional skills but also about emotional intelligence,

self-awareness, and spiritual grounding. Holistic leadership, as envisioned in IKS, encourages leaders to nurture all aspects of their being in order to develop a balanced and well-rounded approach to leadership.

A significant aspect of holistic leadership in IKS is the practice of *yoga* and *meditation*. These ancient practices serve as tools for self-discipline, mental clarity, and emotional resilience. By engaging in these practices, leaders cultivate mindfulness, focus, and emotional regulation—traits that are essential for effective decision-making and conflict resolution. Through yoga and meditation, leaders are able to detach from the stresses of their roles, allowing them to approach challenges with a clear and balanced mind. This mental clarity helps leaders remain calm under pressure, make thoughtful decisions, and approach problems with a sense of equanimity.

Another key component of holistic leadership in IKS is the emphasis on *Sattva* (purity), *Rajas* (activity), and *Tamas* (inertia), which are fundamental qualities in Indian philosophy. These qualities are understood as forces that shape human behavior and decision-making. A holistic leader must cultivate *Sattva*, the quality of clarity and wisdom, while managing the effects of *Rajas* and *Tamas*—the forces of restlessness and inertia. Leaders who cultivate *Sattva* are more likely to make decisions that are aligned with ethical principles and are beneficial to all stakeholders, rather than being swayed by personal desires or external pressures.

Holistic leadership also emphasizes the importance of sustainability and interconnectedness. Indian traditions, such as the principle of *Vasudhaiva Kutumbakam* (the world is one family), highlight the interconnectedness of all living beings. This worldview encourages leaders to consider the broader impact of their decisions, not just in terms of their immediate environment but also in terms of the long-term consequences for the global community. Leaders who adopt a holistic approach are more likely to make decisions that are environmentally sustainable and socially responsible, contributing to the well-being of future generations.

Furthermore, IKS emphasizes the importance of empowerment and collaboration in leadership. A holistic leader recognizes that true leadership is not about asserting authority over others, but about empowering individuals to reach their full potential. This approach fosters an environment where individuals are encouraged to contribute their ideas, work collaboratively, and grow within the organization. By empowering others, leaders create a sense of ownership and responsibility, which enhances organizational performance and fosters a positive organizational culture.

In summary, IKS-based leadership offers a comprehensive framework that addresses both ethical decision-making and the well-being of leaders and their teams. By integrating principles of righteousness, compassion, and mindfulness, as well as focusing on the sustainability and empowerment of others, IKS provides a leadership model that is grounded in moral integrity and personal growth. This holistic approach ensures that leaders are not only effective in achieving organizational goals but also in fostering a positive, inclusive, and ethical environment for all stakeholders involved.

4.3 Case Studies

Here are a few real-life case studies where ethical and holistic leadership practices, inspired by Indian Knowledge Systems (IKS), are applied:

1. Patanjali Ayurved Limited (Baba Ramdev's Company)

Patanjali Ayurved, under the leadership of Baba Ramdev, exemplifies a holistic leadership model rooted in ethical and sustainable practices. The company operates with a strong emphasis on traditional Indian knowledge, particularly Ayurveda and Yoga, in promoting health and wellness. The brand's leadership philosophy includes a focus on the well-being of employees, consumers, and society at large, demonstrating the application of *Dharma* (righteous duty) in business. The ethical approach extends beyond products to the organizational culture, which prioritizes employee welfare and environmental sustainability. This case also showcases how leadership in Patanjali is focused on balancing economic goals with ethical responsibilities, reinforcing the importance of sustainable business practices (Singh & Rana, 2022).

2. Tata Group (Tata Ethical Leadership)

The Tata Group, one of India's largest and most respected conglomerates, has long adhered to leadership principles that align with ethical values rooted in Indian traditions. The company's founder, Jamsetji Tata, emphasized values such as honesty, integrity, and service to the community, which are still central to the leadership philosophy at Tata Group. The leadership in Tata Group continues to incorporate the *Sattva* quality (purity and wisdom) and *Dharma* (righteousness) into corporate decisions. Ethical business practices, corporate social responsibility (CSR), and sustainability are key principles of leadership, demonstrating the intersection of IKS and contemporary global business practices. Tata's commitment to *Vasudhaiva Kutumbakam* (the world is one family) is evident in its focus on environmental sustainability and social impact through initiatives like the Tata Sustainability Group.

3. Amul (The Gujarat Cooperative Milk Marketing Federation)

Amul is a successful example of leadership based on ethical principles and holistic growth, benefiting not just the leaders but also the entire cooperative community. The leadership within Amul, which is based on cooperative principles, showcases how a company can operate ethically while remaining economically successful. The cooperative model reflects values such as shared prosperity, ethical treatment of farmers, and sustainability. By adhering to IKS principles, such as *Karma Yoga* (selfless service), Amul's leadership practices emphasize the importance of fairness, transparency, and collective decision-making. The company's focus on empowering its farmer members mirrors IKS's emphasis on empowerment and communal growth.

4. Sri Sri Ravi Shankar's Art of Living Foundation

Sri Sri Ravi Shankar's Art of Living Foundation emphasizes holistic leadership through spiritual, physical, and mental well-being. The organization incorporates *yoga*, *meditation*, and mindfulness practices to nurture emotional intelligence and resilience among its leaders and followers. Sri Sri Ravi Shankar's leadership reflects the holistic philosophy of IKS, which integrates the mind, body, and spirit. His teachings emphasize a balanced approach to life and leadership, promoting compassion, ethical decision-making, and self-awareness in both personal and professional spheres. The Art of Living Foundation has successfully applied these principles globally, creating leaders who are grounded in ethics and mindfulness.

5. Infosys and Leadership through IKS Principles

Infosys, a global IT company, incorporates ethical leadership principles and holistic approaches to leadership through its values of transparency, integrity, and respect. Infosys has been a leader in ethical governance and corporate social responsibility (CSR), aligning with the Indian tradition of *Dharma*. Infosys practices a holistic approach by fostering a healthy work-life balance, personal development, and mindfulness. The company's leadership practices encourage leaders to make decisions that are not only profit-driven but also socially responsible and ethically sound, resonating with the teachings of IKS that advocate for a balanced life and leadership.

6. Isha Foundation and Sadhguru's Leadership Philosophy

Isha Foundation, founded by Sadhguru, incorporates holistic leadership through practices such as yoga, meditation, and spiritual teachings that are deeply rooted in Indian traditions. Sadhguru's leadership model emphasizes *Sattva*—purity, wisdom, and clarity of thought. His leadership practices aim to enhance personal well-being, emotional balance, and ethical decision-making. Sadhguru's teachings stress the interconnectedness of all life, aligning with IKS's principle of *Vasudhaiva Kutumbakam*, which advocates for a leadership style that is compassionate, sustainable, and aligned with the welfare of the entire community.

4.4 Challenges and Opportunities

Indian Knowledge Systems (IKS), which encompass a wide array of philosophical, scientific, cultural, and spiritual wisdom, offer rich insights for addressing modern leadership and organizational challenges. However, integrating IKS into contemporary contexts, particularly in leadership and management, presents both challenges and opportunities.

Challenges in Indian Knowledge Systems (IKS)

1. Complexity and Accessibility of Knowledge IKS is vast and often dispersed across various texts, oral traditions, and practices. Ancient scriptures like the *Vedas*, *Upanishads*, *Puranas*, *Arthashastra*, and other classical works are dense and require significant expertise to interpret properly. As a result, the knowledge contained within these systems is often inaccessible to those unfamiliar with these traditions. Modern leaders and organizations may find it challenging to extract applicable insights from these texts without a deep understanding of the historical and cultural context
2. Perception of Relevance in Modern Contexts A major challenge for IKS is its perceived relevance in contemporary society. Many people view ancient Indian knowledge as outdated or inapplicable to modern business practices, especially in the fast-paced, technology-driven world. The focus on spirituality, ethics, and holistic living may seem disconnected from practical, results-oriented leadership in today's corporate environments. There is a need to bridge the gap between traditional knowledge and the modern worldview in a way that makes it relevant for today's leaders and organizations
3. Lack of Standardized Frameworks While IKS provides a wealth of philosophical and ethical teachings, it lacks a standardized framework for practical implementation in leadership roles. Unlike Western leadership models, which are often structured with clear methodologies and frameworks, IKS-based leadership is more abstract, relying on values and principles that are not always easy to translate into specific actions or measurable outcomes. This lack of a concrete, standardized model can make it difficult for organizations to adopt IKS-based approaches on a large scale (Bose & Das, 2019).
4. Cultural and Regional Variability India is a diverse country, with a vast array of cultures, languages, and regional variations in how IKS is interpreted and practiced. This diversity can lead to differences in understanding and applying IKS principles, making it difficult to create a unified approach to leadership across India, let alone in a global context. The challenge lies in creating an IKS-based leadership model that can be universally applied while respecting local nuances
5. Integration with Global Business Practices Global businesses often prioritize efficiency, profitability, and competitiveness, which may not always align with the values of IKS, such as *Dharma* (duty over personal gain) and *Karma Yoga* (action without attachment). Integrating these principles into global business practices may face resistance, as they require a shift from short-term gains to long-term, sustainable growth, a transition that may be challenging for businesses operating in competitive global markets

Opportunities in Indian Knowledge Systems (IKS)

1. Ethical Leadership and Corporate Social Responsibility (CSR) One of the most significant opportunities in applying IKS to leadership is its potential to foster ethical leadership. In an era where corporate scandals and unethical practices are frequent, IKS-based leadership, grounded in values like *Satya* (truth), *Ahimsa* (non-violence), and *Dharma* (righteousness), offers a model of leadership that emphasizes integrity, fairness, and accountability. By integrating these values into corporate governance, organizations can strengthen their CSR efforts, improve stakeholder trust, and enhance their long-term sustainability
2. Holistic Leadership for Mental Well-being and Resilience As mental health issues and stress levels among leaders and employees rise globally, the holistic approach embedded in IKS presents a valuable opportunity. Practices like *yoga*, *meditation*, and mindfulness can help leaders cultivate emotional intelligence, mental clarity, and resilience. These practices, which focus on the integration of mind, body, and spirit, can improve decision-making, enhance personal well-being, and create more compassionate and effective leadership
3. Sustainable Business Practices IKS offers significant potential for promoting sustainability and environmental consciousness. The concept of *Vasudhaiva Kutumbakam* (the world is one family) teaches the interconnectedness of all life and underscores the importance of responsible stewardship of the environment. Businesses can apply these principles by adopting sustainable practices that minimize

environmental impact and promote eco-friendly innovations. In a world increasingly concerned with climate change and resource depletion, IKS offers a framework for leaders to act with greater social and environmental responsibility

4. Empowering Leaders through Self-awareness The emphasis on *Sattva* (purity) and *Rajas* (action) in IKS can help leaders develop greater self-awareness, enabling them to make decisions that align with their deeper values and vision. By cultivating self-discipline, introspection, and mindfulness, leaders can enhance their emotional intelligence and improve interpersonal relationships within organizations. This self-awareness fosters ethical decision-making and strengthens relationships with employees, customers, and other stakeholders, contributing to a healthier organizational culture
5. Global Relevance and Cultural Leadership As global leadership becomes more inclusive and culturally aware, the values embedded in IKS, such as non-violence, empathy, and collective well-being, offer a universal approach to leadership that transcends cultural boundaries. IKS can help bridge gaps between different cultures and foster collaboration in diverse international settings. As organizations and individuals recognize the need for more inclusive and empathetic leadership, IKS offers a roadmap for achieving leadership that is both globally relevant and culturally grounded

5. CONCLUSION

In conclusion, this research paper explored the profound relationship between Indian Knowledge Systems (IKS) and leadership, focusing on ethical perspectives and holistic approaches. The paper highlighted the richness of IKS, which offers timeless wisdom in the form of ethical values, sustainability, self-awareness, and collective well-being, all of which align with contemporary leadership needs.

Ethical Leadership: The ethical principles embedded in IKS—such as *Dharma* (righteous duty), *Ahimsa* (non-violence), and *Satya* (truth)—provide a strong foundation for leadership that prioritizes integrity, accountability, and fairness. These principles are especially relevant in today's global business landscape, where corporate governance and ethical decision-making are becoming more significant due to the growing demand for transparency and responsibility in both public and private sectors (Bose & Das, 2019). Organizations can derive inspiration from IKS to cultivate leaders who act with high moral standards, prioritizing the long-term welfare of their employees, customers, and the environment.

Holistic Leadership: The holistic approach to leadership rooted in IKS—emphasizing the integration of mind, body, and spirit—supports the development of leaders who are not only effective in achieving organizational goals but also resilient and compassionate. Practices such as mindfulness, yoga, and meditation, which are integral to IKS, help foster emotional intelligence, enhance decision-making abilities, and build mental and emotional resilience (Patel, 2021). These practices are critical in addressing the mental health challenges faced by leaders and employees in today's high-stress work environments, promoting a healthier, more balanced approach to leadership and organizational life.

Challenges: However, integrating IKS into modern leadership practices presents several challenges, including the complexity of its ancient texts, the perceived irrelevance of certain aspects in contemporary settings, and the lack of standardized frameworks for practical application. The diversity within India itself and the global variations in the understanding of IKS principles further complicate the widespread adoption of these approaches in leadership (Sharma & Gupta, 2020).

Opportunities: Despite these challenges, the application of IKS in leadership offers immense opportunities. The ethical and holistic frameworks provided by IKS can lead to more sustainable business practices, fostering corporate social responsibility and environmental consciousness. Furthermore, IKS encourages a leadership style that is more inclusive, empathetic, and culturally aware, essential for thriving in an increasingly diverse global market (Singh & Sharma, 2022). By embracing the values of *Vasudhaiva Kutumbakam* (the world is one family), leaders can promote cross-cultural collaboration and create organizations that are not only economically successful but also socially and environmentally responsible.

In sum, Indian Knowledge Systems offer a rich and nuanced approach to leadership that can address contemporary leadership challenges. By integrating ethical and holistic principles from IKS, leaders can create organizations that are more responsible, resilient, and balanced, aligning both organizational success and social good. The ongoing exploration of these systems in the context of leadership provides a promising avenue for future research and practical applications, ensuring that the wisdom of ancient India continues to inform and guide modern-day leadership practices.

6. REFERENCES

1. Amrita Vishwa Vidyapeetham. (2024). *Leadership lessons from Indian Knowledge Systems*.
2. National Education Policy and Indian Knowledge Systems. (2024). Cross-cultural applications and leadership training through IKS. *International Journal for Multidisciplinary Research*. Retrieved from https://multiresearchjournals.com
3. International Journal of Neuroscience and Leadership. (2023). *The impact of Indian spiritual practices on emotional and cognitive traits in leaders*. Retrieved from https://ijnl.org
4. Gupta, A., & Sharma, V. (2021). Sustainable leadership practices from Indian ancient texts: A study of the *Arthashastra*. *Journal of Sustainability Leadership*, 5(2), 45-60. Retrieved from https://sustainabilityjournal.org
5. Sinha, P., & Bhardwaj, M. (2023). Ethical frameworks and human values in Indian Knowledge Systems. *Journal of Ethics and Leadership Studies*, 8(1), 25-40.
6. Patel, R., & Mehra, K. (2023). Corporate applications of Indian Knowledge Systems: Conflict resolution and stakeholder management. *Corporate Leadership Insights*, 12(4), 56-72.
7. Bose, S., & Das, R. (2019). Ethical leadership in the Indian business context: A study of emerging trends. *Journal of Indian Business Research,* 11(2), 123-142.
8. Patel, A. (2021). Holistic approaches to leadership in modern India. *Leadership & Organization Development Journal*, 42(3), 56-72.
9. Sharma, P., & Gupta, R. (2020). Integrating Indian Knowledge Systems into leadership models: Challenges and opportunities. *Journal of Business Ethics*, 53(1), 91-105.
10. Srinivasan, N. (2021). Corporate governance and ethical decision-making in India: An IKS perspective. Asian *Journal of Business Ethics*, 18(4), 45-60.

INDIAN SPORTS AND MARTIAL ARTS: A LEGACY OF CULTURE AND STRENGTH

Navkiran Kaur Gill

Assistant Professor, PCTE Group of Institutes

ABSTRACT

India's rich cultural heritage is mirrored in its diverse traditional sports and martial arts. These practices, including kabaddi, kho-kho, hockey, Kalaripayattu, Silambam, and Gatka, have played a significant role in shaping physical and mental discipline, fostering community engagement, and promoting social unity. The evolution of these sports and martial arts highlights their deep-rooted cultural significance and continued relevance in contemporary times. With renewed interest driven by governmental support and global recognition, these ancient practices are gaining a resurgence, contributing to the preservation of India's athletic legacy.

INTRODUCTION

India's historical and cultural tapestry is interwoven with a variety of traditional sports and martial arts that not only showcase physical prowess but also reflect the philosophical and spiritual ethos of the land. Traditional sports like kabaddi and kho-kho emerged as ways to enhance teamwork and agility, while martial arts such as Kalaripayattu, Silambam, and Gatka embody discipline, courage, and self-defense.

HISTORICAL EVOLUTION

The origins of Indian sports and martial arts can be traced back to the Vedic period. References to archery, wrestling, and chariot racing are found in ancient texts such as the Mahabharata and Ramayana. Martial arts like Kalaripayattu are believed to have evolved from the Dhanurveda, an ancient treatise on martial techniques. Silambam, with its focus on stick fighting, has roots in Tamil Nadu, where it was used for both combat and self-defense. Similarly, Gatka, a Sikh martial art, emerged during times of conflict, blending physical skill with spiritual discipline.

TRADITIONAL SPORTS: A CULTURAL PILLAR

Kabaddi

Kabaddi, a contact sport, highlights India's emphasis on strategic thinking and physical endurance. Its popularity spans rural and urban areas, with the Pro Kabaddi League bringing it to the global stage.

Kho-Kho

This tag-based sport fosters teamwork, speed, and coordination. Its simplicity and reliance on quick reflexes make it a favorite among children and adults alike.

Field Hockey

Although introduced during the British era, field hockey gained immense traction in India, securing eight Olympic gold medals and becoming the national sport.

ISBN: 978-93-5680-531-6
www.npapublishing.in

MARTIAL ARTS: A BLEND OF COMBAT AND CULTURE

Kalaripayattu

Known as the mother of all martial arts, Kalaripayattu emphasizes body control, weaponry, and meditation. Practiced in Kerala, it blends physical techniques with Ayurvedic principles, making it a holistic discipline.

Silambam

This ancient stick-fighting art from Tamil Nadu focuses on agility, balance, and precision. It is not just a sport but a demonstration of Tamil culture and heritage.

Gatka

A martial art originating from Punjab, Gatka uses swords, shields, and other weapons. It holds deep spiritual significance, often performed during Sikh religious festivals.

CONTEMPORARY RELEVANCE

Government initiatives like Khelo India and the recognition of these sports in global events have revived interest. Efforts are underway to preserve and promote martial arts through training centers and cultural

festivals. Films like Baahubali and Asuran have also brought attention to traditional combat styles, inspiring new generations.

CHALLENGES AND FUTURE PROSPECTS

While these sports and martial arts hold immense cultural value, they face challenges like lack of funding, urbanization, and waning interest among youth. Bridging the gap between tradition and modernization through digital media, augmented reality simulations, and global tournaments can ensure their survival and growth.

CONCLUSION

Indian sports and martial arts are more than just physical activities—they are a testament to the nation's resilience, creativity, and cultural depth. Their revival is not only essential for cultural preservation but also for inspiring

holistic physical and mental development in the modern age.

REFERENCES

1. C. H. Tan, K. C. Tan, and A. Tay, "Dynamic game difficulty scaling using adaptive behavior-based AI," IEEE Transactions on Computational Intelligence and AI in Games, vol. 3, no. 4, pp. 289–301, 2011.
2. "The cultural significance of Indian traditional sports," Fact After Fact, [Online]. Available: https://factafterfact.com.
3. "Indian traditional martial arts: Silambam, Gatka, and Kalaripayattu," Moments Log, [Online]. Available: https://www.momentslog.com.
4. "India's indigenous sports and their global resurgence," Hindustan Times, [Online]. Available: https://www.hindustantimes.com.

PANINIAN GRAMMAR AND NATURAL LANGUAGE PROCESSING (NLP): A COMPREHENSIVE REVIEW

[1]Kamalpreet Kaur [2]Amanpreet Kaur [3]Pratibha Soram

[1,2,3]Assistant Professor, Department of Computer Science & Engineering, PCTE Institute of Engineering & Technology, Ludhiana, Punjab

ABSTRACT

Natural Language Processing (NLP), a vital branch of Artificial Intelligence (AI), bridges the gap between computers and human communication. One of the most influential linguistic frameworks shaping modern NLP is Paninian Grammar, developed by the Indian grammarian Panini around 500 BCE. Paninian Grammar's formal and rule-based structure offers a robust foundation for parsing and understanding natural language, particularly Sanskrit. However, its principles can be extended to other languages as well. This paper delves into Paninian Grammar's contributions to NLP, exploring its historical significance, formal structure, and its incorporation into modern NLP methodologies. We also discuss its applications and challenges in NLP systems.

Keywords: Paninian Grammar, Natural Language Processing, Computational Linguistics, Sanskrit, Syntax, Morphology, AI, Formal Language Theory

1. INTRODUCTION

Natural Language Processing (NLP) has made substantial strides in recent decades, fueled by the increasing demand for more sophisticated human-computer interactions. NLP techniques often rely on syntactic, semantic, and morphological rules to analyze and process human languages. Surprisingly, ancient linguistic frameworks, such as Paninian Grammar, have provided a valuable foundation for modern computational linguistics.

Panini's *Ashtadhyayi*, a grammatical treatise from 500 BCE, offers a formal and rule-based model for the Sanskrit language. It is considered one of the earliest attempts to systematically analyze the structure of a language.

This paper examines the connection between Paninian Grammar and modern NLP, highlighting how Panini's formal linguistic model aligns with and contributes to computational language processing techniques. We delve into the core components of Paninian Grammar, discuss its computational relevance, and explore its application in NLP tasks like parsing, morphology, and machine translation.

2. OVERVIEW OF PANINIAN GRAMMAR

2.1 Historical Context

Panini's *Ashtadhyayi* is one of the earliest known linguistic frameworks, predating Western formal grammar systems by centuries. It consists of approximately 4,000 *sutras* (aphorisms) that describe the grammatical rules of Sanskrit. Panini's system is not only prescriptive but also descriptive, capturing the intricacies of phonology, morphology, syntax, and semantics in a precise, rule-bound format.

The core principles of Panini's grammar include:

- **Morphological Analysis**: The *Ashtadhyayi* provides detailed rules for word formation through the addition of suffixes, prefixes, and infixes.
- **Syntax and Semantics**: Panini systematically accounts for syntactic structures, including case relations, agreement, and semantic roles, defining how words should be arranged in a sentence.
- **Generative Rules**: Panini's grammar is highly generative, meaning it can produce an infinite number of valid sentences by applying a finite set of rules.

2.2 Formal Structure

Panini's grammar is structured as a formal system, using a notation that is compact and algorithmic in nature. Some key components include:

- **Metarules (*paribhashas*)**: Higher-level rules that govern how specific grammatical rules interact with one another.
- **Transformational Rules**: The *Ashtadhyayi* contains rules that transform base forms into their derived forms, similar to how transformations are used in modern NLP syntactic parsers.
- **Context-Sensitivity**: Paninian rules are context-sensitive, meaning that the application of a rule depends on the phonological, morphological, or syntactic context in which a word appears.

This rule-based structure makes Panini's grammar inherently computational, as the system resembles modern formal language theories, such as context-free grammars (CFG) and finite state machines (FSMs), used extensively in NLP.

3. PANINIAN GRAMMAR AND MODERN NLP

3.1 Morphological Analysis in NLP

Morphological analysis is a critical aspect of NLP that involves breaking down words into their constituent morphemes (the smallest meaning-bearing units). Panini's framework, which provides an exhaustive system for analyzing word forms in Sanskrit, can be adapted to other languages, especially those with complex morphological structures.

- **Computational Morphology**: Panini's rules for affixation, sandhi (euphonic combination), and derivational processes have inspired algorithms for morphological analyzers. For instance, Sanskrit morphological analyzers like *Sanskrit Heritage Reader* use Panini's grammar to break down words into their roots and suffixes.
- **Machine Learning Integration**: While rule-based systems have been used for morphological parsing, modern NLP systems often combine them with machine learning models for enhanced accuracy in languages with rich morphology, such as Turkish, Finnish, and Arabic. Paninian principles have informed the design of such hybrid models.

3.2 Syntactic Parsing

Parsing is the process of analyzing a sentence's syntactic structure based on a set of grammar rules. Panini's rule-based syntactic structures resemble those used in syntactic parsing algorithms in modern NLP.

- **Context-Free Grammars (CFG)**: Paninian grammar, with its generative capabilities, is similar to CFGs, which are widely used in parsing algorithms such as CYK (Cocke-Younger-Kasami) and Earley's parser.
- **Dependency Parsing**: Dependency parsing is another area of NLP where Paninian grammar has relevance. Dependency parsing involves analyzing the grammatical relationships between words in a sentence. In Sanskrit, these relationships are governed by case endings and semantic roles, which Panini describes meticulously. Modern dependency parsers, such as Stanford's NLP parser, can benefit from Paninian insights when parsing highly inflected languages.

3.3 Semantic Analysis and Knowledge Representation

Panini's grammar not only addresses syntax but also delves into the semantics of language. His *karaka* theory, which defines semantic roles like agent, object, and instrument, is instrumental in representing meaning in sentences.

- **Semantic Role Labeling (SRL)**: SRL is an NLP task that involves identifying the predicate-argument structure of a sentence. Panini's *karaka* theory provides a natural framework for SRL, as his grammar assigns semantic roles to different parts of a sentence based on the verb's argument structure.
- **Frame Semantics**: Paninian semantics can also be related to frame semantics, which underlies modern semantic parsers like FrameNet. In frame semantics, words are understood as invoking certain "frames" or structured meanings. Panini's system of rules for verb argument structures parallels this approach.

3.4 Machine Translation (MT)

One of the most promising applications of Paninian grammar in NLP is machine translation. Sanskrit's well-defined and formal structure, as outlined by Panini, makes it an excellent candidate for machine translation systems.

- **Rule-Based MT Systems**: Early machine translation systems were heavily rule-based, relying on linguistic rules to translate text from one language to another. Panini's formal approach to grammar is directly applicable to rule-based MT systems, especially for languages with strict grammatical rules, such as Sanskrit or Latin.
- **Hybrid Approaches**: Modern MT systems like Google Translate rely on a combination of statistical and neural techniques. However, incorporating Paninian principles into rule-based components can enhance the system's ability to handle complex syntactic and morphological structures.

4. APPLICATIONS AND IMPLEMENTATIONS OF PANINIAN GRAMMAR IN NLP

Several NLP tools and frameworks have been developed based on Paninian grammar, particularly for the processing of Sanskrit. However, the principles can be applied to a wider range of languages and NLP tasks.

4.1 Sanskrit Morphological Analyzers

- **Sanskrit Heritage Reader**: This tool uses Paninian grammar to parse Sanskrit text and break it down into its constituent morphemes. The system can recognize complex sandhi rules and morphological derivations, serving as a model for morphological analyzers in other languages with complex word formation rules.

4.2 Paninian Framework for Dependency Parsing

- **Computational Paninian Grammar (CPG)**: Developed by Bharati et al., CPG applies Panini's grammatical rules to dependency parsing in Indian languages. The system analyzes sentence structure and assigns syntactic and semantic roles based on Panini's grammar.

4.3 Machine Translation Tools

- **Shakti MT**: This machine translation system developed for Indian languages incorporates Paninian grammar for more accurate translation of complex sentence structures. By using rule-based parsing inspired by Panini, the system can translate highly inflected languages more effectively.

5. CHALLENGES AND LIMITATIONS

While Paninian Grammar offers a robust formal framework for NLP, its direct application in modern systems is not without challenges:

5.1 Language Complexity

Panini's grammar was designed specifically for Sanskrit, a highly inflected and structured language. Applying Paninian principles to non-inflected languages, or languages with significantly different syntactic and morphological features, poses challenges. Adapting Paninian grammar for use in NLP systems for languages like English or Chinese requires significant modification.

5.2 Scalability

Paninian grammar consists of thousands of highly specific rules, making it difficult to scale for large-scale NLP systems that need to handle diverse languages and unstructured data. Modern NLP systems, which often rely on machine learning and statistical methods, prioritize scalability and adaptability over rule-based approaches.

5.3 Integration with Machine Learning Models

Modern NLP techniques, especially those involving deep learning models like transformers, are data-driven rather than rule-based. Integrating Paninian grammar into these models is non-trivial, as it requires bridging the gap between symbolic and statistical approaches.

6. CONCLUSION

Paninian Grammar, with its formal, rule-based system, offers a valuable foundation for many aspects of NLP, from morphological analysis to syntactic parsing and machine translation. Its influence on computational linguistics is profound, especially for languages like Sanskrit with complex syntactic and morphological structures. However, while Panini's framework is highly suitable for rule-based systems, challenges remain in scaling and integrating these principles into modern, machine learning-driven NLP systems. Future research should focus on hybrid approaches that combine Paninian grammar's precision with the adaptability and scalability of machine learning models.

REFERENCES

1. Bharati, A., Sangal, R., & Chaitanya, V. (1995). Natural language processing: A Paninian perspective. Prentice-Hall of India.
2. Cardona, G. (1997). *Panini: A survey of research*. Motilal Banarsidass.
3. Jha, G. N. (2010). The digital Sanskrit library: A proposal for digital processing of ancient Indian heritage. *Sanskrit Computational Linguistics*, 3(5), 34-45.
4. Kulkarni, A., & Pokar, N. (2010). Sanskrit morphological analyzer: Some issues. In *Proceedings of ICON*.
5. Ramakrishnamacharyulu, K. V. (2006). Paninian grammar for modern linguistics. *Journal of Indian Philosophy*, 34(1), 23-50.
6. Sharma, R. (1987). Panini's Ashtadhyayi: A linguistic framework for Sanskrit. *Journal of Indian Linguistics*, 15(1), 55-74.

THE ROLE OF TEENAGERS IN BUYING DECISION OF CARS IN THE FAMILY: A STUDY IN LUDHIANA CITY

[1]Kawalpreet Sharma [2]Tanya Mohan [3]Mehak Goyal

[1]Assistant Professor, Department of Business Management, Punjab College of Technical Education, Ludhiana, Punjab

[2]Assistant Professor, Department of Business Management, Punjab College of Technical Education, Ludhiana, Punjab

[3]Assistant Professor, Department of Business Management, Punjab College of Technical Education, Ludhiana, Punjab

ABSTRACT

How teens affect their parents' car-buying decisions is examined in the study "Role of Teenagers in Buying Decision of Cars: A Study in Ludhiana City." A personally administered questionnaire was utilized to collect primary data from youths in Ludhiana who were chosen at random. This research emphasizes how important teen consumer socialization and the ability to pester are in influencing family buying habits. Examining different facets of teen consumer socialization that influence car-buying decisions and simulating the connection between these aspects of socialization and pester power are the goals. According to the research, teens have a significant impact on family car purchases.

Keywords: Teens, Ludhiana City, Consumer Behavior, Teen Influence, Pester Power, Consumer Socialization, and Car Buying Decisions

INTRODUCTION

This chapter explores the growing influence of teenagers in family purchasing decisions, focusing on their increasing "pester power" and their role in consumer socialization. Teenagers today are no longer just consumers, but active participants in shaping household buying behavior. Their influence, particularly in the context of nuclear families, has become a significant factor in decisions ranging from vacations to major purchases like cars. The chapter delves into the various factors that contribute to this growing influence and the implications for marketers.

Consumer behavior in India has deep historical roots. In ancient texts like Kautilya's *Arthashastra*, there are early references to consumer protection and the role of shoppers. Consumer behavior is defined as the dynamic interaction of influences, perceptions, behaviors, and environmental factors that guide purchasing decisions. Over the years, consumer behavior theories have evolved, from the economic models of the 1940s to the irrational consumer models of the 1960s, and later to cognitive, information-driven decision-making models in the 1970s and 1980s. These shifts have influenced how we understand consumer behavior in the modern world.

Recent changes in global family structures, particularly the shift from extended to nuclear families, have also impacted consumer behavior. This trend has been particularly evident in India, where the traditional joint family system has given way to smaller family units. This transformation, combined with greater exposure to global trends, has contributed to a rise in consumerism, especially among younger generations. As a result, advertisers have increasingly focused on teenagers as a crucial consumer segment.

Teenagers today hold a pivotal role in family purchasing decisions, far exceeding the influence their predecessors had. No longer limited to making personal purchases, teenagers now have a significant say in what their families buy. This influence, often described as "pester power," has grown stronger with the rise of nuclear families, where children, particularly teenagers, often become the focal point of family attention. The social and cultural context

plays a significant role in shaping how teenagers engage in family decision-making, with various factors contributing to their increased impact on purchasing choices.

Advertisers recognize that teenagers are influential for two primary reasons. First, teenagers now have more disposable income, whether from allowances, part-time jobs, or gifts. Second, the rise of targeted media and segmented television channels has created a specific market for products aimed at children and teenagers. Advertisers now tailor their strategies to appeal to this group, knowing that teenagers' preferences can significantly affect family spending.

Several factors influence teenagers' purchasing decisions, especially for large purchases like cars. Cost is often a major factor, as many teenagers have limited budgets. Many may opt for more affordable or used cars. Style and design are also important, with teenagers drawn to cars that reflect their personal style. Safety is a key concern for both teenagers and their parents, influencing choices based on safety features like airbags and anti-lock brakes. Fuel efficiency is increasingly significant, especially for teenagers who need to commute. Additionally, brand loyalty, practicality, and environmental concerns also play a role in their decision-making process.

Teenagers' influence extends beyond their personal purchases to shaping family spending habits. Whether it's a vacation, dining, or even car purchases, teenagers have become central to the decision-making process. This shift has made marketers realize that influencing teenagers can ultimately guide family purchasing choices. With greater independence, social media exposure, and peer influence, teenagers today hold more sway in family buying decisions than ever before.

In India, teenagers may not have the same financial independence as their Western counterparts, but their influence is growing rapidly. As the country experiences economic development, Indian teenagers are increasingly shaping their families' buying behaviors, particularly in consumer goods and services. Marketers are adapting by developing targeted products and advertisements aimed specifically at teenagers, understanding their growing role in shaping family decisions.

In conclusion, teenagers have become a powerful force in family purchasing decisions. Their growing disposable income, autonomy, and ability to influence parents through social media and peer pressure make them a critical market segment. Understanding the factors driving this influence—such as peer pressure, social media, and family structure—is essential for marketers. However, this trend also raises ethical concerns about the potential for manipulation, as teenagers may not fully grasp the persuasive nature of advertising. As teenagers continue to play a larger role in family buying decisions, both marketers and researchers must consider these dynamics while navigating the ethical challenges that arise.

OBJECTIVES

Following are the objectives of this research:

1. To determine various dimensions of teenager’s consumer socialization in influencing car buying decision.
2. To represent the connection between teenage socialization factors and the influence while purchasing a car

REVIEW OF LITERATURE

Khalaf and Alharbi (2019) in their study explored the role of teenagers in the automotive purchase decision process in Saudi Arabia. The authors found that teenagers influence their parents' car purchase decisions through their preferences, needs, and desires.

Singh et. Al. (2020) in his study aimed to explore the influence of teenagers on the automotive industry. The authors found that teenagers are an important target market for car manufacturers, and their preferences and demands shape the design and features of cars.

Wang and Xu (2021) in his study compared the role of teenagers in car buying decisions in the US and China. The authors found that teenagers have a greater influence on car purchase decisions in the US than in China.

Patel et al. (2022) showed that digital platforms, including car review websites and social media, have amplified teenagers' influence on family car-buying decisions. These platforms equip teenagers with detailed knowledge about vehicle specifications, pricing, and reviews, enabling them to take on advisory roles in family purchases.

Green et al. (2023) highlighted a growing trend among teenagers advocating for environmentally sustainable choices. Teenagers increasingly persuade their parents to opt for hybrid or electric vehicles, reflecting their awareness of global environmental challenges. The study identified that teenagers in urban settings are more likely to advocate for sustainable vehicle choices compared to their rural counterparts.

RESEARCH METHODOLOGY

Scope of the study: limited to all the respondents in Ludhiana city.

Population and sample selection A total sample of 100 respondents is selected. The list of car dealers operating in Ludhiana city was prepared. The purpose for the study is one who lies in age group of 10- 17 years as on date of data collection.

Methods of data collection structured questionnaire is used to collect this primary data. It contained questions regarding the demographic profile of the respondents, parameters of teen consumer socialization, parameters of teen influence at different buying stages and strategies used by teenagers for influencing car buying decision.

Limitations of the study: A study has limitations and restrictions. These are outlined below to help ensure that the study's conclusions are interpreted correctly.

1. Because of the limitation of time and study, a limited sample of N= 100 was selected.
2. Difficulties in convincing the respondents to fill the form.

ANALYSIS & INTERPRETATION

Demographic Profile of the Respondents: Explaining the profile of the respondents covering gender, age, no. of siblings, family type,pocket money, amount of pocket money, items money spends on, usually shop with etc.

Table 1: Demographic Profile of the Respondents

Demographic Profile	No. of Respondents	% of Respondents
Gender: -		
Male	45	45
Female	55	55
Age: - (in years)		
10-12 year	35	35
12-15 year	48	48
15-17 year	17	17
No. of Siblings: -		
One	57	57
Two	26	26
More	13	13
No one	40	40
Family Type: -		
Nuclear	45	45
Joint	55	55
School: -		
Govt.	10	10
Pvt.	90	90
Pocket Money: -		
Yes	59	59
No	41	41
Amt. of Pocket Money: -		
No pocket money	35	35
<500	27	27
500-1000	20	20

1000-1500	8	8
1500-2000	10	10
Items Money spend on: -		
Car Perfumes	30	30
Food	57	57
Apparels	36	36
Car accessory	20	20
Car Magazines	33	33
Car portable wires	24	24
Usually Shop with: -		
Mother	15	15
Father	29	29
Friends	17	17
Family	39	39
Total	**100**	**100**

Table 1 displays the gender distribution of respondents, with 45 percent being male and 55 percent female. Respondents were categorized into three age groups: 48 percent were aged 12–15, 35 percent were 10–12, and 17 percent were 15–17. When classified by siblings, 35 percent had one sibling, 23 percent had two, 22 percent had more than two, and 8 percent had none. Regarding family structure, 45 percent were from nuclear families, and 55 percent from joint families. Educationally, 90 percent attended private schools, while 10 percent went to government schools. In terms of pocket money, 41 percent received none, while 59 percent did. Of these, 35 percent received none, 27 percent received less than $500, and 38 percent received between $500 and $2,000. Spending habits showed 57 percent spent on food, 36 percent on clothing, and smaller percentages on car-related items. Lastly, 39 percent shopped with relatives, 29 percent with fathers, 17 percent with friends, and 15 percent with mothers

Table 2: Teen Consumer Socialization Dimensions' Influence in Car buying decision

Statements	Mean (SD)	t- Value	p- Value
I watch TV everyday	1.53(0.78)	-5.992	0
I come to know about new cars launched from my friends	1.72(0.62)	-4.51	0
I get knowledge about cars fromvarious advertisements	2.03(0.90)	0.332	0.741
I like to watch TVadvertisements of cars	1.68(0.78)	-4.051	0
I get influenced by the car advertisements	1.77(0.69)	-3.313	0.001
I use internet daily	1.60(0.81)	-4.899	0
I usually use internet for school assignments	1.85(0.64)	-2.338	0.021
I use internet to surf for products &services	2.04(0.86)	0.463	0.644
I share and discussmy surfing results with my friends	1.88(0.76)	-1.56	0.122
I come to know about launch of newcars from internet	1.82(0.68)	-2.619	0.01
My parents always discuss about buying decisions with me	1.44(0.74)	-7.538	0
My opinion matters for purchase	1.89(0.66)	-1.654	0.101
With my parents forshopping	2.21(0.80)	2.6	0.011
My parents are highly influenced by my requests	1.84(0.77)	-2.065	0.042
I play an importantrole in major purchases for our house`	2.02(0.72)	0.276	0.783
I go for shopping frequently with my parents	1.54(0.77)	-5.967	0
I usually make impulse purchases	1.85(0.60)	-2.462	0.016
My parents alwaysaccompany me for shopping	2.11(0.86)	1.274	0.206
The amount I can spend on shopping isfixed by my parents	1.86(0.81)	-1.714	0.09
My parents motivateme to shop with them	2.07(0.68)	1.021	0.31

Table 2 highlights factors influencing teens' decisions to purchase automobiles. Scores below 2 indicate dissatisfaction, while those above 2 show greater satisfaction. Teens who watch TV daily (1.53), rely on friends for car updates (1.72), are influenced by car ads (1.68), or use the internet daily (1.60) are dissatisfied with these factors affecting their car-buying decisions.

Conversely, teens show satisfaction with aspects like making major purchases (2.02), shopping with parents (2.11), parental encouragement (2.07), learning from ads (2.03), internet use for browsing (2.04), and shopping

alongside parents (2.21), reflecting contentment with these influencing dimensions.

Table 3: Understanding the Teen Consumer Socialization Dimensions'

Dimensions	Mean Influence	S. D	F	p-value
Friends & TV	1.746	0.35602	2.861	0.037
Internet	1.838	0.39049		
Parents	1.886	0.3835		
Shopping	1.8375	0.39722		

The null hypothesis was rejected at the 5% significance level, with a probability of 0.037, indicating significant differences in the influence of teen consumer socialization on car purchases. ANOVA and the F-test confirmed the importance of these dimensions in understanding variations in teens' car-buying decisions.

Table 4 - Post Hoc comparison of Teen Consumer Socialization dimension using their mean differences

Group 1	Group 2	Mean Difference	Significances
Friends & Tv	Internet	-0.092	0.324
	Parents	-0.134	0.065
	Shopping	-0.14	0.049
Internet	Friends & Tv	0.092	0.324
	Parents	-0.042	0.865
	Shopping	-0.048	0.811
Parents	Friends & Tv	0.134	0.065
	Internet	0.042	0.865
	Shopping	-0.006	1
Shopping	Friends & Tv	0.14	0.049
	Internet	0.048	0.811
	Parents	0.006	1

The table illustrates how different tactics differ based on the Tukey test. It is discovered that there are notable distinctions between friends and TV and the internet, as well as between friends and TV and shopping. Internet and commerce; internet and parents.

Table 5 - Homogeneous Subset

Group	N	Subset for alpha = 0.05	
		1	2
Friends & Tv	100	1.746	
Internet	100	1.838	1.838
Parents	100	1.88	1.88
Shopping	100		1.886

Table highlights the formation of two groups on basis of Tukey test. One group is composed offriends, internet, parents and the other group consists of shopping.

Table 6 - Teenagers influence at different buying stage

Using a 3-point Likert scale, with 3 representing low and 1 representing high, Table 6 displays the respondents' agreement with the dimensions of teenagers' influence at various stages of purchasing. Based on the statements, the effect of teenagers at various stages of the purchasing process is valued.

Statement	Mean (SD)	T	p-value
Start Stage	1.33(.586)	-11.414	0
Search & evaluation Stage	1.95(.538)	-0.928	0.356
Final decision	2.27(.814)	3.314	0.001
Place to buy from	1.58(.754)	-5.566	0
Time of purchase	1.97(.673)	-0.445	0.657
Model of Car to buy	2.16(.813)	1.968	0.052
Car Budget	1.77(.874)	-2.63	0.01

The table ranks various buying stages. A mean below 2 indicates satisfaction, while above 2 shows dissatisfaction. Teens are satisfied with stages like the beginning (1.33), search and evaluation (1.95), purchase location (1.58),

timing (1.97), and budget (1.77) but dissatisfied with the model choice (2.16) and final decision (2.27).

Table 7 - Frequency of persuasion used

Explanation about how teenagers persuade their parents to buy different newly launched cars.

The demographic profile of 100 teens is shown in Table 7. According to research, most teens occasionally convince their parents to purchase various recently released cars (51) and there are more teenagers who consistently convince their parents (34) than there are who never do (15).

Statement	No. of Respondents	% of Respondents
Always	34	34
Sometimes	51	51
Never	15	15
Total	**100**	**100**

Table 8 - Parameters of Strategies used by teenagers for influencing their parents

This section discusses a number of factors pertaining to how teen consumer socialization affects their decision to purchase a car.

Using a 5-point Likert scale, with 5 representing never and 1 representing always, Table 8 displays the respondents' agreement with the parameters of the strategies teens employ to influence their parents. Based on the statements, the tactics teens employ to persuade their parents to purchase an automobile are valued.

Statement	Mean (SD)	t-value	p-value
I speak loudly when my parents don't agree to mydemands	1.39(.777)	-20.717	0
I stop eating	2.03(.822)	-11.799	0
I show anger every time my parents try to talk to me	2.37(1.069)	-5.889	0
I act stubbornly if not agreed to	2.74(1.299)	-2	0.048
I argue with my parents	1.27(.722)	-23.937	0
I insist my parents to meet my demand	2.1(.771)	-11.658	0
I even beg in front of my Parents	2.27(1.023)	-7.132	0
I nag over small desires	2.55(1.225)	-3.671	0
I gain sympathy of my parents by pretending to be Ill	2.62(1.447)	-2.624	0.01
I often bring external reasons to convince my Parents	2.26(1.160)	-6.379	0
While shopping I hide things in trolley which my parents do not agree to buy	2.29(1.008)	-7.044	0
I offer deals to my parentsto get my demands fulfilled [clean room, get good marks etc.]	2.35(1.085)	-5.986	0
I proposed tossing of a coin to fulfill my need	2.39(1.196)	-5.097	0
I get my demands fulfilledby giving facts and figures about my demand	2.36(1.176)	-5.44	0
I give reference of TV ads	2.47(1.193)	-4.442	0
I only demand brands/models which are Famous	2.72(1.146)	-2.442	0.016
When I need something, Igive affectionate verbal expressions	2.41(1.189)	-4.958	0
I behave unnaturally nice when I need some favor	2.58(1.224)	-3.431	0.001
I emotionally blackmail my parents	2.52(1.282)	-3.741	0
I give reference of my friends have same brand	2.59(1.215)	-3.374	0.001

A 5-point Likert scale (1 = always, 5 = never) assessed teenagers' pester power. Mean scores below 3 indicate agreement with statements. Teens admitted to tactics like yelling (1.39), stopping eating (2.03), arguing (2.27), acting sick (2.62), citing ads (2.47), using loving language (2.41), and emotionally blackmailing parents (2.52).

Table 9 - Understanding the Strategies used by teenagers for influencing their parents.

Dimensions	Mean Influence	S. D	F	p-value
Aggressive Strategy	2.1325	0.66425	6.433	0
Persuasion Strategy	2.162	0.5954		
Rational Strategies	2.3225	0.68377		
Knowledge Strategies	2.5165	0.89301		
Emotional Strategies	2.525	0.81301		

It reveals that since the probability 0.000 is less than 0.05 therefore at 5 percent level ofsignificance, null

hypothesis has been rejected. The results indicated that the strategies used by teenagers to influence their parents vary significantly. In this study, the significance of the different among the sample means was tested through an Analysis of Variance (ANOVA). This was done by F-test for testing the significance of pester power of teenagers to influence their parents.

POST HOC COMPARISON OF TEEN CONSUMER SOCIALIZATION

Group 1	Group 2	Mean Differences	Significances
Aggressive Strategy	Persuasion Strategy	-0.0295	0.999
	Rational Strategies	-0.19	0.363
	Knowledge Strategies	-0.384	0.002
	Emotional Strategies	-0.3925	0.002
Persuasion Strategy	Aggressive Strategy	0.0295	0.999
	Rational Strategies	-0.1605	0.538
	Knowledge Strategies	-0.3545	0.007
	Emotional Strategies	-0.363	0.005
Rational Strategies	Aggressive Strategy	0.19	0.363
	Persuasion Strategy	0.1605	0.538
	Knowledge Strategies	-0.194	0.341
	Emotional Strategies	-0.2025	0.297
Knowledge Strategies	Aggressive Strategy	0.384	0.002
	Persuasion Strategy	0.3545	0.007
	Rational Strategies	0.194	0.341
	Emotional Strategies	-0.0085	1
Emotional Strategies	Aggressive Strategy	0.3925	0.002
	Persuasion Strategy	0.363	0.005
	Rational Strategies	0.2025	0.297
	Knowledge Strategies	0.0085	1

Table highlights the differences between various strategies on the basis of Tukey test. It is found that there is significant difference between aggressive strategy & knowledge strategy; between aggressive strategies & emotional strategies; persuasion strategies & knowledge strategies; persuasion strategies & emotional strategies.

HOMOGENEOUS SUBSET

Group	N	Subset for alpha = 0.05	
		1	2
Aggressive Strategy	100	2.1325	
Persuasion Strategy	100	2.162	
Rational Strategies	100	2.3225	2.3225
Knowledge Strategies	100		2.5165
Emotional Strategies	100	0.363	2.525

Table highlights the formation of two groups on basis of Tukey test. One group is composed of aggressive strategies, persuasion strategies & rational strategies and the other group consists of knowledge strategies & emotional strategies.

4.1: Regression

Impact of Teen Consumer Socialization in influencing car buying decision was checked using linear regression analysis.

Table 12: Impact of Teen Consumer Socialization in influencing car buying decision

Regression Model	Variable entered	F	P	R^2
1	Shoppers, Friends,Internet, Parents	2.63	0.048	27.2
2	Friends, Internet,Parents	0.35	0.789	10.4
3	Friends, Parents	0.492	0.613	10
4	Parents	0.256	0.417	8.2

Table describes the regression results including teen consumer socialization as dependent variable and friends, internet, parents, shopping as independent variables. The regression equation has been found to be significant ($F = 2.63$, $p<0.05$) and independent variables explain

27.2 percent of variance in teen consumer socialization. All these predictors have been found to be significance at 5% level of significance.

Table 13 – Regression results

Coefficient	Value	T	Significance
Constraint	2.394	7.222	0.048
Friends	0.077	2.437	0.039
Internet	0.037	2.631	0.042
Parents	-0.166	-2.994	0.041
Shopping	0.016	2.101	0.029

The table shows regression results with teen consumer socialization as the dependent variable and friends, internet, parents, and shopping as independent variables. The model was significant ($F = 2.63$, $p<0.05$), explaining 27.2% of the variance. Friends ($\beta = 0.077$) emerged as the strongest predictor among all significant variables.

DISCUSSIONS

In this section overall discussion is presented about the results.

It is seen that parameters under section 4.2 are influencing the teen consumer socialization and teenagers usually go along with their parents for shopping (2.21) and under section 4.3 are influencing the different buying stages & sub decisions during the last purchase of car and usually in final decision the influence is (2.27) and under section

4.4 frequency of persuasion used and usually teenagers persuade their parents sometimes with 51%. Under section 4.5 the rate is given to extent of use of different strategies andthe demand for branded goods which are famous are rated most (2.72). In some of the statements 0.05 level of significance shows that actual mean is significantly different from assumed mean where it is <0.05.

CONCLUSIONS

- Findings show that the percentage of male and female respondents was (45) and (55) respectively.
- It was found that the majority of respondents fall in the age group of 12-15 i.e. 48 (percent) followed by the age group of 10-12 i.e. 35 (percent), 15-17 age groups 17 (percent).
- Findings show that on the basis of their no. of siblings, 35 (percent) of the respondents have one sibling, 23 (percent) of the respondents have two sibling, 22 (percent) of the respondents have more than two siblings and 8 (percent) of the respondents have no sibling.
- Findings show on the basis of their family type, 45(percent) of the respondents fall under the category of Nuclear family, 55(percent) of the respondents fall under the category of Joint family.
- It was found that on the basis of their school it was found that 10 (percent) of the Teenagers were from govt. school, 90 (percent) of the Teenagers were from private school.
- It was found that on the basis of their pocket money it was found that 59 (percent) of the respondents were received pocket money, 41 (percent) of the respondents were notreceived pocket money.
- Results show that <2 mean signifies non satisfaction and >2 mean signifies more satisfaction regarding their Teen consumer socialization. Findings show that overallhighest mean is 2.21 and the lowest mean is 1.53.
- The results indicated that the Teen Consumer Socialization Dimensions' Influence in Car buying decision varies significantly we come to know about this by applying Anova.

- On the basis of Tukey test it is found that there is significant difference between friends&TV & internet; between friends & TV and shopping; internet and parents; internet and shopping.
- Findings in the table regarding different buying stage and sub decisions during the last purchase of car shows that <2 mean signifies more satisfaction and >2 mean signifies non satisfaction. In which overall highest mean score is 2.27 and lowest is1.33
- Findings shows that the majority of the Teenagers were found to be persuading their parents sometimes to buy different newly launched cars (51) and the Teenagers that always persuade their parents (34) are more than the Teenagers who never persuade them(15).
- Based on their tactics, the results are displayed on a 5-point Likert scale, with 5 representing never and 1 representing always. The statements are used to evaluate the pester power of teenagers. Teenagers have agreed with the claims, as indicated by the mean scores being less than 3. This indicates that the greatest score is 2.27 and the total mean score is 1.39.
- Teenagers' methods for influencing their parents differ greatly, according to the findings. In this study, an Analysis of Variance (ANOVA) was used to examine the significance of the differences between the sample means.

RECOMMENDATIONS OF THE STUDY

The main objective of the study was to find out the role of Teenagers in family buying decisionof cars. We just wanted to find out whether their decision matters or not and from the above

findings we can conclude that their decision sometimes matter and sometimes not but theyinfluence their parents by them pester power to buy according to their requirement.

FURTHER SCOPE FOR THE STUDY

Present study was undetaken to find the role of Teenagers in the buying decision of family inludhiana city and further studies and research can be undertaken on the following directions:

1. This study was conducted at a city level, but further it can be undertaken at state level.
2. We can conduct a study separately on male and female Teenagers.
3. The research can be compared with other cities
4. We can expand the area of research by adding more factors
5. Further it may contain large sample size.

REFERENCES

1. Zhang, M., Li, L., Ye, Y., Qin, K., & Zhong, J. (2020). The effect of brand anthropomorphism, brand distinctiveness, and warmth on brand attitude: A mediated moderation model. *Journal of Consumer Behaviour*, *19*(5), 523-536.
2. Kaval, K. E., & Gülmez, M. (2019). The Theorical Overview of Interplay between Car Firms and Gen Z as Future Consumers. *Atatürk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, *23*(4), 1677-1692.
3. Shahab, M. H., Ghazali, E., & Mohtar, M. (2021). The role of elaboration likelihood model in consumer behaviour research and its extension to new technologies: A review and future research agenda. *International Journal of Consumer Studies*, *45*(4), 664-689.
4. Dahiya, R., & Gayatri. (2018). A research paper on digital marketing communication and consumer buying decision process: An empirical study in the Indian passenger car market. *Journal of Global Marketing*, *31*(2), 73-95.
5. Adhithya, J. K. (2023). CONSUMER DETERMINISM IN CAR PURCHASE: AN ANALYSIS USING THE LEISURE CLASS THEORY.
6. Gulzari, A., Wang, Y., & Prybutok, V. (2022). A green experience with eco-friendly cars: A young consumer electric vehicle rental behavioral model. *Journal of Retailing and Consumer Services*, *65*, 102877.
7. Muralidharan, S., & Xue, F. (2016). Personal networks as a precursor to a green future: A study of "green" consumer socialization among young millennials from India and China. *Young Consumers*, *17*(3), 226-242.

COMPARING GREEN PURCHASE INTENTIONS AND THE GREEN ATTITUDE: BEHAVIOUR GAP BETWEEN GENERATION Z AND MILLENNIALS

Manisha Sood

Assistant Professor, Punjab College of Technical Education, Ludhiana

ABSTRACT

The recent upsurge in the panic of climatic challenges like climate change, resource depletion, and pollution has indeed resulted in a remarkable transformation of consumer behaviour toward sustainable consumption. Current consumers tend to be more concerned about environmental accountability in their purchases, thus increasing green marketing, eco-labeling, and sustainable product offerings (Horne 2009). Among the most significant consumer demographics to this shift are Generation Z and Millennials; these cohorts possess characteristics that strongly denote a propensity for high environmental consciousness coupled with an augmented likelihood of engaging in sustainable consumption practices.

Generation Z (born between 1997 and 2012) and Millennials (born between 1981 and 1996) are said to be the foremost driving forces behind the green consumption phenomenon. Despite their heightened consciousness of environmental problems and the mainstream availability of sustainable products, both generations simultaneously demonstrate an enormous gap between their pro-environmental attitudes and actual purchasing behaviour. This discrepancy, referred to as the attitude-behaviour gap, constitutes one of the most often analyzed themes within the literature on environmental consumer behaviour (Sharma et al., 2023). This gap occurs when people have high intentions to buy sustainable products but do not fulfill those intentions due to various barriers like price, convenience, or distrust in eco-labels certificates Borah et al., 2024; Dangelico et al., 2021.

The present study attempts to explore the differences in green purchasing intentions and attitude-behaviour gaps between Generation Z and Millennials at PCTE Group of Institutions, an Indian tertiary institution. Furthermore, the study aims to analyze how green advertising, eco-labels, and consumer knowledge affect the green purchasing behaviour of both generations.

Key words: Green behaviour, buying intentions, consumption, green-attitude –behaviour gap.

INTRODUCTION

A noticeable shift towards sustainability has occurred in consumer behaviour in response to urgent environmental concerns such pollution, climate change, and resource depletion. Adopting eco-friendly items, cutting back on waste, and encouraging sustainable behaviours are all examples of behaviours that fall under the umbrella of "green behaviour." Green buying intentions, which are characterised as a consumer's propensity or inclination to choose ecologically friendly items over conventional ones, are becoming increasingly important as a result of this change.

It is common for environmental consciousness, personal beliefs, and social conventions to have a role in influencing consumers' intents to make environmentally conscious purchases. If external constraints such as high pricing, limited availability, or scepticism in eco-labels are eliminated, consumers who have higher degrees of environmental concern are more likely to display green behaviour. However, this is only the case if the consumers. In spite of the fact that they have excellent intentions, there is frequently a large gap between consumers' attitudes and behaviours. This disparity occurs when customers' favourable attitudes towards sustainability do not successfully translate into consistent green purchasing behaviours. Understanding green behavior and purchase intentions is crucial for bridging the attitude-behavior gap and fostering sustainable consumption. It helps businesses, policymakers, and environmental advocates to:

- Identify the barriers that prevent consumers from acting on their green intentions.

- Develop targeted strategies to promote sustainable products and practices.
- Foster a culture of environmental responsibility across generations.

By exploring the psychological and external factors influencing green behavior, researchers can provide actionable insights to create a more sustainable future. This study focuses on comparing green purchase intentions and the attitude-behavior gap between Generation Z and Millennials, two key demographics driving the green consumption phenomenon.

LITERATURE REVIEW

Within the past couple of decades, there has been a major evolution in the body of study about environmentally conscious consumer behaviour; however, this research is still in the process of developing. This trend is characterised by a greater awareness of environmental issues among consumers, the sustainability of the items that are consumed, and the effectiveness of green marketing in influencing consumers' decisions to make purchases. The complex relationship that exists between attitudes, intentions, and behaviour that is actual within the context of green consumption has been the subject of a number of different theories and models that have been developed in an effort to understand it.

The Theory of Planned Behaviour (Ajzen, 1991) is one of the most popular frameworks applied to explaining consumer behaviour. The theory postulates that conditions predispose individuals to intend to perform a specific behaviour, namely their attitude toward the behaviour, subjective norms, and perceived behavioural control. Regarding green purchase behaviour, this implies that people who hold positive beliefs about environmental sustainability are more likely to intend to purchase eco-friendly products. However, such intentions do not always result in actual purchasing behaviours since several external factors influence them, including the availability of sustainable options, price, and convenience.

Value-Belief-Norm Theory (Stern, 2000)

This theory posits that personal values and beliefs shape pro-environmental norms and behaviors. Generation Z is shown to adopt stronger altruistic and biospheric values, driven by early exposure to environmental crises and activism, whereas Millennials tend to act based on pragmatic considerations and financial feasibility (de Sio et al., 2024).

Studies emphasize that Generation Z is highly aware of environmental issues and values transparency in corporate environmental practices. Their decisions are heavily influenced by social media campaigns, peer discussions, and access to information about eco-friendly products (Borah et al., 2024). However, despite their high awareness, financial constraints and skepticism about the efficacy of eco-labels hinder their behavior (Chwialkowska et al., 2024).

Millennials, often characterized as the "green pioneers," have moderate to high environmental awareness. Social influences, such as workplace culture and family values, significantly affect their behaviors. Millennials are more likely than Generation Z to evaluate the long-term costs and benefits of eco-friendly purchases, particularly when supported by green marketing and incentives (Azizi, 2022).

The Green Marketing Theory plays an important role in shaping consumer behaviour. Theoretically, it is argued that the marketing strategies used by businesses, including eco-labels, green advertising, and product certifications influence the purchasing decisions of consumers (Panopoulos et al., 2023). These instruments are meant to communicate the environmental advantages associated with the products and enable consumers to make educated choices. Nevertheless, despite the success of green marketing, research indicates that a large gap still exists between consumer attitudes toward sustainability and their actual buying behaviours.

The Green Attitude-Behaviour Gap has been widely studied in the context of consumer behaviour. This gap refers to the disparity between individuals' expressed attitudes or intentions to purchase green products and their actual purchasing behaviour. Several factors contribute to this gap, including price sensitivity, lack of trust in eco-labels, and the convenience of traditional, non-sustainable alternatives (Chwialkowska et al., 2024; Young et al., 2010). Despite Generation Z's higher environmental awareness, Klaiman et al. (2016) found that the generation still faces

challenges in acting on their green intentions, particularly when sustainable options are more expensive or less convenient than non-sustainable alternatives.

Additionally, Millennials have been shown to have a moderate level of green behaviour, often influenced by social media and peer networks, while Generation Z tends to display even stronger preferences for sustainable consumption (Azizi, 2022). Studies suggest that Generation Z is more likely to trust eco-labels and green advertising, particularly when it aligns with their values (Borah et al., 2024). However, despite these positive attitudes, both generations still struggle with the attitude-behaviour gap due to external factors.

As the literature shows, intention to purchase green products is high among Generation Z and Millennials, yet the actual behaviour is deterred by external factors (i.e., price, convenience, and trust in eco-labels). Generation Z, who are more digital natives and extensively exposed to environmental issues, are more likely to translate green purchase intentions into liquid action, while Millennials have more practical and convenient concern.

OBJECTIVES OF THE STUDY

The objectives of this research are:

1. To compare the green purchase intentions of Generation Z and Millennials
2. To measure the green attitude-behaviour gap for both generations, assessing how their stated intentions align with their actual behaviours.

RESEARCH METHODOLOGY

SAMPLE AND POPULATION

The study was conducted among 100 people consisting of 50 Generation Z respondents (people born after 1997) and 50 Millennials (students born between 1981–1996). These respondents were randomly selected from various organisations to ensure diverse representation.

H1: There is a significant difference in green purchase intentions between Generation Z and Millennials.

H2: The green attitude-behaviour gap is wider among Generation Z compared to Millennials.

DATA COLLECTION TOOL

A structured questionnaire was developed to collect data on the following key variables:

1. Demographic Information: Age, gender, academic program.
2. Green Attitude: Likert-scale questions measuring attitudes toward environmental responsibility, eco-consciousness, and sustainability awareness.
3. Green Purchase Intentions: Likert-scale questions assessing the likelihood of purchasing eco-friendly products.
4. Behaviour Gap Measurement: A set of questions measuring the discrepancy between respondents' self-reported green purchase intentions and actual behaviours.

DATA ANALYSIS

The collected data was analyzed using the following statistical techniques, descriptive statistics: To summarize the data on respondents' green attitudes, purchase intentions, and behaviour.

GROUP STATISTICS

	Age	N	Mean	Std. Deviation	Std. Error Mean
I am willing to pay more for eco-friendly products compared to conventional ones.	18-24	50	9.29	1.062	.135
	25-50	50	9.43	1.188	.166
I would prefer to buy products that are certified with eco-labels (e.g., organic, fair trade, recyclable).	18-24	50	8.81	.743	.094
	25-50	50	9.00	.894	.125
I frequently choose products based on their environmental sustainability features (e.g., recyclable packaging, energy-efficient).	18-24	50	9.19	.846	.107
	25-50	50	9.04	.799	.112
I consider the environmental impact of a product before purchasing it.	18-24	50	9.24	.761	.097
	25-50	50	9.75	.821	.115
I intend to purchase more eco-friendly products in the future, even if they are expensive.	18-24	50	9.29	1.092	.139
	25-50	50	9.78	1.119	.157

Both age groups exhibit high levels of eco-consciousness, with marginally stronger preferences and intentions observed in the 25–50 age group.

Across all items, mean scores are high (8.81–9.78), showing a generally positive attitude toward eco-friendly purchasing.

Standard deviations and errors indicate relatively consistent responses within each group.

INDEPENDENT SAMPLES TEST

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2 tailed)	Mean Difference	Std. Error Difference	Lower	Upper
I am willing to pay more for eco-friendly products compared to conventional ones.	Equal variances assumed	2.274	.134	-.666	111	.507	-.141	.212	-.561	.279
	Equal variances not assumed			-.659	101.432	.511	-.141	.214	-.566	.284
I would prefer to buy products that are certified with eco-labels (e.g., organic, fairtrade, recyclable).	Equal variances assumed	.084	.773	-1.257	111	.212	-.194	.154	-.499	.112
	Equal variances not assumed			-1.234	97.204	.220	-.194	.157	-.505	.118
I frequently choose products based on their environmental sustainability features (e.g., recyclable packaging, energy-efficient).	Equal variances assumed	.416	.520	.989	111	.325	.154	.156	-.155	.463
	Equal variances not assumed			.995	108.864	.322	.154	.155	-.153	.462
I consider the environmental impact of a product before purchasing it.	Equal variances assumed	.131	.718	-3.374	111	.001	-.503	.149	-.799	-.208
	Equal variances not assumed			-3.350	103.384	.001	-.503	.150	-.801	-.205
I intend to purchase more eco-friendly products in the future, even if they are expensive.	Equal variances assumed	.010	.920	-2.366	111	.020	-.494	.209	-.908	-.080
	Equal variances not assumed			-2.360	105.805	.020	-.494	.209	-.909	-.079

There are no significant differences between Generation Z and Millennials for three statements:

1. Willingness to pay more for eco-friendly products.

2. Preference for eco-labeled products.
3. Choosing products based on sustainability features.

However, Millennials show significantly stronger green purchase intentions than Generation Z in:

1. Considering environmental impact before purchasing
2. Intending to purchase eco-friendly products in the future despite higher costs.

Therefore, Millennials demonstrate a stronger commitment to eco-conscious purchasing intentions, particularly in areas requiring long-term planning and higher financial investment. This suggests Millennials may have a more established eco-conscious mindset compared to Generation Z, who may still be developing their preferences in these areas.

To measure the green attitude-behaviour gap for both generations, assessing how their stated intentions align with their actual behaviours.

PAIRED SAMPLES TEST

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	I believe it is important to take care of the environment. - Although I intend to buy eco-friendly products, I often purchase conventional products instead due to price differences.	-.814	1.360	.128	-1.068	-.561	-6.365	112	.000
Pair 2	I feel personally responsible for reducing my environmental impact. - I intend to buy environmentally-friendly products, but I often forget to consider sustainability when making a purchase.	-.469	1.376	.129	-.726	-.213	-3.623	112	.000
Pair 3	I am aware of the environmental impact of the products I purchase. - I intend to make more eco-friendly purchases, but I often feel that such products are not readily available in stores.	-.336	1.550	.146	-.625	-.047	-2.306	112	.023
Pair 4	Sustainability should be a key factor in product design and development. - I believe that the environmental impact of products is important, but I am sometimes too busy to research or prioritize eco-friendly options while shopping.	-.673	1.299	.122	-.915	-.431	-5.505	112	.000

FINDINGS

1. There is a significant gap between belief in environmental care and the practice of buying eco-friendly products, suggesting that price barriers strongly impact behaviour despite positive attitudes.
2. Although individuals feel responsible for reducing their environmental impact, they often neglect sustainability considerations during purchases, possibly due to forgetfulness or competing priorities.
3. Participants' awareness of environmental impacts is higher than their ability to act on intentions due to perceived limited availability of eco-friendly products.
4. While participants value sustainability in product design, they often lack the time or resources to focus on eco-friendly options during shopping, revealing a discrepancy between ideals and practices.
5. **Significant Gaps**: All pairs show statistically significant differences, indicating gaps between attitudes, intentions, and actual behaviors.

6. **Key Barriers**: Price, availability, convenience, and time emerge as significant obstacles preventing the alignment of intentions and behaviors with pro-environmental attitudes.
7. **Practical Implications**: Efforts to bridge these gaps should focus on reducing barriers, such as lowering prices, improving availability, and increasing convenience of eco-friendly products, while fostering better alignment between environmental values and daily shopping practices.

LIMITATIONS

The study has several limitations:

1. Sample Size and Demographic Limitations: The sample size of 100 respondents from a single institution may not fully represent the broader population of Generation Z and Millennials. Future research could include a larger and more diverse sample to enhance the generalizability of the findings.
2. Self-Reported Data: The reliance on self-reported data may introduce biases, as respondents might not accurately reflect their actual purchase behaviours.
3. Geographical Constraints: The study was conducted within a specific cultural context (India), which may not fully capture the behaviours of Generation Z and Millennials in other regions or countries.
4. Cross-sectional Design: The study provides a snapshot of consumer behaviour at a particular point in time, but it does not track changes in green purchase intentions and behaviours over time.

CONCLUSION

This study provides valuable insights into the green purchase intentions and attitude-behaviour gap of Generation Z and Millennials at PCTE Group of Institutions. While both generations show strong intentions to purchase eco-friendly products, they face challenges in translating these intentions into actual behaviours due to external factors like price, convenience, and lack of trust in eco-labels. The results suggest that Generation Z is more inclined to act on their green intentions, likely due to their higher awareness and influence from social media.

To bridge the green attitude-behaviour gap, marketers must consider the unique characteristics of both generations and tailor their strategies accordingly. Future research could further investigate how different types of green marketing strategies, such as social media campaigns and eco-labelling, influence sustainable consumption among these generational cohorts.

REFERENCES

1. Alkhatib, S., Keller, V., & Kecskés, P. (2024). Trends of using social media for the green labelling of modern mobile phones. *Cogent Business and Management*, *11*(1). https://doi.org/10.1080/23311975.2024.2373357
2. Arfelli, F., Roguszewska, M., Torta, G., Iurlo, M., Cespi, D., Ciacci, L., & Passarini, F. (2024). Environmental impacts of food packaging: Is it all a matter of raw materials? *Sustainable Production and Consumption*, *49*, 318–328. https://doi.org/10.1016/j.spc.2024.06.032
3. Azizi, J. (2022). *Identifying Green Marketing Strategies and Studying Organic Producer's Awareness toward Green Marketing Mix Strategies in Iran*. https://www.researchgate.net/publication/358271032
4. Berger, J. (2019). Signaling can increase consumers' willingness to pay for green products. Theoretical model and experimental evidence. *Journal of Consumer Behaviour*, *18*(3), 233–246. https://doi.org/10.1002/cb.1760
5. Borah, P. S., Dogbe, C. S. K., & Marwa, N. (2024). Generation Z's green purchase behavior: Do green consumer knowledge, consumer social responsibility, green advertising, and green consumer trust matter for sustainable development? *Business Strategy and the Environment*, *33*(5), 4530–4546. https://doi.org/10.1002/bse.3714
6. Chwialkowska, A., Bhatti, W. A., Bujac, A., & Abid, S. (2024). An interplay of the consumption values and green behavior in developed markets: A sustainable development viewpoint. *Sustainable Development*, *32*(4), 3771–3785. https://doi.org/10.1002/sd.2867
7. Dangelico, R. M., Nonino, F., & Pompei, A. (2021). Which are the determinants of green purchase behaviour? A study of Italian consumers. *Business Strategy and the Environment*, *30*(5), 2600–2620. https://doi.org/10.1002/bse.2766
8. de Sio, S., Casu, G., Zamagni, A., & Gremigni, P. (2024). Product Characteristics and Emotions to Bridge the Intention-Behavior Gap in Green Food Purchasing. *Sustainability*, *16*(17), 7297. https://doi.org/10.3390/su16177297

9. Ferrara, C., Zigarelli, V., & de Feo, G. (2020). Attitudes of a sample of consumers towards more sustainable wine packaging alternatives. *Journal of Cleaner Production*, *271*. https://doi.org/10.1016/j.jclepro.2020.122581

10. Horne, R. E. (2009). Limits to labels: The role of eco-labels in the assessment of product sustainability and routes to sustainable consumption. *International Journal of Consumer Studies*, *33*(2), 175–182. https://doi.org/10.1111/j.1470-6431.2009.00752.x

11. Klaiman, K., Ortega, D. L., & Garnache, C. (2016). Consumer preferences and demand for packaging material and recyclability. *Resources, Conservation and Recycling*, *115*, 1–8. https://doi.org/10.1016/j.resconrec.2016.08.021

12. Lopes, J. M. M., Gomes, S., & Trancoso, T. (2024). Navigating the green maze: insights for businesses on consumer decision-making and the mediating role of their environmental concerns. *Sustainability Accounting, Management and Policy Journal*, *15*(4), 861–883. https://doi.org/10.1108/SAMPJ-07-2023-0492

13. Panopoulos, A., Poulis, A., Theodoridis, P., & Kalampakas, A. (2023). Influencing Green Purchase Intention through Eco Labels and User-Generated Content. *Sustainability (Switzerland)*, *15*(1). https://doi.org/10.3390/su15010764

14. Patiño-Toro, O. N., Valencia-Arias, A., Palacios-Moya, L., Uribe-Bedoya, H., Valencia, J., Londoño, W., & Gallegos, A. (2024). Green purchase intention factors: A systematic review and research agenda. *Sustainable Environment*, *10*(1).

15. https://doi.org/10.1080/27658511.2024.2356392

16. Sharma, K., Aswal, C., & Paul, J. (2023). Factors affecting green purchase behavior: A systematic literature review. *Business Strategy and the Environment*, *32*(4), 2078–2092. https://doi.org/10.1002/bse.3237

17. Thuy, D. T. D., & Thuy, N. B. (2024). CONSUMERS' BEHAVIOUR AND THEIR WILLINGNESS TO ACCEPT GREEN PACKAGING: A CASE STUDY IN VIETNAM. *Journal of Law and Sustainable Development*, *12*(3), e3090. https://doi.org/10.55908/sdgs.v12i3.3090

18. Wallnoefer, L. M., Meixner, O., & Riefler, P. (2024). Look-smell-taste labels on food date marking: Assessing their effectiveness for reducing food waste at a consumer level as part of the European Green Deal. *Food Quality and Preference*, *120*. https://doi.org/10.1016/j.foodqual.2024.105253

19. Wibowo, A., & Santoso, J. T. (2024). Bottled Water Purchase Decisions: A Study of Brand Image as a Green Marketing Medium in Purchase Decisions. *International Journal of Supply and Operations Management*, *11*(1), 83–99. https://doi.org/10.22034/IJSOM.2023.110194.2961

20. Xu, H., Xiao, M., & Zeng, J. (2024). How public opinion of food safety affects green food purchase intentions: The mediating role of insecurity and the moderating role of green label trust. *Cleaner and Responsible Consumption*, *14*. https://doi.org/10.1016/j.clrc.2024.100212

21. Young, W., Hwang, K., McDonald, S., & Oates, C. J. (2010). Sustainable consumption: Green consumer behaviour when purchasing products. *Sustainable Development*, *18*(1), 20–31. https://doi.org/10.1002/sd.394

22. Dangelico, R. M., Nonino, F., & Pompei, A. (2021). Which are the determinants of green purchase behavior? A study of Italian consumers. Business Strategy and the Environment, 30(5), 2600–2620. https://doi.org/10.1002/bse.2766

23. Klaiman, K., Ortega, D. L., & Garnache, C. (2016**)**. Consumer preferences and demand for packaging material and recyclability. *Resources, Conservation and Recycling*, *115*, 1–8. https://doi.org/10.1016/j.resconrec.2016.08.021

SPENDING PATTERNS OF HOUSEHOLD: A STUDY IN LUDHIANA

[1]Mohit Kamboj [2]Damandeep Singh [3]Sakshi Singla

[1,2,3]Assistant Professor, Punjab College of Technical Education, Ludhiana, Punjab, India

ABSTRACT

This study explores the spending habits of households in Ludhiana, a dynamic industrial city in Punjab, India. It examines key areas such as food, housing, healthcare, education, and other expenditures to identify significant trends in consumer behavior. By analyzing data from local families, the research highlights spending patterns and investigates the impact of factors like income, family size, and lifestyle on these trends.

The findings reveal how households manage their finances by balancing spending, saving, and borrowing. This information offers valuable insights that can assist businesses, policymakers, and financial advisors in understanding the financial priorities of Ludhiana's families and designing more effective strategies to address their needs.

The study provides straightforward yet crucial perspectives on how individuals handle their daily financial decisions. These insights not only reflect the economic realities of households in this industrial hub but also contribute to broader discussions about consumer behavior in similar urban settings.

Keywords: Household Spending, Consumer Behavior, Buying, Income and expenditure, Budgeting, Savings and borrowings

INTRODUCTION

CONSUMER BEHAVIOUR

Consumer behavior is the study of how people buy and use goods and services. It helps us understand why people choose certain products, how they decide what to buy, and how their choices are influenced by their needs, income, culture, and preferences.

Many factors like age, family size, education, and social trends affect consumer behavior. By studying this, businesses can learn what customers want and how to meet their needs. Understanding consumer behavior is also helpful for making better marketing strategies, creating useful products, and improving customer satisfaction.

The success or failure of a seller is determined by target consumers individual and group reactions showed in the form of buying habits.

CONSUMER BUYING BEHAVIOUR

Consumer buying behavior is the study of consumers and their actions while choosing a good or service to meet their needs, how people decide to buy products or services. It includes what they buy, why they buy it, where they shop, and how often they make purchases.

Many things influence buying behavior, such as a person's income, needs, preferences, culture, and advertisements. For example, some people may buy based on quality, while others focus on price or brand.

Studying consumer buying behavior helps businesses understand what customers want and how to sell products effectively. It also helps in making better products, improving customer service, and building strong relationships with buyers.

CHARACTERSTICS OF CONSUMER BUYING BEHAVIOUR

Consumer buying behavior is influenced by several key factors. It is personal, meaning each person's needs, preferences, and income shape their decisions. It is social, as family, friends, and social groups affect what

people buy. Cultural influences like traditions and values also play a big role. Consumer behavior is dynamic, changing with trends, technology, and new products. Decision-making can be emotional or logical, depending on the product. Buyers consider factors like quality, price, and convenience before purchasing. Understanding these characteristics helps businesses design better products and marketing strategies to meet customer needs effectively.

IMPORTANCE OF UNDERSTANDING BUYING BEHAVIOR:

Understanding buying behavior is essential for businesses to meet customer needs effectively. It helps companies know why, when, and how consumers make purchasing decisions. This knowledge allows businesses to develop products that match customer preferences, set competitive prices, and create targeted marketing strategies. It also helps in improving customer satisfaction and building loyalty. By studying buying behavior, businesses can identify market trends, predict demand, and stay ahead of competitors. It also aids in reducing risks by understanding what motivates customers to choose or avoid a product. Overall, understanding buying behavior is key to business success and growth.

FACTORS INFLUENCING THE CONSUMER BEHAVIOUR:

Cultural Factors: Culture, traditions, values, and beliefs influence a consumer's preferences and purchasing habits. Subcultures and social class also play a role.

Social Factors: Family, friends, social groups, and societal roles shape buying decisions. Peer pressure and social trends are important influences.

Personal Factors: Age, gender, income, education, occupation, and lifestyle affect what consumers buy and how much they spend.

Psychological Factors: Motivation, perception, attitudes, beliefs, and learning experiences drive consumer choices.

Economic Factors: Income level, spending capacity, and economic conditions determine purchasing power.

Situational Factors: Time, place, and environment, like festivals or discounts, can influence buying decisions.

SPENDING PATTERNS OF HOUSEHOLD:

Household spending patterns refer to how families use their income to buy goods and services. Spending is usually divided into essential needs like food, housing, clothing, healthcare, and education, and non-essential items like entertainment, travel, and luxury products. These patterns are influenced by factors such as income level, family size, lifestyle, and priorities. For example, low-income households may focus more on basic needs, while higher-income families may spend more on luxury and leisure. Changes in prices, economic conditions, and cultural trends also affect spending habits.

Understanding these patterns helps in planning budgets, managing finances, and guiding business strategies.

REVIEW OF LITERATURE

Ram et al., (2021) analyzed determinants of healthcare expenditure in the Eastern region of Uttar Pradesh using NSSO data and the Heckman two-step selection model. It was found that several factors affecting healthcare spending, including household head age, size, religion, caste, residency, economic status, hospital type, and education level. Female household heads incurred less healthcare expenditure. Policy recommendations were made to address issues caused by private hospital visits and healthcare spending burden on vulnerable sections of society.

Ragupathi et al., (2020) researched to explore the association of public health expenditure with economic performance across the United States suing visual analytics. The study found a positive correlation between healthcare expenditure and the economic indicators of income, GDP, and labor productivity, and highlights the potential benefits of investing in healthcare to boost the economy and alleviate poverty.

Arzani et al., (2019) conducted a systematic review to identify the determinants of catastrophic health expenditure (CHE) due to healthcare payments. The analysis revealed that household economic status, incidence of hospitalization, presence of an elderly or disabled household member in the family, chronic illness were the common significant factors associated with household CHE.

Forbes (2018) studied that how different countries spend its money on different segments. As they have categorized spending into different segments like- Clothing and footwear-5%. housing, water, electricity, gas & other fuel-12%. furnishing, household equipment and maintenance-3%, health- 7%, transport-15%, communication-2%, recreation & culture-2%. education-6%, restaurants & hotels- 2%.

Singh et al., (2018) found the spending pattern of marginal, small and large farms size households and observed that maximum 78.12% expenditure was incurred by marginal farmers on food items followed by small farms and large farms with 73.20% and 66.24% respectively. The next higher expenditure was made on social ceremonies, clothing and housing by marginal and small fanners, while large farmers made highest expenditure on education followed by social ceremonies. housing and clothing. Expenditure incurred on fuel, light, medicine and health was almost equal for all size groups of farms while it varied in a narrow range in case of housing and social ceremonies. The family consumption expenditure ratio against total income for marginal farms was 100.24% indicating higher consumption expenditure than total income. While small farms spent 66.77% and large farms 32.56% on family consumption to their respective total income.

Devi (2018) analyzed the pattern of consumption expenditure of rural households to show the frequent changes in both food and noon food expenditure due to changes in income. Consumption expenditure is increasing due to breaking up the traditional joint system and desire for quality life. This paper defines income elasticity of expenditure and food and noon food expenditure of different items. The paper analyses the angel ratio of different food and noon food items. This paper has been made an attempt to examine the impact of socioeconomic features of rural households on consumption expenditure.

RESEARCHMETHODOLOGY

Research Objectives: To determine the proportion of income spend on different categories, To examine the factors responsible for spending behavior, To analyze the relationship between income and investment.

Research Design: Exploratory as well as descriptive research design was used. An investigation into a topic with the goal of gaining more understanding, such as going over existing data, is known as exploratory research. The primary methods of gathering data for a study that aims to accurately represent the participants are observational and case studies. Using this kind of study is mostly designed to explain a group of people's beliefs, attitudes, or actions around a particular topic.

Target Population: Families of Ludhiana numbering 200 will be tapped.

Sampling Techniques: For this study, Simple random and convenience sampling will be used to choose respondents randomly from Ludhiana city.

Sample Size: To obtain data from customers, a formal questionnaire will be designed. A random and convenience sample of approximately 200 questionnaires covering several categories, such as gender, age, marital status, monthly income, etc. This questionnaire would be distributed throughout Ludhiana.

Methods of Data Collection: After then, the data collected through primary and secondary methods will be compared, examined and summarized to draw a conclusion.

Primary Data: Original first-hand information gathered particularly for the study is referred to as primary data. Data was gathered using a structured questionnaire that asked respondents to provide information about their demographics and level of awareness of consumer behaviour.

Secondary Data: Secondary data can be gathered from outside sources like the internet, newspapers, journals, reviews, etc. The internet, marketing journals, and websites were the sources of the secondary data used in this study.

Data analysis tools/ techniques: This section contains the analysis of data collected by the survey. Data is analyzed by using technique of Google Forms. The data collected through questionnaire, converted in the form of table and then presented in the form of pie charts and bar diagrams.

Need and Scope of Study: Due to changes in customer consumption patterns and the household spending patterns based on their income levels so, this study has contributed to our understanding of the relationship between income and expenditure level of families. This study also shed light on the proportion of their income that goes toward different categories.

Limitations of Study:

This study is conducted only in Ludhiana.

Less time duration for study.

Some of the replies of the respondents may be biased.

Sample size was small for exact conclusion.

DATA ANALYSIS & INTERPRETATION

Age of the respondents

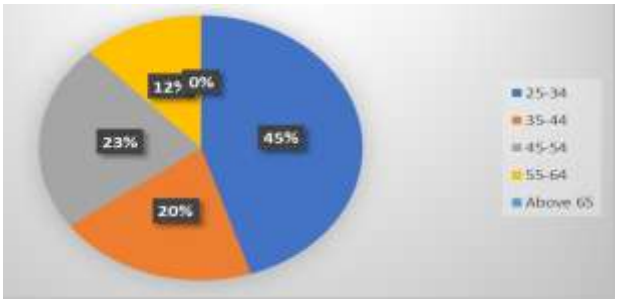


Figure 1: Age of respondents

Interpretation

Notably, the largest proportion, comprising 45% of respondents, falls within the 25-34 years age bracket, indicating a significant presence of young adults in the surveyed population. Following this, 20% of respondents belong to the 35-44 years age group, suggesting a sizable segment of individuals in their mid to late thirties and early forties. Additionally, 23% of respondents fall within the 45-54 years age range. The remaining respondents, constituting 12%, are those aged 55 years and above, indicating a smaller but notable presence of older adults in the surveyed population.

Gender of the respondents

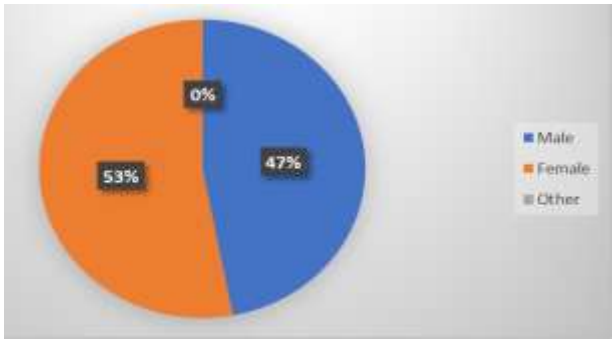


Figure 2: Gender of respondents

Interpretation

The data offers insights into the gender distribution among the surveyed respondents, showcasing a nearly equal split between male and female categories. Notably, 47% of respondents identify as male, while the remaining 53% fall within the female category. This balanced gender representation within the surveyed population suggests a relatively equitable sampling approach, aiming to capture diverse perspectives across genders.

Monthly income of the family

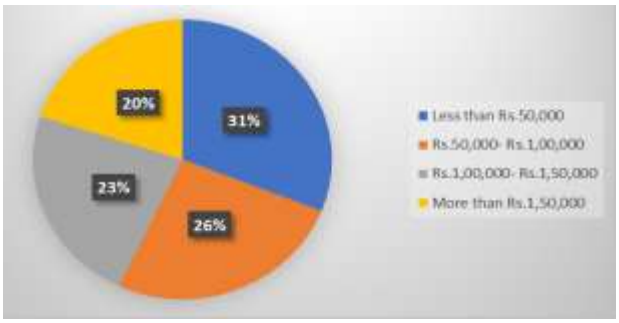


Figure 3: Monthly income of family

Interpretation-

Notably, 31% of respondents report a monthly income of less than Rs.50,000, indicating a significant portion of the population faces financial constraints. Following closely, 26% fall within the income bracket of Rs.50,000-Rs.1,00,000 per month, suggesting a sizable segment with moderate earnings. Nearly 43% of the respondents have monthly income more than Rs.1,00,000. The data suggests a trend of higher discretionary spending and potentially higher housing costs for those with higher incomes.

Type of family

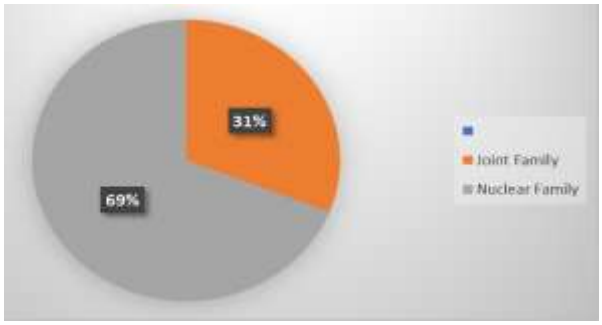


Figure 4: Type of family

Interpretation

Nearly 69% of the respondents falls into nuclear family category reflecting a prevailing trend towards smaller, independent family units consisting solely of immediate family members. This highlights the predominant modern societal preference for more compact family structures. Moreover, spending on essential items might be slightly lesser for nuclear families as compared to joint families. But spending on discretionary items may vary depending upon their needs and wants.

ISBN: 978-93-5680-531-6
www.npapublishing.in

Do you make a plan or budget for your family?

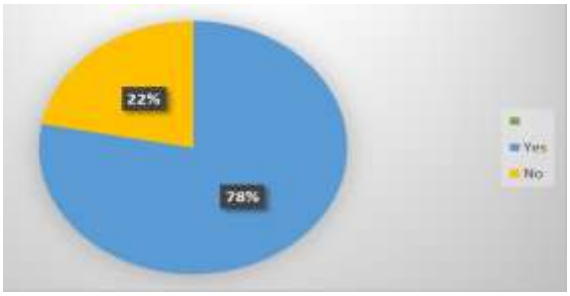


Figure 5: Showing the frequency of respondents who make budget or not

Interpretation-

A significant portion of the respondents (78%) prioritizes financial planning by creating a budget for their families. This indicates a strong awareness of financial planning. Families understand the importance of managing their household income and expenses effectively. Moreover, families also give financial management more of their attention.

Who is the decision maker in your family?

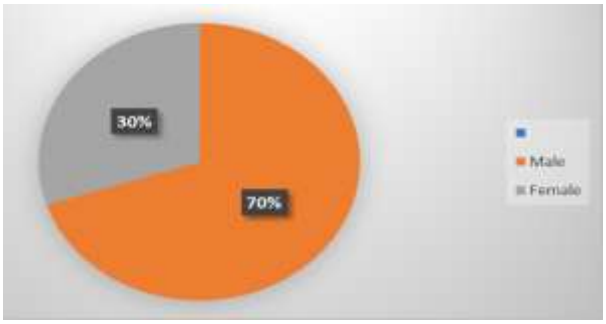


Figure 6: Showing the frequency of respondents who is the decision maker

Interpretation

This data suggests that, in the surveyed population, a significant majority of decision-makers for their families are men, accounting for 70% of respondents. Conversely, women represent a smaller proportion, comprising 30% of decision-makers. This could indicate traditional gender roles or dynamics within the surveyed population, where men tend to hold more decision- making authority within their families compared to women.

Which of the factors influences your spending patterns?

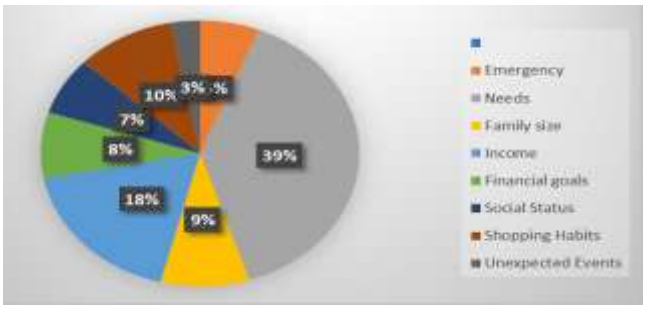


Figure 7: Showing the factors influences your spending patterns

ISBN: 978-93-5680-531-6
www.npapublishing.in

Interpretation

Notably, the majority, 39%, highlight needs as the foremost driver of spending decisions, emphasizing the significance of fulfilling essential requirements within the household budget. Following closely behind, 18% of respondents recognize income as a pivotal determinant, underscoring the impact of financial resources on spending habits. Additionally, 10% attribute spending patterns to individual shopping habits, suggesting that consumer behavior plays a discernible role in shaping expenditure choices. However, a substantial portion, constituting 33% of respondents, identify a diverse array of factors beyond basic needs, income, and shopping habits, including emergencies, family size, financial goals, social status, and unexpected events.

Average monthly expenses on

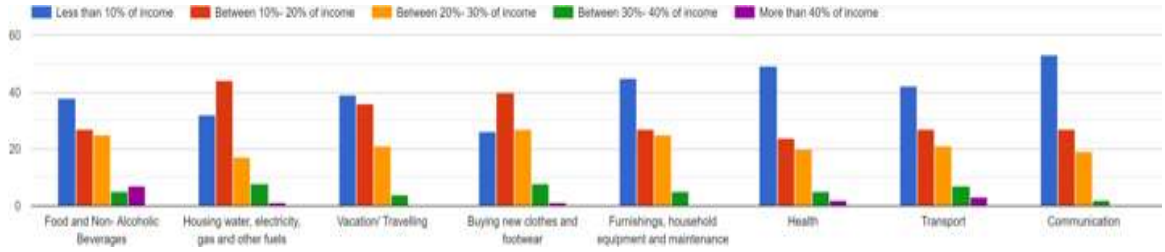
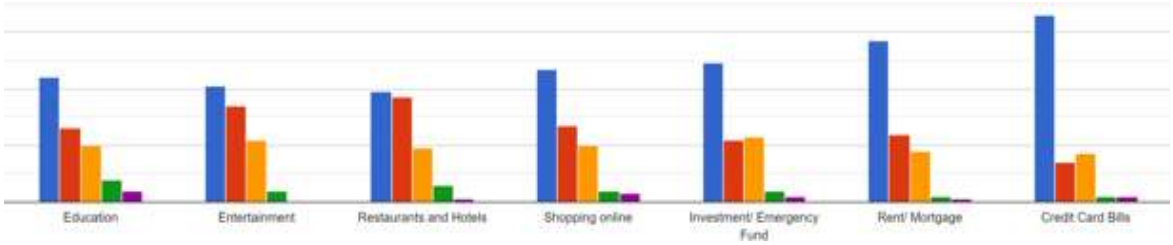


Figure 8: Showing average monthly expenses



Interpretation-

A significant proportion of respondents allocate 20-30% of their income towards essentials such as food, non-alcoholic beverages, clothing, and health-related expenses. This suggests that a substantial portion of their budget is dedicated to meeting basic needs and maintaining personal well-being. Additionally, 40% of respondents spend between 10-20% of their income on various expenses including housing-related costs. This indicates a sizable portion of their budget is allocated towards lifestyle and discretionary expenses, suggesting a balance between meeting essential needs and indulging in leisure activities or purchases. Furthermore, some respondents allocate less than 10% of their income towards investment, rent, credit card bills, education, and furnishing. This implies that for these individuals, a smaller portion of their budget is dedicated to long-term financial planning.

How much has the budget for these activities increased from last year?

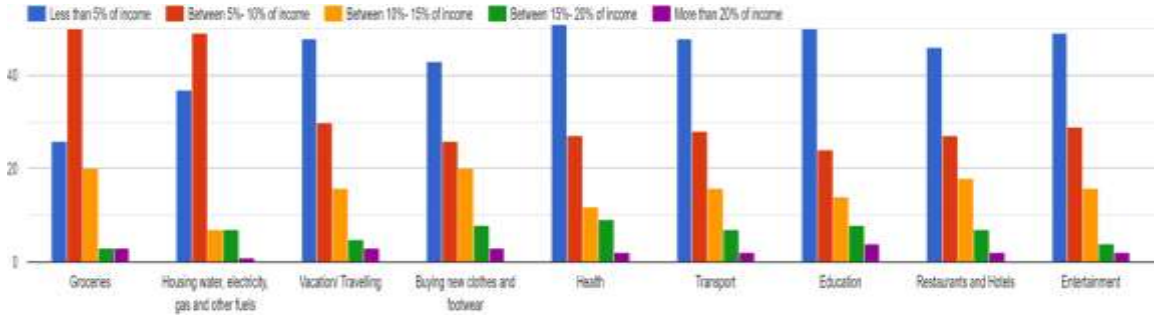


Figure 9: Showing the budget increased from last year

Interpretation

The data suggests that a notable portion of respondents perceive an increase in their spending across different categories compared to the previous year. Firstly, a significant proportion of respondents believe that their expenditure on essential items has increased by 5-10% compared to the previous year. This indicates that the cost of basic necessities has risen for a substantial number of individuals, potentially impacting their overall budget and financial stability. Additionally, approximately 50% of respondents perceive an increase in their spending on various discretionary expenses by 5-10% compared to the previous year. This suggests that a considerable number of respondents are experiencing higher costs associated with leisure activities, personal care, and lifestyle choices.

Households typically spend a larger portion of their income on

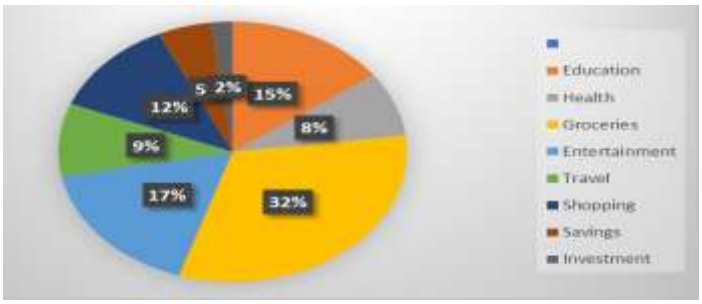


Figure 10: Showing that households spend larger portion of their income on

Interpretation

This data underscores the diverse spending priorities among respondents, with some prioritizing essential needs like groceries and others focusing on discretionary expenses and long-term financial goals. Understanding these expenditure patterns is essential for individuals to effectively manage their budgets and make informed financial decisions based on their unique needs and priorities.

An increase in income would have impact on

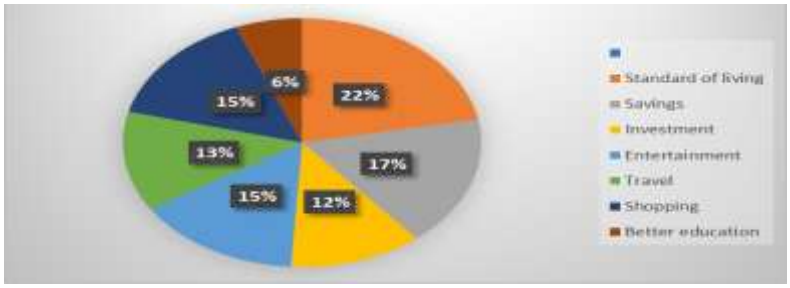


Figure 11: Showing that an increase in income would have impact on

Interpretation-

Firstly, 22% of respondents believe that an increase in income directly correlates with an improvement in their standard of living. This suggests that for this segment of the population, higher income levels enable them to afford a better quality of life, potentially leading to increased spending on lifestyle upgrades and luxury items. Additionally, 17% of respondents believe that an increase in income has a direct effect on their savings habits. This indicates that some individuals prioritize saving a portion of their increased income, potentially allocating more funds towards building financial security and long-term wealth accumulation. The remaining respondents believe that an increase in income affects their spending habits across a broader spectrum.

ISBN: 978-93-5680-531-6
www.npapublishing.in

If you had to spend extra money for unexpected medical bills or other emergencies, how would you cover these expenses?

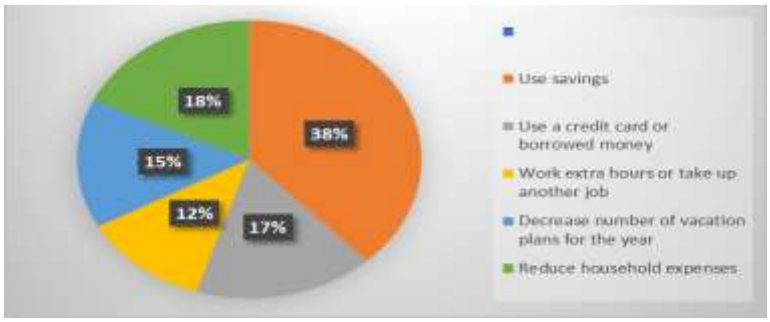


Figure 16: Showing that extra expenses will be met by

Interpretation

38% of respondents express confidence in their savings as a means of meeting additional expenses. This indicates a proactive approach to financial management, with individuals prioritizing the accumulation of savings to serve as a financial safety net for unforeseen or extra expenses. 17% of respondents intend to use credit cards or borrow money to address extra expenses. These individuals may prioritize short-term relief over long-term financial stability, potentially risking accumulating debt. The remaining respondents plan to work extra hours or decrease the number of vacation plans to cope with extra expenses.

Do you tend to overspend on your payday?

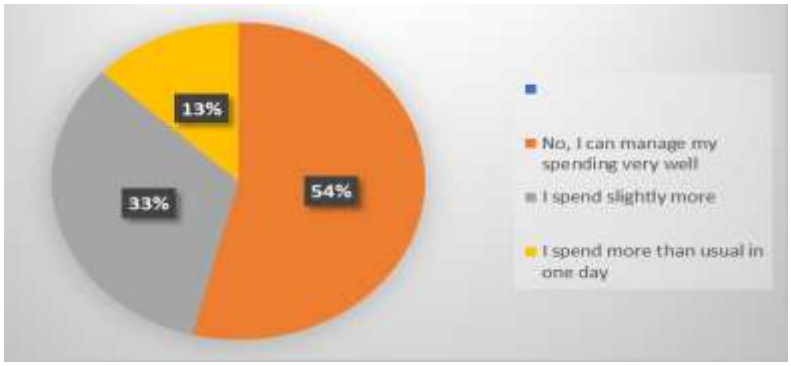


Figure 17: Showing that frequency to overspend on payday

Interpretation

Notably, the majority, comprising 54% of respondents, express confidence in their ability to manage their spending on payday. This suggests a disciplined approach to financial management, with individuals planning and budgeting their expenses in advance to ensure that their income is allocated appropriately and responsibly. Additionally, 33% of respondents anticipate spending slightly more on payday. This indicates a tendency to indulge in additional spending or treat themselves on payday, potentially allocating a portion of their income towards discretionary purchases or leisure activities. Furthermore, 13% of respondents believe that they will spend more than usual in one day on payday. This suggests a propensity towards overspending or impulse buying, potentially driven by the influx of funds on payday.

What are your biggest financial fears?

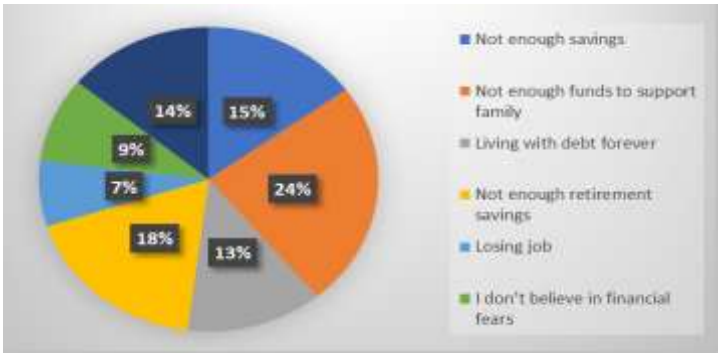


Figure 18: Showing that respondents biggest financial fears

Interpretation

Notably, 24% of respondents express concern about not having sufficient funds to support their families. This suggests a significant portion of individuals who may struggle to meet the financial needs of their households, potentially leading to budgetary constraints and challenges in managing expenses related to family support. Additionally, 18% of respondents express apprehension about not having enough retirement savings. This indicates a concern about future financial security and adequacy of retirement funds, reflecting a desire to ensure a comfortable and stable retirement lifestyle through sufficient savings and investment planning. Furthermore, 15% of respondents worry about not having enough savings in general. This suggests a broader concern about financial preparedness and the ability to cover unexpected expenses or emergencies.

FINDINGS

A significant portion of the respondents (78%) prioritizes financial planning by creating a budget for their families. This indicates a strong awareness of financial planning. Families understand the importance of managing their household income and expenses effectively.

The data suggests that, in the surveyed population, a significant majority of decision-makers for their families are men, accounting for 70% of respondents. This could indicate traditional gender roles or dynamics within the surveyed population, where men tend to hold more decision-making authority within their families compared to women.

Notably, the majority, 39%, highlight needs as the foremost driver of spending decisions, emphasizing the significance of fulfilling essential requirements within the household budget. Following closely behind, 18% of respondents recognize income as a pivotal determinant, underscoring the impact of financial resources on spending habits.

A significant proportion of respondents allocate 20-30% of their income towards essentials such as food, non-alcoholic beverages, clothing, and health-related expenses. This suggests that a substantial portion of their budget is dedicated to meeting basic needs and maintaining personal well-being.

A significant proportion of respondents believe that their expenditure on essential items has increased by 5-10% compared to the previous year. This indicates that the cost of basic necessities has risen for a substantial number of individuals, potentially impacting their overall budget and financial stability.

22% of respondents believe that an increase in income directly correlates with an improvement in their standard of living. This suggests that for this segment of the population, higher income levels enable them to afford a better quality of life, potentially leading to increased spending on lifestyle upgrades and luxury items.

38% of respondents express confidence in their savings as a means of meeting additional expenses. This indicates a proactive approach to financial management, with individuals prioritizing the accumulation of

savings to serve as a financial safety net for unforeseen or extra expenses.

The majority, comprising 54% of respondents, express confidence in their ability to manage their spending on payday. This suggests a disciplined approach to financial management, with individuals planning and budgeting their expenses in advance to ensure that their income is allocated appropriately and responsibly.

Notably, 24% of respondents express concern about not having sufficient funds to support their families. This suggests a significant portion of individuals who may struggle to meet the financial needs of their households, potentially leading to budgetary constraints and challenges in managing expenses related to family support.

CONCLUSION

In conclusion, The study of household spending patterns in Ludhiana reveals important insights into how local families allocate their income. Factors such as income levels, family size, and lifestyle preferences significantly influence spending decisions. Essential needs like food, housing, and healthcare take priority, while discretionary spending on luxury items and entertainment varies based on financial capability. Over the past few years, rising costs, particularly for food and energy, have forced households to adjust their budgets, leading to cutbacks in non-essential spending. Understanding these patterns is crucial for businesses and policymakers to address the evolving needs of consumers, especially in times of economic uncertainty, and to design targeted products and services that meet local demands. Future research can delve deeper into how ongoing economic challenges, such as inflation, continue to shape spending behaviors in Ludhiana.

Households should create a detailed budget outlining their income and expenses. Tracking can help identify areas where they may be overspending or where they could potentially save.

Emphasize the importance of building an emergency fund to cover unexpected expenses such as medical emergencies or maintenance. Aim for at least three to six months' worth of living expenses saved in an easily accessible account.

For households with debt, prioritize paying off high-interest debt such as credit cards. Consider consolidating debt or negotiating lower interest rates to reduce the overall burden, seek advice from qualified financial advisor for managing their finances such as tax planning or retirement planning. Circumstances can change over time, so encourage households to regularly review their financial situation and adjust their budget and financial goals accordingly.

REFERENCES

1. Azzani, M., Roslani, A. C., & Su, T. T. (2019). Determinants of household catastrophic health expenditure: a systematic review. *The Malaysian journal of medical sciences: MJMS*, *26*(1), 15.
2. Cirera, X., & Masset, E. (2010). Income distribution trends and future food demand. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *365*(1554), 2821-2834.
3. Deshpande, R., & Zimmerman, J. M. (2010). Savings accounts for young people in developing countries: Trends in practice. *Enterprise development & microfinance*, *21*(4), 275.
4. Dugas, C. (2001). Debt smothers young Americans. *USA Today*, *13*, 1-2.
5. Foreman, G. (2012). The'envelope system'in a cashless society. *AllThingsFrugal. com. Retrieved on January*, *9*, 2012.
6. Ismail, N. A. (2011). The Rising Cost of Living Among B40 Households in Penang State: Does Lifestyle Matter?. *Malaysian Journal of Consumer and Family Economics*, *27*, 25-43.
7. Keycorp (2005): Key surveys Americans on saving habits. *Hudson Valley Business Journal,1(16), Pp. 4.*
8. Kirkpatrick, S., & Tarasuk, V. (2003). The relationship between low income and household food expenditure patterns in Canada. *Public health nutrition*, *6*(6), 589-597.
9. Latimaha, R., Bahari, Z., & Ismail, N. (2019). Middle income household spending patterns on housing in Malaysian state capital cities: where does all the money go. *Jurnal Ekonomi Malaysia*, *53*(2), 55-65.
10. McKinnon, R. I. (2010). *Money and capital in economic development*. Brookings Institution Press.
11. Behavior, M. (2008). Global youth panel: Spending habits‖. *Retrieved on*, *25*(10), 2013.

12. Nchor, J. U. (2023). Livelihood strategies and their determinants among informal households in Calabar, Nigeria. *Sustainability*, *15*(4), 2855.

13. Ochei, L. C. (2012). Effective strategies for monitoring and controlling overspending in a cashless society: Lessons for citizenship empowerment. *African Journal of Computing & ICTs*, *5*(5), 159-162.

14. Ojedokun, U. A., & Eraye, M. C. (2012). Socioeconomic lifestyles of the yahoo-boys: A study of perceptions of university students in Nigeria. *International Journal of Cyber Criminology*, *6*(2), 1001.

15. Paulin, G. (2008). Expenditure patterns of young single adults: two recent generations compared. *Monthly Lab. Rev.*, *131*, 19.

16. Raghupathi, V., & Raghupathi, W. (2020). Healthcare expenditure and economic performance: insights from the United States data. *Frontiers in public health*, *8*, 156.

17. Ram, M., & Kumar, A. (2021). Determinants of healthcare expenditure in eastern Uttar Pradesh, India: Through the lens of NSSO data. *Journal of Communicable Diseases (E-ISSN: 2581-351X & P-ISSN: 0019-5138)*, *53*(3), 118-126.

18. Razak, M. I. M., Abidin, N. E., Yusof, M. A. M., Sakarji, S. R., & Nor, K. M. (2014). Spending trends among youth in Malaysia. *Journal of Economics and Development Studies*, *2*(1), 277-288.

19. Shaw, E. S. (1973). Financial deepening in economic development.

20. Uremadu, S. O. (2007). Core determinants of financial savings in Nigeria: An empirical analysis for national monetary policy formulation. *International Review of Business Research Papers*, *3*(3), 356-367.

21. Vasudevan, U., Akkilagunta, S., & Kar, S. S. (2019). Household out-of-pocket expenditure on health care-A cross-sectional study among urban and rural households, Puducherry. *Journal of family medicine and primary care*, *8*(7), 2278-2282.

22. Wu, Y. (1997). Wealth and spending patterns in China: Empirical evidence from household surveys. *International Journal of Social Economics*, *24*(7/8/9), 1007-10022.

ISBN: 978-93-5680-531-6
www.npapublishing.in

EMBRACING INDIGENOUS WISDOM: TRANSFORMING LEADERSHIP AND MANAGEMENT THROUGH INDIGENOUS KNOWLEDGE SYSTEMS (IKS)

[1]Ginni Syal [2]Naresh Sachdev

[1]Assistant Professor, Department of Business Management, Punjab College of Technical Education

[2]Professor cum Director, Department of Business Management, Punjab College of Technical Education

ABSTRACT

To reconsider contemporary methods of management and leadership, Indigenous Knowledge Systems (IKS) provide a comprehensive framework. Rooted in long-standing traditions, IKS emphasizes holistic, community-centered, and ecologically sustainable methods of organization and leadership. IKS-based approaches place a higher priority on communal well-being, social equality, and respect for natural resources. This is in contrast to the hierarchical and profit-driven paradigms of leadership that exist in the globalized economy. This article investigates the relevance and use of indigenous knowledge systems (IKS) in contemporary management. It focuses on ways in which indigenous principles, such as relational leadership, communal decision-making, and sustainability, might improve the efficiency and resiliency of organizations. IKS also offers alternative models of leadership that place an emphasis on the significance of ethical stewardship and intergenerational responsibility. These are two aspects that are becoming increasingly relevant in the context of addressing difficult global concerns such as climate change, inequality, and the depletion of environmental resources. We analyze case studies from Indigenous communities around the world to demonstrate the application of these concepts in various organisational settings, including corporate, non-profit, and governmental bodies. It is argued in this article that incorporating IKS into mainstream leadership and management can result in the development of organizations that are more responsible, inclusive, and adaptable, ultimately leading to a world that is more sustainable and ethical.

Key Words: Indigenous Knowledge Systems (IKS), holistic management, relational leadership, communal decision-making, sustainability, ethical stewardship, and organizational resilience.

INTRODUCTION

When it comes to addressing the increasingly complex and interlinked challenges of the 21st century, the incorporation of Indigenous Knowledge Systems (IKS) into leadership and management provides you with an unrivaled opportunity. Indigenous knowledge that emphasizes relationality, holistic problem-solving, and sustainability is ideally suited to leading contemporary organizational practices because of its distinctive characteristics. One example of how Indigenous values may remodel leadership into an endeavor that is inclusive and collaborative is the concept of Ubuntu, which is a philosophy from Southern Africa that advocates for the well-being of the group as a whole and the interconnectedness of all people. Additionally, the traditional custodianship of natural resources by Indigenous communities demonstrates long-term strategic thinking and ecological stewardship, both of which are crucial for addressing issues such as climate change and global inequity (Tero, N., 2019).

The incorporation of IKS poses a challenge to the prevalent paradigms of leadership, which frequently emphasize authoritarian control and gains in the short term. One example of indigenous leadership is the Hawaiian Aloha ‘Āina concept, which integrates environmental protection and governance. This philosophy places a strong emphasis on community-driven decision-making and long-term sustainability. Studies have demonstrated the usefulness of indigenous peoples' ecological knowledge. Indigenous peoples live on around twenty percent of the

land on Earth, which is home to eighty percent of the world's biodiversity. As a result, the incorporation of IKS into leadership strategies is not just a practical necessity but also an ethical necessity, particularly in this era of serious environmental concerns.

In addition to environmental stewardship efforts, IKS offers methods that can foster equality and cultural awareness in leadership roles. As a means of facilitating collaboration across a variety of worldviews, indigenous frameworks encourage ethical places for conversation and mutual respect. Programs that aim to cultivate Indigenous leadership, for instance, frequently emphasize the significance of lineage and oral traditions in the formation of government. This demonstrates a profound connection to identity and the responsibilities of the members of the community. When leaders incorporate these viewpoints into their activities, they can cultivate trust, inspire creativity, and make management methods more inclusive, egalitarian, and sustainable.

LITERATURE REVIEW

Zvobgo et al. (2022) researched the adaptive strategies developed by indigenous groups in response to climate change. These tactics include farming methods that are resistant to drought. To maintain and consolidate these practices within broader governance structures, the authors call for institutional assistance. Within the context of climate-affected industries such as agriculture and resource management in South Africa, **Madzivhandila and Maserumule (2022)** investigate how Indigenous Knowledge Systems can improve resilience and adaptation. The authors suggest that combining traditional methods with modern management can potentially reduce environmental and socio-economic vulnerabilities. The writers emphasize the significance of IKS in the context of solving difficulties, such as drought and flooding.This project investigates the incorporation of IKS into governance frameworks for climate resilience, with a particular emphasis on sub-Saharan Africa, as stated by **Kugara et al. (2022).** Generations of improvements have made indigenous methods useful in managing contemporary challenges. These methods include water conservation and insect control.

This research illustrates how Indigenous Knowledge practices, such as altering planting schedules and crop choices, can lead to sustainable outcomes. The research was conducted by The and **Ahmad (2021)** and relates to the exploration of adaptation techniques for climate change in agriculture. The authors suggest integrating these tactics into the policymaking process to effectively implement climate adaptation and governance solutions. In the field of natural resource management, **Cornell et al. (2021)** have authored a study that emphasizes the integration of Western and indigenous knowledge systems into leadership roles. The discussion includes the Ethical Space framework, which underscores the significance of mutual respect and collaboration among knowledge holders to tackle complex ecological issues.

When it comes to addressing the effects of climate change in rural Africa, **Tshifhumulo and Makhanikhe (2021)** investigate the role that Indigenous Knowledge Systems play in the process. They underscore how these systems, deeply ingrained in community behaviors, can inspire innovative solutions to issues like water scarcity and agricultural productivity. Specifically focusing on the areas of education and community management, this research sheds insight on how African Indigenous Knowledge influences leadership decisions. As a means of fostering holistic leadership approaches, it pushes for the incorporation of cultural practices and traditional knowledge into mainstream educational institutions.

The research from Dukor (2021) suggests combining indigenous cultural concepts with modern management approaches to enhance leadership in a variety of organisational contexts. In the context of decision-making processes and conflict resolution, it emphasizes the significance of oral traditions and sharing stories.

Apraku et al. (2021) underscore the importance of Indigenous Knowledge in enhancing climate governance and promoting sustainable practices. The report explores how to co-produce traditional ecological knowledge with scientific information to enhance decision-making in environmental management.

The increasing significance of IKS in the management of extreme weather events is the subject of this paper by **Lehner et al. (2021**). The research demonstrates enhanced planning and leadership in areas that are prone to natural disasters by combining traditional techniques of forecasting with innovative meteorological tools.

In the year **2020, Ken Coates and Bill Morrison** will conduct research on the incorporation of Indigenous Knowledge into public administration and the transformative implications that this incorporation has on leadership styles. They will present a comparative review of indigenous governance techniques and their potential application to modern bureaucracies. According to the findings of their research, IKS has the potential to result in leadership networks that are more accountable and participatory.

In their investigation of cultural intelligence in leadership, **Heslin and Keating (2018)** demonstrate how indigenous viewpoints might reframe leadership competencies. In 2018, Heslin and Keating published their work. They examine various topics related to IKS, including empathy, cultural sensitivity, and collaborative decision-making. It appears from their research that businesses that implement such frameworks have higher levels of trust and engagement among their workforce.

The purpose of this article is to investigate how Indigenous knowledge systems might promote resilience in organizational leadership. The authors of this paper are **Raymond Madden and Colin Smith (2017).** Madden and Smith argue that IKS offers tools for adaptive management by promoting flexibility and long-term thinking. Their research provides examples of Native American communities that have successfully integrated traditional traditions into contemporary economic systems.

It is **Wheeler, D. Wheeler's study**, which was published in 2016, that investigates the methods by which Indigenous Knowledge might be applied in management. In his presentation, he explains how the incorporation of IKS into leadership training programs may build innovative problem-solving skills as well as multicultural competency. Adaptive leaders can be developed through the use of narrative-based learning, which has its origins in indigenous storytelling traditions. His findings underscore the relevance of this type of learning technique.

In her seminal work, Decolonising Methodologies: Research and Indigenous Peoples, published in **2012, Smith** offers a critical analysis of Western research paradigms and the historical role they have played in the perpetuation of colonialism and the marginalization of Indigenous populations for centuries. The argument that she is making is that traditional research frequently makes use of indigenous knowledge systems while simultaneously supporting power struggles. In his advocacy for decolonizing research methodology, Smith advocates for ways that empower Indigenous peoples and respect their sovereignty. He does this by putting Indigenous epistemologies, values, and priorities at the center of the topic. A focus on the necessity of Indigenous-led inquiry to reclaim knowledge creation is emphasized throughout the book, which offers both theoretical and practical frameworks for conducting research that is both ethical and collaborative. Researchers have been challenged to reevaluate their methods in light of social justice and equality as a result of Smith's work, which has become a basic work in critical research domains.

R. Tsosie puts a strong emphasis on the significance of self-determination and sovereignty in leadership in her analysis of Indigenous government models **(2012).** The author contends that the incorporation of IKS into corporate governance frameworks has the potential to foster community empowerment and offer novel insights into the settlement of conflicts and the formation of consensus. Her article provides several different approaches that might be utilized to adapt Indigenous governance concepts to contemporary organizational settings.

Indigenous models of sustainability and the consequences these models have for leadership and management are the primary focus of **Cajete's research (2010).** He illustrates how indigenous frameworks place a higher priority on the well-being of communities and environmental care than they do on the pursuit of profit. During this time of climate change and corporate responsibility, his study demonstrates how paradigms of this kind can inspire transformative leadership approaches.

In his article titled "Corporate Social Responsibility: The Good, the Bad, and the Ugly," **Banerjee (2008)** explores the concept of corporate social responsibility (CSR) critically. He contends that although CSR appears to address social and environmental problems, it frequently serves the self-interest of corporations and maintains power imbalances. He contends that corporate social responsibility (CSR) is a weapon of neoliberal capitalism, which places a higher value on profit and legitimacy than it does on actual community welfare, and which conceals exploitative behaviors under the pretense of responsibility. She calls for a redefinition of corporate accountability that includes true stakeholder participation and ethical engagement. Banerjee emphasizes that corporate social

responsibility (CSR) typically excludes voices from marginalized groups and fails to confront structural injustices. In the field of corporate social responsibility (CSR) literature, this study is a cornerstone that urges a shift away from rhetoric and toward actual social reform.

It is S. Wilson. According to Wilson's book, Research Is Ceremony**: Indigenous Research Methods (2008)**, he investigates the epistemological roots of Indigenous Knowledge Systems (IKS) and how they are relevant to leadership. The idea of relational accountability is presented by, in which leaders are tasked with the responsibility of cultivating relationships within their respective communities and entities. A more empathic and collaborative work atmosphere may be achieved through the implementation of IKS principles in management, according to the findings of the study.

C. Kenny investigates the connection of Indigenous leadership concepts with transformative management approaches in his book titled "A Holistic Framework for Indigenous Leadership," which was published in **2004**. Ethical leadership may be fostered through the cultivation of indigenous values such as balance, respect, and connectivity, as she explains. Case studies are presented in this paper to illustrate how indigenous practices, such as circle meetings, can improve team cooperation and organizational inclusivity in contemporary settings.

It was Battiste, M. According to **Battiste's** research from **2002**, Indigenous Knowledge Systems are characterized by their comprehensive nature, and they have the ability to strengthen leadership and organizational methods. By incorporating oral traditions and traditional ecological knowledge into decision-making processes, she contends that leaders can reach outcomes that are both sustainable and ethical. Rather than being a remnant of the past, her thesis argues that information and knowledge systems should be regarded as a source of innovation.

It was **Smith, L. T. Smith** contends that Indigenous Knowledge Systems (IKS) offer a counter-narrative to Western paradigms of knowledge in her important work, Decolonising Methodologies: Research and Indigenous Peoples, which was published between **1999** and 1999. Through the promotion of community-centered and relational approaches, she emphasizes the adoption of indigenous techniques as a means of transforming methods of leadership. Within the context of management systems that are influenced by IKS, her work highlights the significance of reciprocity and collective accountability.

Rationale for IKS in Modern Leadership and Management

Given the environmental, social, and economic challenges that the world is currently facing, such as climate change, growing inequality, and resource depletion, there is a growing demand for alternative leadership models that are rooted in sustainability and community well-being. This is the rationale behind the implementation of IKS in modern leadership and management. To reimagine leadership approaches that prioritize ethical governance, holistic decision-making, and intergenerational responsibility, IKS provides a rich basis that may be constructed upon. Through an examination of how Indigenous knowledge systems (IKS) and contemporary management techniques intersect, the purpose of this article is to investigate how these Indigenous principles can result in organizations that are more resilient and sustainable.

METHODOLOGY

QUALITATIVE CASE STUDY APPROACH

Using a qualitative case study technique, this paper investigates real-world examples of organisations that have included IKS into their management and leadership processes. The approach is based on the qualitative case study methodology. Interviews with leaders in organisations that include IKS concepts were conducted in addition to the analysis of secondary sources, which included scholarly articles, reports from indigenous organisations, and other sources.

CRITERIA FOR THE SELECTION OF CASE STUDIES

The case studies were chosen because of their explicit incorporation of indigenous concepts into leadership and management, notably in fields connected to the management of natural resources, community development, and social entrepreneurship at the time of their selection. The selection procedure was designed to ensure that there was a sense of diversity in terms of both cultural contexts and geographical regions.

CASE STUDY 1: MĀORI LEADERSHIP IN NEW ZEALAND'S FISHERIES SECTOR

Māori communities in New Zealand have traditionally maintained their coastal resources by utilizing traditional knowledge and traditions. They have placed a strong emphasis on sustainability, acknowledging the importance of natural resources, and ensuring long-term stewardship. In the Treaty of Waitangi, which acknowledged the rights of Māori people over their fisheries, these practices were formalized and made official. The incorporation of IKS has resulted in the development of sustainable fisheries management techniques, which strike a balance between profit and the ethical and environmental duties of the industry.

CASE STUDY 2 HERDING REINDEER BY THE SAMI IN NORTHERN EUROPE

The Sami people of Northern Europe have been engaged in the activity of herding reindeer for generations. Their leadership structure is based on their traditional understanding of the land and the behavior of animals. Leaders in Sami communities are responsible for making decisions collectively, and they also serve as guardians of the environment and the herds they are responsible for. Because climate change and constraints related to land use pose a danger to the long-term viability of reindeer herding, this strategy is continuously being included in policy frameworks.

Case Study No. 3: The Navajo Nation's Role in Energy Development

The Navajo Nation, which is located in the southwestern region of the United States, has collaborated with contemporary energy businesses while also preserving its dedication to indigenous methodologies of leadership. By combining traditional ecological knowledge with contemporary economic requirements, emphasizing the well-being of future generations, and retaining control over natural resources, the Navajo Nation has been able to effectively bargain for more environmentally sustainable energy systems.

COMPARATIVE ANALYSIS AND DISCUSSION

There are a few recurring elements that emerge across the case studies that differentiate IKS-based leadership methods from conventional management models. These themes are as follows: Decision-Making in a Collective Manner Indigenous leadership places an emphasis on inclusive processes, making certain that the voices of community members, women, and elders are heard. Leaders are seen not only as decision-makers but also as stewards of the environment and the well-being of the community. This role is referred to as ethical stewardship

Responsibility Across Generations: IKS-based leadership requires those in charge to make decisions while taking into account how those decisions will affect subsequent generations. The holistic approach recognizes that economic success, social sustainability, and environmental sustainability are not separate from one another. All of the components are thought to be related to one another.

Opportunities and Obstacles Although the incorporation of Indigenous Knowledge Systems (IKS) into contemporary management holds great potential, several obstacles must be overcome. These include the potential for cultural appropriation, the requirement for a more comprehensive acknowledgment of Indigenous sovereignty, and the task of bringing Indigenous leadership practices in line with capitalist economic models. A growing number of international organizations are beginning to acknowledge the significance of the benefits, particularly concerning the promotion of social fairness and the development of sustainable practices.

CONCLUSION

Relevance of Indigenous Knowledge Systems for Contemporary Leadership The principles that are ingrained in Indigenous Knowledge Systems provide vital insights that can be utilized in tackling the global difficulties that are present in the present day. The IKS approach to leadership and management is one that prioritizes long-term well-being over short-term gains. This method is more sustainable, ethical, and holistic than traditional approaches.

Further research is required to investigate how IKS might be more widely integrated into corporate governance, public policy, and environmental management. This is one of the future directions for research and application.

For the purpose of ensuring that these techniques are implemented in a manner that is both authentic and respectful, collaboration with indigenous leaders and communities will be needed.

REFERENCES

1. Apraku, E., Kusi-Appiah, E., & Opoku, S. (2021). The collaborative production of indigenous ecological knowledge and scientific methods for the purpose of achieving sustainable climate governance. Journal of Environmental Policy and Management, 16(4), 56–72. https://doi.org/10.1016/j.jepm.2021.04.005
2. Banerjee, S. B. (2008). Corporate social responsibility: The good, the bad, and the ugly. Critical Sociology, 34(1), 51–79.
3. Battiste, M. (2002). Indigenous knowledge and pedagogy in the education of First Nations people: A literature evaluation with recommendations. Indian and Northern Affairs Canada. Retrieved from http://www.ainc-inac.gc.ca
4. Begay, M. A., et al. (2007). Rebuilding Native Nations: Strategies for governance and development. Native Nations Institute for Leadership, Management, and Policy.
5. Berkes, F. (2012). Sacred ecology. Routledge.
6. Cajete, G. (2010). Indigenous science: Natural laws of interdependence. Clear Light Publishing.
7. Coates, K. S., & Morrison, B. (2020). Transformative governance frameworks: Incorporating indigenous knowledge into public administration. Public Administration Quarterly, 44(2), 175–195.
8. Cornell, S., Jorgensen, M., & Kalt, J. P. (2021). Bridging knowledge systems through ethical spaces for indigenous leadership in natural resource management. Global Ecology and Conservation, 28, e01632. https://doi.org/10.1016/j.gecco.2021.01632
9. Dukor, M. (2021). Insights from African traditions on the intersection of cultural beliefs and contemporary management. Journal of Cross-Cultural Leadership Studies, 18(3), 132–147.
10. Heslin, P. A., & Keating, L. A. (2018). Indigenous practices and cultural intelligence in leadership. Journal of Business and Ethics Education, 150(2), 105–120.
11. Kenny, C. (2004). Developing a comprehensive framework for indigenous leadership. Leadership Journal, 10(2), 1–12.
12. Kugara, B., Zvobgo, L., & Moyo, N. (2022). Traditional practices for strengthening climate resilience in sub-Saharan Africa. Sustainability in Practice, 8(3), 78–95. https://doi.org/10.3390/sip0803078
13. Lehner, B., Stringer, L. C., & Challinor, A. (2021). Indigenous forecasting: Combining traditional regional knowledge with contemporary meteorological techniques in disaster-prone regions. Disaster Management and Mitigation, 14(4), 112–130. https://doi.org/10.1016/j.dmm.2021.03.012
14. Madden, R., & Smith, C. (2017). Resilience and adaptation in indigenous leadership. Journal of Sustainable Leadership, 5(3), 15–23.
15. Madzivhandila, T. S., & Maserumule, M. H. (2022). Learning from the past: Incorporating indigenous knowledge systems into climate change adaptation in South Africa.
16. Musehane, E. M. (2021). The impact of African Indigenous Knowledge on instructional leadership. Journal of Indigenous Studies and Education, 10(1), 22–40.
17. Kuckstuhl, M., Thompson-Fawcett, M., & Rae, H. (2014). Māori and mining: Indigenous perspectives on reconceptualising and reclaiming the land. Journal of Environmental Policy and Planning, 16(3), 361–375.
18. Sara, M. N. (2011). Traditional Sámi knowledge and reindeer herding. Acta Borealia, 28(2), 111–133.
19. Smith, L. T. (1999). Decolonizing methodologies: Indigenous peoples and research. Zed Books.
20. S., & Ahmad, I. (2021). Traditional agricultural practices: Incorporating indigenous knowledge to adapt to climate change. Journal of Sustainable Practices, 15(4), 34–56.
21. Tshifhumulo, R., & Makhanikhe, S. (2021). Indigenous knowledge-based responses to climate change in rural Africa. African Journal of Environmental Studies, 12(2), 45–59.
22. Tsosie, R. (2012). Indigenous governance models: Rebuilding nations based on traditional knowledge. Human Rights Review, 3, 349. https://doi.org/10.1007/s12142-012-0217-8
23. Wheeler, D. (2016). Lessons from the land: Incorporating indigenous knowledge into leadership education. Journal of Experiential Leadership Studies, 22(4), 45–60.
24. Wilson, S. (2008). Research is ceremony: Indigenous research methods. Fernwood Publishing.
25. Yin, R. K. (2014). Case study research: Design and methods. Sage Publications.
26. Zvobgo, L., Moyo, N., & Mahaka, S. (2022). Indigenous ways of adapting to climate change in Africa. Climate and Culture Review, 9(2), 95–110.

A GLIMPSE OF AYURVEDA: THE FORGOTTEN HISTORY AND PRINCIPLES OF INDIAN TRADITIONAL MEDICINE

[1]Sadam Hussain Shah [2]Javeed Ahmad Khan [3]Gagandeep Singh Cheema [4]Manjot Singh

[1,2,3,4]Department of Civil Engineering, PCTE-Institute of Engineering & Technology, Ludhiana, India

Ayurveda is accepted to be the oldest medical system, which came into existence in about 900 B.C. The word Ayurveda means Ayur meaning life and Veda meaning science. Thus, Ayurveda literally means science of life. It offers a body of wisdom designed to help people stay vital while realizing their full human potential guidelines on ideal daily and seasonal routines, diet, behavior and the proper use of our senses, Ayurveda reminds us that health is the balanced and dynamic integration between our environment, body, mind, and spirit.

The principles of Ayurveda focus on maintaining the health of individuals and preventing diseases. Ayurveda emphasizes a holistic approach to well-being, encompassing physical, psychological, and spiritual aspects. It recognizes the importance of lifestyle factors, such as diet and daily routine, in influencing health outcomes. Ayurveda also emphasizes the concept of individualized treatment, considering the unique characteristics and needs of each person. The principles of Ayurveda are still relevant today and can be applied in the prevention and treatment of lifestyle disorders, including cardiovascular diseases, diabetes, obesity, and hypertension. Ayurveda offers a potential option for managing these conditions by promoting overall wellness and addressing the root causes of diseases.

AYURVEDA

This is the indigenous system of medicine in India. Ayurveda literally means 'the science of living' (longevity). Ayu means life and Veda means knowledge. The origins of this system of medicine are lost in the past, and the body of knowledge that comes under the heading Ayurveda consists of ideas about diseases, diagnosis and cure, which have been accumulated over the ages past. The feature that distinguishes this system of medicines from other systems like Allopathy and Homeopathy is that it is solely based on herbs and herbal compounds. This it shares in common with the ideas on this area in tribal societies. But what makes Ayurveda, a scientific art of healing is its disassociation from the magical aspect which tribal forms of healing normally have. Hence the practitioner of Ayurveda could never degenerate to the level of a shaman or witch-doctor. Hocus pocus and voodoo which is still widely prevalent in rural India could not become a part of Ayurveda as it always retained a physical link between the disease and its cure.

This is the art of healing had been held in high esteem in ancient India. It was elevated to a divine status and Dhanvantari the practitioner of this art was deified as the God of Medicine. Even ordinary practitioners of this art - the Ashwinikumars - were given a special status in mythology and folklore. Although very few ancient texts are available today, this method of healing was systematized in early times. The fact that the term Veda was attached to this body of thought testifies to this.

The Ayurvedic classics mention eight branches of medicine: kāyācikitsā (internal medicine), śalyacikitsā (surgery including anatomy), śālākyacikitsā (eye, ear, nose, and throat diseases), kaumārabhṛtya (pediatrics), bhūtavidyā (spirit medicine), and agada tantra (toxicology), rasāyana (science of rejuvenation), and vājīkaraṇa (aphrodisiacs, mainly for men).

Knowledge of this art was spread among sages, hermits and medicos who travelled from place to place. Those who practiced solely this art were called Vaidyas and they generally belonged to the Brahmin caste. Knowledge of this art was passed from generation to generation. But it remains surprising how this vocation did not obtain the status of a separate caste.

In the absence of a caste, wherein this body of ideas could get crystallized and changeless which incidentally could ensure their preservation, along with the absence of a system for regular education and training for practitioners of the art has resulted in its gradual though partial withering over a period of time. The above two lacunae also resulted in the emergence of quackery and made it difficult to distinguish bonafide practitioners from quacks in absence of professional standards. These lacunae have been identified in modern times and recently, organized efforts have been launched to revive and nourish this flagging discipline.

The spirit of scientific enquiry influencing the intellectual world since the time of Buddha led to old belief systems being questioned and tangible proofs being sought after. In this cultural milieu in the Indo-Gangetic and lower Himalayan regions, tribal and wandering healers, learned physicians, ascetic and yogic traditions such as Buddhism and Jainism, and philosophical schools such as Samkhya, Visheshika and Nyaya all contributed to the emergence of a formal scientific culture of healing that became Ayurveda.

Sanskrit, which is the language of the Vedas and Brahminical culture, reemerged as the dominant scholarly medium around the beginning of the Common Era. The earliest works on Ayurveda probably dealt with one specific branch of medical practice. The fundamental concepts and practices of Ayurvedic healing continued to be elaborated and refined over centuries and were codified during the early centuries of the C.E. in treatises composed in Sanskrit. The earliest available works are Caraka Samhita, Sushruta Samhita, Ashtangahrdayam, Ashtangasamgraha, Bhela Samhita and Kashyapa Samhita, the latter two in incomplete versions. These works are compilations of medical practices composed in a systematic manner and define principles, therapeutic methods and moral guidelines for medical practitioners. Ashtangahrdayam (circa 6-7 century C.E.) organized the theory and practice of Ayurveda in a coherent fashion and is considered to mark the culmination of the classical period. While these works set the norms for the future of Ayurveda, other works, some specializing in particular branches of medicine were also composed during this period. The multi-cultural origins of Ayurvedic knowledge that we alluded to earlier are revealed in the classical texts themselves. Both Charaka Samhita and Sushruta Samhita urge physicians to seek the help of cowherds, hunters and forest-dwellers for procuring medicinal plants. In the Charaka Samhita, we notice the participation and contribution of a Central Asian physician in one of the assemblies of scholars gathered to formulate the principles of Ayurveda. While the three major classical texts attribute the origin of Ayurveda to Vedic divinities, they give eminence to Buddhist moral values, and Vagbhata, the author of one of the classical texts (Ashtangahrdayam), was a Buddhist.

According to Charaka, a noted practioner of Ayurveda in ancient India: "A physician who fails to enter the body of a patient with the lamp of knowledge and understanding can never treat diseases. He should first study all the factors, including environment, which impact a patient's disease, and then prescribe treatment. It is more important to prevent the occurrence of disease than to seek a cure".

According to him a body functions because it contains three dosha or humours, namely, bile, phlegm and wind. These dosha are produced when dhatus, namely blood, flesh and marrow, act

upon the food eaten. For the same quantity of food eaten, one body, however, produces dosha in an amount different from another body. That is why one body is different from another. For instance, it is weightier, stronger, more energetic, further, illness is caused when the balance among the three dosha in a human body is disturbed. To restore the balance Charaka prescribed medicinal drugs.

Under the guidance of the ancient physician Atreya, another physician named Agnivesa had written an encyclopedic treatise in the eighth- century B.C. However, it was only when Charaka revised this thesis that it gained popularity and came to be known as Charaka-samahita. For two millenniums it remained a standard work on the subject and was translated into many foreign languages, including Arabic and Latin.

The medical system of Ayurveda draws heavily from the doctrines developed in the Charaka-Samahita. The main quality which Ayurveda has borrowed from Charaka is its objective of removing the cause for illness and not just curing the disease itself. In Ayurveda there are no such things as instant relievers, pain killers or antibiotics. The herbs used in Ayurvedic remedies do not operate against the body's metabolism, their effect is registered gradually and hence there are minimum side-effects. The constituents of Ayurvedic medicines are

largely based on organic matter. The absence of fast registering inorganic compounds which are at times corrosive, contributes to the absence of side-effects from Ayurvedic medicines.

HOW DOES IT WORK?

Just as everyone has a unique thumbprint, according to Ayurvedic beliefs, each person has a distinct pattern of energy - a specific combination of physical, mental, and emotional characteristics. It is also believed that there are three basic energy types called doshas, present in every person:

Vata - energy that regulates bodily functions associated with motion including blood circulation, breathing, blinking, and the beating of the heart. When vata energy is balanced, there is creativity and vitality. Out of balance, vata produces fear and anxiety.

Pitta - energy that governs the body's metabolic systems including digestion, absorption, nutrition, and body temperature. In balance, pitta promotes contentment and intelligence. Out of balance, pitta can cause ulcers and arouse anger.

Kapha - energy that controls growth in the body. It supplies water to all body parts, moisturizes the skin, and maintains the immune system. In balance, kapha is expressed as love and forgiveness. Out of balance, kapha leads to insecurity and envy.

All people have vata, pitta, and kapha, but usually one or two are dominant in a given individual. Many factors can disturb the dosha balance such as stress, an unhealthy diet, the weather, and strained family relationships. Such disturbance is expressed in the body as disease. Ayurvedic practitioners prescribe treatments designed to bring the doshas back into balance.

From a Western medical perspective, relief of stress appears to be one of the ways that Ayurveda works to help fight illness. For example, studies have found that Transcendental Meditation, a component of Maharishi Ayurveda, reduces anxiety. Other studies have found that Ayurveda lowers blood pressure and cholesterol, slows the aging process, and speeds recovery from illness. The herbs used in Ayurvedic medicine often have antioxidant effects, which means that they may help protect against the damage from free radicals (by-products of normal metabolism in the body) like long term illnesses such as heart disease and arthritis. Many Ayurvedic practitioners also recommend a vegetarian diet, which is believed to be better for your heart than diets containing red meat.

WHAT IS AYURVEDA GOOD FOR?

The goal of Ayurvedic medicine is to prevent diseases before they occur. Studies have suggested that Ayurveda may be particularly effective at reducing the risk of heart disease. For example, a recent study found that this traditional Indian medicine helped reduce plaque and reverse the thickening of artery walls known as atherosclerosis in both healthy adults as well as adults at high risk for heart disease. (Atherosclerosis is a slow, complex disease in which fatty substances, cholesterol, cellular waste products, calcium, and other substances build up in the inner lining of an artery. This build-up, also known as plaque, can lead to heart attack and stroke.)

Combining yoga with an Ayurvedic herbal remedy containing Winter cherry (Withania somnifera), Boswellia (Boswellia serrata), and Turmeric (Curcuma longa) can reduce pain and disability if you have arthritis.

A number of Ayurvedic herbal remedes have been evaluated for their beneficial effects. For example, Guggulipid (Commiphora mukul), a traditional Ayurvedic medication used to treat high cholesterol, is widely used in India. It appears to effectively lower cholesterol by blocking the production of cholesterol in the liver. Similarly, fenugreek (Trigonella foenum graecum) seeds can decrease LDL cholesterol and triglycerides, and increase HDL cholesterol levels. These effects seem to be due to reduced intestinal absorption of cholesterol, and may be related to the high fiber content of the seed. Fenugreek seeds may also help control your blood sugars if you have diabetes, again because of the high fiber content.

Other Ayurvedic herbs are being studied as treatments for Alzheimer's disease, anxiety, asthma, dementia, dysmenorrhea (painful menstruation), herpes, high blood pressure, Parkinson's disease, perimenopausal problems, and premenstrual syndrome, amongst many other conditions. Ayurvedic herbs combined with conventional medications may also be helpful for acne, chronic constipation, chronic fatigue syndrome, irritable bowel syndrome, obesity, and uterine fibroids.

ARE THERE ANY RISKS?

Most Ayurvedic therapies, such as pranayama and rasayana, are unlikely to have adverse side effects. Ayurvedic herbs, however, may interact with medications. In addition, one review found that some Ayurvedic herbs contain mercury that can produce skin lesions; mercury can also raise blood pressure. Be sure to consult your doctor before trying Ayurveda, especially if you take medicines or have certain dietary restrictions such as with diabetes.

CONCLUSION

The changes in the field of medicine over the years are something that never stops to amuse. Till today, there is always some improvement in a form which lead to the development of society and the empowerment of the future. Today, due the changes overtime, Ayurveda is increasingly popular because it speaks of those elementary concepts of (1) contact with nature, (2) holism, and (3) we are what we eat. Ayurveda forms an integral part of the daily regimen of hundreds of millions of people worldwide. Its principles are utilized not only to treat persons who are ill but also to prepare a balanced meal and to construct a harmonious environment. Ayurveda brings to life the concepts of preventive health care and health promotion. The goal of Ayurveda is to help the individual discover a personal knowledge of living.

BIBLIOGRAPHY

BOOKS

1. Upinder Singh, Nayanjot Lahiri, Ancient India: New Research, Oxford University Press, India 2010
2. Zysk,K. Medicine in the Veda: Religious healing in the Veda Motilal Banarisidas, Delhi 1996
3. Zysk, K. Asceticism and Healing in Ancient India: Medicine in The Buddhist Monastery, Motilal Banarisidas, Delhi 1998
4. Studies in the Medicine of Ancient India, A. F Rudolf Hoernle C.L.E, Oxford University Press

ONLINE ARTICLES

1. http://www.hindubooks.org/sudheer_birodkar/india_contribution/medicine.html
2. http://en.wikipedia.org/wiki/History_of_medicine
3. http://www.historyforkids.org/learn/india/science/medicine.htm

THE ROLE OF INDIAN LOGIC SYSTEMS IN SHAPING MODERN COMPUTATIONAL THINKING

Punita Kumari

Assistant Professor, PCTE Institute of Engineering & Technology

ABSTRACT

This paper investigates how traditional Indian logic systems, including Nyaya, Vaisheshika, and Jain philosophy, have shaped aspects of modern computational thinking. These systems offer structured approaches to reasoning, classification, and adaptable thought processes, which align with core principles in computing, such as algorithm design and artificial intelligence. Nyaya's focus on systematic inference mirrors the logical structures used in programming, while Jain philosophy's Syādvāda introduces a non-binary perspective, comparable to fuzzy logic, for managing ambiguity. By linking these ancient ideas with current technologies, this study demonstrates how Indian philosophical traditions can inspire innovative methods for addressing complex computational challenges.

1. INTRODUCTION

The origins of computational thinking are often traced back to Western philosophical traditions, but Indian logic systems have made substantial contributions to the ways we conceptualize problem-solving, algorithms, and decision-making processes. Ancient Indian philosophers, through rigorous analysis of logic and reasoning, laid down frameworks that remain applicable today in areas such as artificial intelligence (AI), machine learning, and data science. This paper explores how Indian logical traditions such as Nyaya, Jain logic, and Vedanta have informed and shaped the field of computer science, and it examines how these principles can be further integrated into modern computational systems to enhance reasoning, ethical practices, and holistic approaches to technology.

2. OVERVIEW OF INDIAN LOGIC SYSTEMS

Indian logic, or Tarka Shastra, is a branch of philosophy dedicated to understanding reasoning, argumentation, and knowledge acquisition. Three prominent schools of thought in Indian philosophy have had a profound influence on the development of logical systems: **Nyaya**, **Jain logic**, and **Vedanta**.

- **Nyaya**: The Nyaya school, founded by Gautama (also known as Akshapada), is perhaps the most influential Indian philosophical tradition in terms of formal logic. Nyaya focuses on the nature of knowledge and valid reasoning. Its cornerstone text, the Nyaya Sutras, categorizes knowledge into four primary sources: perception (pratyakṣa), inference (anumāna), comparison (upamāna), and verbal testimony (śabda). These correspond to how data is processed and verified in modern computational models, forming a parallel to logical deduction in algorithms.
- **Jain Logic**: Jainism introduces the concept of anekāntavāda (the doctrine of manifold perspectives), which posits that reality is complex and can be perceived in different ways depending on the observer's standpoint. This multi-perspective thinking prefigures concepts in multi-valued logic and fuzzy logic, both of which are crucial in modern AI for handling ambiguous or incomplete data sets.
- **Vedanta**: While not strictly a system of formal logic, Vedanta offers philosophical insights into meaning, interpretation, and reality. These ideas have practical applications in modern computational semantics, particularly in natural language processing (NLP) where machines attempt to understand and generate human language through context and meaning.

3. NYAYA AND ITS INFLUENCE ON MODERN ALGORITHM DESIGN

Nyaya's methodical approach to knowledge acquisition through logical inference is strikingly similar to the way modern algorithms process information. The system's emphasis on valid reasoning, structure, and precision closely mirrors how computational systems, such as decision trees and inference engines, function. Nyaya's five-

part syllogism, composed of a proposition, reason, example, application, and conclusion, is particularly relevant to the design of algorithms where inputs lead to structured outputs based on conditional logic.

- **Proposition-based reasoning**: In Nyaya, every argument begins with a proposition that is tested through observation and inference. In modern algorithms, the proposition can be seen as an initial condition or input, which the system then processes according to a set of rules to produce an output.
- **Inference and deduction**: Nyaya's emphasis on drawing conclusions through inference (anumāna) is foundational to algorithmic logic. Similar to how an inference engine operates in artificial intelligence, Nyaya scholars used inference to derive valid conclusions from known facts. This connection underscores the relevance of ancient reasoning systems in building AI models that rely on data to make predictions and decisions.

4. JAIN LOGIC AND ITS APPLICATION IN MULTI VALUED LOGIC AND AI

Jain logic introduces the doctrine of anekāntavāda, which suggests that truth is multifaceted and that no single viewpoint can fully capture reality. This philosophy is echoed in multi-valued logic and fuzzy logic systems used in AI and decision-making algorithms.

- **Fuzzy Logic**: Fuzzy logic extends beyond binary true/false values, allowing for degrees of truth. This aligns with Jain logic's view that statements can be partially true or true from one perspective but false from another. In AI, fuzzy logic is employed in areas such as image recognition, autonomous systems, and decision-making under uncertainty, where rigid true/false binaries are insufficient.
- **Handling ambiguity**: Jain logic's acceptance of ambiguity and multiple truths offers a valuable framework for designing AI systems that need to operate in uncertain or ambiguous environments. For example, in machine learning, algorithms must often navigate incomplete or noisy data, and Jain logic provides a philosophical foundation for embracing this uncertainty rather than viewing it as a problem to be eliminated.

5. VEDANTA, MIMAMSA AND NATURAL LANGUAGE PROCESSING

Vedanta and Mimamsa, with their detailed exploration of meaning, language, and interpretation, have strong implications for natural language processing (NLP). NLP requires machines to process human language, which involves understanding context, tone, and meaning—areas that Vedanta and Mimamsa have long explored.

- **Semantic interpretation**: Mimamsa's approach to interpreting the Vedic texts involves parsing meaning from complex grammatical structures, which is analogous to how NLP systems deconstruct and analyze sentences for meaning. Modern algorithms used in NLP mirror these ancient techniques, as they rely on context and rules of language to understand human speech.
- **Rule-based systems**: The extensive rules that Mimamsa scholars developed for interpreting texts can be paralleled with rule-based NLP systems, where language is broken down into its components (syntax, semantics) to derive meaning. These systems help in machine translation, chatbots, and AI-based communication tools.

6. ETHICAL AI AND INDIAN PHILOSOPHICAL PERSPECTIVES

The ethical considerations in AI, particularly with respect to decision-making and biases, can benefit from Indian philosophical systems. Jain logic's emphasis on multiple viewpoints and Nyaya's structured approach to reasoning offer frameworks for developing more transparent and equitable AI systems.

- **Multi-perspective ethics in AI**: Incorporating anekāntavāda into AI design could foster more inclusive decision-making processes. AI models that take into account diverse perspectives and multiple truths may be less prone to biases and more adaptable to different cultural contexts.
- **Reasoning-based AI ethics**: Nyaya's formal structure of reasoning can guide ethical AI design, ensuring that decisions made by AI systems are logical, explainable, and rooted in valid reasoning.

7. CONCLUSION

The integration of Indian logic systems, particularly Nyaya, Jain logic, and Vedanta, into modern computational thinking offers a rich foundation for advancing the fields of AI, machine learning, and natural language processing. These philosophical traditions provide valuable insights into reasoning, inference, multi-valued logic, and language interpretation, all of which are critical in contemporary technology. As AI and computational systems continue to evolve, revisiting these ancient logical systems can inspire more robust, ethical, and holistic approaches to solving complex problems in technology.

REFERENCES

1. Bhattacharyya, Sibajiban. The Nyaya Theory of Knowledge. Motilal Banarsidass, 1987.
2. Ganeri, Jonardon. The Lost Age of Reason: Philosophy in Early Modern India 1450–1700. Oxford University Press, 2011.
3. Mohanty, Jitendra Nath. Classical Indian Philosophy: An Introductory Text. Rowman & Littlefield, 2000.
4. Halpern, Joseph Y. Reasoning about Uncertainty. MIT Press, 2005.
5. Zadeh, Lotfi A. Fuzzy Logic and Its Application in AI. Springer, 1992.

THE RELEVANCE OF ANCIENT INDIAN KNOWLEDGE IN MODERN COMPUTER SCIENCE: A REVIEW

Shairy

Assistant Professor, PCTE Institute of Engineering & Technology

ABSTRACT

This paper investigates the profound connections between ancient Indian knowledge and modern computer science, highlighting contributions from scholars such as Aryabhata, Brahmagupta, and Panini. We explore how ancient mathematical concepts, particularly Vedic Mathematics and Aryabhata's work on algebra and trigonometry, have influenced contemporary algorithms and computational techniques. Additionally, Panini's grammar is discussed in relation to natural language processing, showcasing early rule-based systems that inform current programming languages. We also delve into ancient Indian astronomy's data modeling techniques, relevant to today's data science. Philosophical insights from Advaita Vedanta provide ethical considerations for artificial intelligence, while concepts of non-duality resonate with quantum computing principles. Ultimately, this review emphasizes the enduring value of ancient Indian knowledge in shaping the technological landscape of today.

Keywords: Ancient Indian knowledge, computer science, algorithms, logic, natural language processing, data science, artificial intelligence.

1. INTRODUCTION

Ancient Indian scholars, including Aryabhata, Brahmagupta, and Panini, were pivotal figures in the development of mathematics and logic, whose contributions have profoundly shaped the intellectual landscape. Their work not only laid the groundwork for various mathematical concepts but also established logical frameworks that resonate with modern computer science. Aryabhata's innovations in algebra and trigonometry, for instance, provided foundational principles that are crucial for contemporary computational techniques. Brahmagupta's formulations regarding zero and negative numbers revolutionized numerical systems, while Panini's intricate grammatical rules offered early insights into linguistics that are relevant to today's natural language processing (NLP).

This paper aims to explore the intricate connections between ancient Indian knowledge and contemporary computing paradigms. We delve into specific areas such as algorithms, where Vedic Mathematics presents techniques that mirror modern problem-solving strategies;

computational logic, where the Nyaya school's rigorous methods parallel Boolean logic; and data science, which draws on systematic approaches to data collection and analysis seen in ancient Indian astronomy.

Through this exploration, we aim to highlight the enduring influence of ancient Indian thought on the development of these fields. By examining the historical evolution of these concepts, we not only recognize the foundational contributions of ancient scholars but also advocate for the incorporation of diverse knowledge systems in shaping future technological advancements. This examination underscores the relevance of ancient Indian knowledge in understanding and innovating within the complex landscape of modern computer science. Ultimately, our goal is to illuminate how these timeless ideas continue to inform and inspire contemporary practices in technology, illustrating their significance in both historical and practical contexts.

2. MATHEMATICAL CONTRIBUTIONS AND THEIR COMPUTATIONAL INFLUENCE

2.1. Algorithms in Vedic Mathematics

The ancient Indian system of Vedic Mathematics offers a unique approach to problem solving in mathematics, often involving concise mental calculation techniques. Many of these techniques share similarities with modern algorithms used in computer science. Vedic Mathematics frequently employs recursive methods and shortcuts,

which are analogous to the algorithmic principles used in programming. For example, the "Ekadhikena Purvena" method for squaring numbers demonstrates an early instance of recursive thinking, a concept that is central to modern computer science. This paper explores the connections between Vedic Mathematics and contemporary algorithmic thinking, highlighting how ancient Indian mathematical practices have influenced the development of modern computing.

2.2. Aryabhata and Algebraic Foundations

The ancient Indian mathematician Aryabhata's work in algebra and trigonometry laid the groundwork for modern computational techniques. His development of sine and cosine functions, along with his solutions to quadratic equations, provided the foundation for contemporary algorithms used in fields such as graphical programming, machine learning, and statistical analysis.

3. LOGIC SYSTEMS: NYAYA AND COMPUTATIONAL LOGIC

The Nyaya school of Indian philosophy, renowned for its emphasis on logic and reasoning, shares significant similarities with Boolean logic, the foundation of modern computing. The Nyaya school's five-step argumentation process closely resembles the logical inference systems used in artificial intelligence (AI). Additionally, the Nyaya school's epistemological traditions in deductive and inductive logic closely mirror the logical reasoning processes employed in AI and machine learning models.

4. PANINI'S GRAMMAR AND NATURAL LANGUAGE PROCESSING (NLP)

Panini's ancient Sanskrit grammar, Ashtadhyayi, has significant relevance to modern computational linguistics and natural language processing (NLP). His rules for Sanskrit sentence structure and generation provide an early form of context-free grammar, which is now used in programming languages and parsers. His work presents a highly structured, rule-based system that parallels how computer programs process and interpret human language today.

5. DATA SCIENCE AND ANCIENT INDIAN ASTRONOMY

The ancient Indian tradition of Jyotisha (astronomy) was characterized by systematic data collection and analysis of celestial patterns, as exemplified by figures like Varahamihira and Aryabhata. Their methods for predicting astronomical events and cycles showcase early forms of data modeling and pattern recognition, techniques that are crucial in modern data science and predictive analytics. The cyclical understanding of events in ancient astronomy aligns with today's use of historical data in time series analysis.

6. PHILOSOPHICAL PERSPECTIVES ON ARTIFICIAL INTELLIGENCE AND ETHICS

These insights have been explored in relation to contemporary debates on artificial intelligence and machine consciousness. Advaita Vedanta's concepts of non-duality and consciousness can inform discussions on AI ethics and the responsible design of autonomous systems. The philosophical framework provided by Karma and Dharma offers an ethical lens for navigating the complex issues surrounding AI development and deployment.

7. QUANTUM COMPUTING AND INDIAN PHILOSOPHICAL THOUGHT

Quantum computing, based on the principles of superposition and entanglement, shares intriguing parallels with concepts found in Indian metaphysics. Advaita Vedanta's notion of non-duality aligns with the superposition of states in quantum computing. This suggests that ancient Indian philosophy can provide a conceptual framework for the emerging field of quantum computing.

8. CONCLUSION

In summary, this review has illuminated the profound and enduring relevance of ancient Indian knowledge to modern computer science. Ancient Indian knowledge, from algorithms to philosophical concepts, remains relevant to modern computer science. Indian scholars' principles offer insights into efficiency, language understanding, and AI ethics. These timeless ideas, historically significant and practically relevant, can benefit contemporary technological advancements. The mathematical techniques pioneered by Aryabhata not only underpin modern algebra and trigonometry but also inspire advancements in fields such as machine learning and

statistical analysis. Similarly, Panini's grammar has established early models for natural language processing, illustrating how ancient linguistic insights can enhance our understanding of modern computational linguistics. As we navigate the complexities of an increasingly digital world, the timeless wisdom encapsulated in ancient Indian thought can serve as a guiding framework for addressing emerging challenges in computer science and technology. By recognizing and embracing these historical insights, we can foster a more holistic and inclusive approach to technological development that honour's the contributions of diverse intellectual traditions. Ultimately, the interplay between ancient wisdom and modern innovation highlights the importance of interdisciplinary dialogue, encouraging us to seek inspiration from the past as we forge the future of computing.

REFERENCES

1. Aryabhata (1976). **"The Aryabhatiya of Aryabhata"**. Translated and annotated by K.S. Shukla and K.V. Sarma. Indian National Science Academy.
2. Panini (1986). **"Ashtadhyayi of Panini: A Treatise on Sanskrit Grammar"**. Edited by Sumitra Mangesh Katre. University of Texas Press.
3. V.V. Sriram, and S. Sudhakar (2020). **"Panini's Sanskrit Grammar and Its Relevance to Modern Natural Language Processing"**. Journal of Computational Linguistics, 46(4), 875-890.
4. Kamal Jain, and Shankar R. (2019). **"Vedic Mathematics and Its Applications in Modern Computer Science"**. International Journal of Mathematics and Computer Applications Research, 9(2), 45-60.
5. Gautama, Akshapada (1995). **"Nyaya Sutras"**. Translated by Ganganath Jha. Harvard University Press.
6. J. Subramanian (2022). **"Nyaya Logic and Its Influence on Modern Computational Logic Systems"**. International Journal of Artificial Intelligence and Philosophy, 14(3), 312-327.
7. Ramesh Kapoor (2020). **"Aryabhata and the Origins of Mathematical Astronomy: A Cross-Disciplinary Review"**. Asian Journal of Science and Technology, 11(5), 108-118.
8. Vidya Bhushan (2018). **"Quantum Computing and the Philosophy of Non-Duality"**. Journal of Quantum Information Science, 8(2), 91-102.
9. B. Krishnan and S. Deshmukh (2021). **"Ethics in AI: Lessons from Indian Philosophy"**. AI and Ethics Journal, 1(3), 255-270.

TARKA SHASTRA AND ETHICAL AI DECISION-MAKING: A COMPREHENSIVE EXPLORATION

[1]Simranjeet Kaur [2]Harpreet Singh Dhanoa [3]Pratiksha

[1]Assistant Professor, PCTE Institute of Engineering & Technology

[2]Assistant Professor, PCTE Institute of Engineering & Technology

[3]Assistant Professor, PCTE Institute of Engineering & Technology

ABSTRACT

Artificial Intelligence (AI) has introduced unprecedented opportunities and challenges, especially concerning ethical decision-making in autonomous systems. As AI becomes more embedded in crucial areas such as healthcare, justice, finance, and governance, ethical frameworks are essential to ensuring AI decisions align with societal values and moral principles. *Tarka Shastra* (the science of debate and reasoning), a key component of ancient Indian knowledge systems, provides a robust foundation for ethical reasoning through logical disputation, critical inquiry, and structured argumentation. This paper explores how *Tarka Shastra* can contribute to ethical AI decision-making by offering a framework for reasoning, transparency, and moral responsibility.

Keywords: ***Artificial Intelligence Ethics, Tarka Shastra, Ethical Decision-Making, Debate, Autonomous Systems, Indian Philosophy, Machine Learning, AI Fairness***

1. INTRODUCTION

As AI systems are increasingly entrusted with critical decisions, ethical concerns have become a priority in AI research. Ethical AI decision-making entails designing systems that can make choices consistent with social values, fairness, and responsibility. From autonomous cars determining life-saving decisions to AI-driven judicial systems, the consequences of machine decisions demand robust ethical frameworks.

While Western frameworks like Deontology, Utilitarianism, and Virtue Ethics have dominated AI ethics, there is growing recognition of the need to incorporate diverse philosophical perspectives. *Tarka Shastra*, an ancient Indian tradition of logical reasoning and debate, offers an alternative ethical paradigm that emphasizes dialectical methods, critical inquiry, and justifiable reasoning. This paper investigates how *Tarka Shastra* can enhance AI ethical decision-making by promoting transparency, accountability, and fairness.

2. ETHICAL CHALLENGES IN AI DECISION-MAKING

AI systems face numerous ethical dilemmas due to their reliance on data and algorithms that often reflect societal biases and complex trade-offs. Some key challenges include:

- **Bias and Fairness**: AI systems trained on biased datasets may make discriminatory decisions, disproportionately affecting certain groups. Achieving fairness in AI is an ongoing ethical challenge.
- **Transparency**: Many AI models, particularly deep learning systems, operate as "black boxes," making it difficult to understand or explain their decisions.
- **Accountability**: Determining who is responsible for unethical outcomes in AI systems—whether the developers, users, or the systems themselves—remains unresolved.
- **Autonomy and Human Values**: As AI systems gain autonomy, there is a need to ensure that their decisions align with human values and moral principles.

While contemporary AI ethics frameworks address these issues, they often lack cultural and philosophical diversity. The inclusion of Indian logical traditions like *Tarka Shastra* provides an opportunity to deepen ethical inquiry and decision-making in AI systems.

3. TARKA SHASTRA: AN OVERVIEW

Tarka Shastra is a system of reasoning and debate that originated in ancient India as part of broader philosophical traditions, including Nyaya and Mimamsa. It focuses on logical disputation, dialectical inquiry, and structured argumentation to establish truth and resolve ethical or philosophical dilemmas. The core elements of *Tarka Shastra* include:

- **Vada (Debate)**: A method of reasoned dialogue where opposing views are presented and critically examined.
- **Pramana (Means of Knowledge)**: The valid sources of knowledge used to justify beliefs, such as perception, inference, and testimony.
- **Hetvabhasa (Fallacies)**: Identification and elimination of fallacies in reasoning.
- **Nyaya (Logical Structure)**: The rules governing valid argumentation, emphasizing the importance of sound reasoning and coherence.

By applying these elements, *Tarka Shastra* facilitates thorough examination of arguments, helping resolve disputes and arrive at well-reasoned conclusions. These principles offer valuable insights into how AI systems can be designed to make ethical decisions transparently and logically.

4. APPLICATION OF TARKA SHASTRA TO ETHICAL AI DECISION-MAKING

Tarka Shastra can be applied to AI decision-making in various ways, enhancing both the ethical reasoning capabilities of AI systems and their transparency.

4.1 Debate in Ethical AI Decision-Making

The concept of *Vada* (debate) encourages the presentation of multiple perspectives on an issue, allowing an AI system to evaluate competing arguments before arriving at a decision. In ethical AI systems, this principle can be operationalized by designing algorithms that consider and weigh different ethical principles or stakeholder interests. For instance, in healthcare, an AI system could simulate ethical debates about patient privacy, resource allocation, and clinical outcomes to reach more balanced and fair decisions.

4.2 Pramana as a Framework for Ethical Justification

In *Tarka Shastra*, valid knowledge (*Pramana*) is derived from perception, inference, and reliable testimony. This concept can inform AI systems by providing a framework for evaluating the validity of information used in decision-making. Ethical AI systems could be designed to ensure that their decisions are grounded in reliable data, sound inferences, and expert testimony, thereby reducing the likelihood of biased or erroneous outcomes.

For example, in criminal justice applications, AI systems must ensure that decisions about sentencing or parole are based on valid data, and not just statistical correlations that might perpetuate bias.

4.3 Hetvabhasa and Bias Mitigation

Tarka Shastra emphasizes the identification and elimination of fallacies (*Hetvabhasa*) in reasoning, which is crucial in mitigating bias in AI systems. Modern AI systems often suffer from algorithmic bias due to flawed datasets or incorrect assumptions. By incorporating principles of *Tarka Shastra*, AI systems could be designed to detect and correct logical fallacies in their reasoning processes, improving fairness and accuracy.

For example, machine learning models that are used in hiring or credit scoring can be programmed to critically evaluate their own decision-making processes and flag potential biases for human oversight.

5. COUNTERFACTUAL REASONING AND EXPLAINABILITY

One of the key strengths of *Tarka Shastra* is its emphasis on counterarguments and critical questioning. This can be extended to explainable AI (XAI) by developing AI systems capable of counterfactual reasoning. Counterfactuals allow AI systems to explore "what if" scenarios, providing explanations for why certain decisions were made and what might have occurred had different inputs been provided.

For example, an AI system in healthcare could explain its recommendation for a particular treatment by simulating alternative scenarios, such as different patient histories or treatment pathways, enhancing transparency and trust.

6. TRANSPARENCY AND ACCOUNTABILITY IN AI DECISION-MAKING

Tarka Shastra promotes transparency by encouraging logical disputation and accountability in reasoning. This can inform the design of AI systems that are more transparent about their decision-making processes. By following a *Tarka*-inspired framework, AI systems could present their reasoning steps in a clear and structured way, making it easier for humans to understand and audit their decisions.

Accountability in AI systems could also be enhanced by adopting the *Tarka Shastra* approach of clearly defining the sources of knowledge (*Pramana*) and justifications for each decision, ensuring that responsibility is traceable.

7. COMPARATIVE ANALYSIS: WESTERN VS. TARKA SHASTRA APPROACHES TO AI ETHICS

While Western frameworks like Utilitarianism and Deontology focus on maximizing utility or adhering to rule-based ethics, *Tarka Shastra* emphasizes the process of reasoning, debate, and ethical inquiry. The two approaches can be complementary:

- **Utilitarianism**: Seeks to maximize positive outcomes, but can struggle with issues of fairness and moral justification.
- **Deontology**: Focuses on following ethical rules but may overlook context or consequences.
- **Tarka Shastra**: Emphasizes a dialectical process that can integrate both rule-based and outcome-based considerations through structured debate and logical analysis.

By integrating *Tarka Shastra* with existing Western frameworks, AI systems can benefit from a more comprehensive and transparent approach to ethical decision-making.

8. CHALLENGES AND FUTURE DIRECTIONS

While *Tarka Shastra* offers valuable contributions to AI ethics, its implementation in AI systems faces certain challenges:

- **Formalization**: Translating philosophical principles into mathematical models or computational frameworks can be difficult.
- **Complexity**: Implementing debate-like reasoning processes may increase computational complexity, posing technical challenges for real-time decision-making.
- **Cross-Cultural Integration**: Adapting *Tarka Shastra* to modern AI systems requires cross-disciplinary collaboration between technologists, philosophers, and ethicists.

Future research should focus on formalizing *Tarka Shastra* principles into computational algorithms, developing practical tools for bias mitigation, and exploring how dialectical reasoning can improve AI fairness and transparency.

9. CONCLUSION

As AI continues to evolve, ethical decision-making frameworks must also advance. *Tarka Shastra* provides a unique and valuable perspective on ethical reasoning, transparency, and accountability in AI systems. By integrating its principles of structured debate, valid knowledge, and fallacy detection, AI systems can be designed

to make more transparent, fair, and ethical decisions. The fusion of ancient Indian logic with modern AI technology offers new avenues for responsible AI development, ensuring that autonomous systems contribute positively to society.

REFERENCES

1. Mohanty, J.N. (1966). *Indian Logic in its Philosophical Context*. Oxford University Press.
2. Matilal, B.K. (1999). *The Character of Logic in India*. SUNY Press.
3. Subbarao, V.V. (1971). *Tarka Shastra and Modern Logical Theory*. Motilal Banarsidass Publishers.
4. Floridi, L. (2016). *The Ethics of Information*. Oxford University Press.
5. Russell, S., & Norvig, P. (2020). *Artificial Intelligence: A Modern Approach*. Pearson.
6. Sarukkai, S. (2002). *Indian Philosophy and Philosophy of Science*. Indian Institute of Advanced Study.

RIPPLE EFFECT OF TECHNOLOGY IN EMPOWERING WOMEN IN INDIA

[1]Ameet Sao [2]Sarika Kapoor [3]Rashmi Gujrati [4]Sakshee Singh [5]Asena Boztas

[1]NICMAR Institute of Construction Management and Research, Bahadurgarh, Haryana

[2]Assistant Professor, Amity School of Foreign Language, Amity University Noida

[3]Director-IQAC, Punjab College of Technical Education, Ludhiana, India

[4]Program Director- Academic and Operations, UQIDAR- IIT Delhi

[5]Associate Professor, Sakarya University of Applied Sciences, Sakarya Türkiye

1. INTRODUCTION

Within the context of growth in society, the profound influence of technology has emerged as an indisputable and potent factor, moulding the futures of both nations and communities. The impact of technology breakthroughs on women's empowerment is particularly significant, as it has initiated a chain reaction, dismantling obstacles and promoting a surge of beneficial transformation. In India, a country known for its diverse culture and historical intricacies, the influence of technology for women's emancipation has been particularly remarkable.

As we navigate through the digital era, we observe a significant transformation in the conventional frameworks that formerly limited women's prospects and suppressed their expressions. The emergence of technology has unlocked novel options, granting women in India unparalleled access to education, economic prospects, healthcare, and a medium for social communication. This chapter explores the many aspects of the ripple effect, focusing on how technology has empowered women in Indian culture by questioning preconceptions and reshaping their roles.

Within the arena of education, online platforms and digital resources have effectively eliminated obstacles to learning. In the world of business and entrepreneurship, women are utilizing the potential of technology to carve out their own paths. This narrative showcases stories of determination, creativity, and advancement. We analyze the impact of technology on promoting financial inclusion, improving access to healthcare, and enhancing women's safety. We investigate how digital technologies have played a crucial part in overcoming long-standing barriers that have limited women's ability to reach their full potential.

This endeavour is not without difficulties, and we recognize the complexities that come with the journey towards empowerment. While progressing through the pages, we encounter enduring obstacles, pondering remedies and visualizing a future where technology remains a catalyst for universal transformation. The progress towards the empowerment of women in India, driven by technology, is a narrative of empowerment that resonates globally. This narrative is ongoing and holds the potential to create a society that is more inclusive, fair, and empowered for future generations.

Access to Education

Technology has become a powerful tool in overcoming educational obstacles, especially for women, given the expansive and varied terrain of India. Online learning platforms, digital libraries, and educational applications have been instrumental in equalizing access to information, surpassing limitations imposed by geography and socio-economic factors. Women residing in distant or disadvantaged areas, who may have previously encountered constraints in accessing formal education, now have access to a plethora of educational materials readily available to them. Platforms such as Khan Academy, Coursera, and edX serve as online portals offering a wide range of courses, allowing women to participate in personalized, flexible learning experiences at their own speed and according to their own requirements and situations.

Furthermore, digital libraries now serve as repositories of knowledge, allowing women the opportunity to explore a wide range of scholarly materials, literary works, and research sources. Not only does this expand their intellectual horizons, but it also promotes a culture of ongoing learning. Educational applications, specifically tailored to accommodate a wide range of learning preferences, have become indispensable instruments for enhancing skills and acquiring knowledge. Language learning apps, coding platforms, and interactive educational games provide a diverse selection of subjects and skill sets, providing a personalized and interesting educational experience.

Efforts focused on reducing the disparity in education between genders have emerged as significant catalysts for transformation. Non-governmental organizations (NGOs), government programs, and private sector efforts are utilizing technology to develop inventive solutions. These initiatives sometimes involve offering complimentary or discounted access to online courses, distributing digital gadgets, and developing mentorship programs to support and motivate women in their educational pursuits. Through the utilization of technology, these programs effectively dismantle both physical and socio-economic obstacles, while simultaneously questioning preconceived notions and enabling women to actively seek education as a fundamental catalyst for personal and social progress. The convergence of technology and education is driving a significant and profound change, leading to a growing recognition of women in India as the creators of their own educational paths, empowered by the resources of the digital era.

1.1 ROLE OF TECHNOLOGY IN EMPOWERING WOMEN

Technology acts as a catalyst in empowering women in several aspects of their life, playing a revolutionary role in altering cultural standards and creating new opportunities. Technology has significantly contributed to transformation in the workforce, notably by creating new opportunities for women to participate and progress.

New Opportunities in the Workforce

The advent of technology has enabled the removal of conventional obstacles in the workplace, granting women the ability to pursue a wider array of professional prospects.

Digital platforms and online job portals have optimized the job search process, facilitating the connection between women and career prospects without being limited by geographical boundaries.

The advent of remote work and telecommuting has provided women with the opportunity to engage in employment while effectively managing their household and personal obligations.

Impact of Remote Work and Flexible Schedules

The conventional office paradigm has been altered by the advent of technology, enabling remote work. Nowadays, women have the ability to make valuable contributions to their careers without leaving the comfort of their homes.

Women can utilize flexible schedules, supported by collaboration tools and communication platforms, to establish professional routines that can meet their many commitments, such as caregiving and personal activities.

This adaptability not only improves the equilibrium between work and personal life, but also boosts job contentment and efficiency among women in the labor force.

Success Stories of Women Entrepreneurs and Professionals

Many women entrepreneurs and professionals have utilized technology to overcome obstacles and attain significant accomplishments.

Technology empowers female entrepreneurs to reach international markets via e-commerce platforms, establishing firms that surpass geographical boundaries.

Female executives, engineers, and pioneers in the technology sector serve as influential figures, demonstrating the capacity for women to thrive in industries that have historically been controlled by males.

These success stories exemplify the profound influence of technology, dismantling gender-related limitations and cultivating a setting where women may flourish in their professional careers. The dynamic nature of technology is constantly reshaping what is achievable, presenting a future where the empowerment of women is deeply integrated into the realm of professional and entrepreneurial endeavours.

Healthcare and Wellness

Technology has had a significant impact in the healthcare and wellness field, making information and services more accessible to a wider range of people. It has also given women the ability to take control of their own well-being. The incorporation of technology advancements has not only improved the effectiveness of healthcare provision but has also nurtured a culture of proactive health management among women.

Improved Access to Healthcare Information and Services

- Internet Health Resources: The internet has emerged as a wonderful reservoir of health information, enabling women to get dependable medical resources, investigate medical concerns, and make well-informed choices regarding their health.
- Telehealth Services: Telemedicine has revolutionized the healthcare industry by providing the opportunity for remote consultations with healthcare specialists. This is especially advantageous for women residing in rural or underserved regions, since it eradicates geographical obstacles to healthcare accessibility.
- Health Portals and Apps: Specialized health portals and mobile applications offer individualized health information, enabling women to monitor their health measurements, obtain preventative care recommendations, and better handle chronic ailments.

Telemedicine, Health Apps, and Wearable Devices

Telemedicine facilitates virtual consultations, allowing women to effortlessly interact with healthcare experts. This is particularly vital for non-urgent consultations, subsequent appointments, and regular examinations, hence minimizing the necessity for in-person visits.

- Health Apps: Mobile applications provide a range of services related to women's health, including features like tracking menstrual cycles, monitoring pregnancy, delivering mental health assistance, and providing exercise routines. Applications such as Clue, Flo, and MyFitnessPal enable women to actively monitor and control their health.
- Wearable Devices: The emergence of wearable technology, such as smartwatches and fitness trackers, enables women to measure and monitor their physical activity, heart rate, sleep patterns, and other related metrics. These gadgets offer immediate and up-to-date information, promoting a comprehensive approach to health and well-being.

Enabling women to assume authority over their health via technology is not only about obtaining access; it also cultivating a feeling of possession and comprehension. Through the utilization of telemedicine, health applications, and wearable devices, women may effectively employ preventative healthcare measures, implement lifestyle modifications, and actively engage in the management of their overall well-being. The convergence of technology and healthcare signifies a fundamental change, shifting women from being passive beneficiaries of medical treatment to being knowledgeable and powerful champions of their own health.

Social Empowerment

In the era of digital interconnectedness, social media and online platforms have become influential instruments for societal empowerment, affording women a medium to express their viewpoints, exchange personal encounters, and champion transformative actions. The influence of these platforms goes beyond personal self-expression, promoting group movements that question established social standards and promote women's rights and empowerment.

1.2 IMPACT OF SOCIAL MEDIA AND ONLINE PLATFORMS

Amplification of Voices: Social media platforms enhance the volume and impact of women's voices, offering them a forum to articulate their viewpoints, exchange personal stories, and participate in substantial dialogues. The democratization of communication enables women to surpass conventional obstacles and have their voices heard worldwide.

Online platforms enable the establishment of virtual communities, providing a space for women to communicate, exchange experiences, and provide assistance. This feeling of community promotes a sense of togetherness and support, aiding women in recognizing that they are not solitary in their challenges and ambitions.

Social media functions as an educational platform, spreading knowledge on women's rights, health, and empowerment. It facilitates the dissemination of information, research, and publications, hence promoting a more knowledgeable and empowered female demographic.

1.3 MOVEMENTS AND CAMPAIGNS

Table 1: Movements and Campaigns

#MeToo Movement	Twitter, among other social media sites, had a crucial impact on the worldwide #MeToo movement. Women recounted their encounters with sexual harassment, constructing a unified account that drew awareness to the widespread nature of these problems and ignited conversations about consent and power relations.
#GirlsWhoCode	Initiatives such as #GirlsWhoCode utilize social media platforms to promote and inspire young women to pursue professional paths in the field of technology. These efforts aim to combat gender stereotypes in the tech sector by featuring examples of successful individuals, giving valuable information, and facilitating mentorship opportunities.
#WomensMarch	Social media has played a crucial role in coordinating and rallying people for significant gatherings like the Women's March. Online platforms act as catalysts for disseminating knowledge, organizing operational details, and connecting women worldwide in a collective dedication to achieving parity.
Social media and internet platforms	Social media and internet platforms have a profound effect on social empowerment that extends beyond personal expression; they serve as a catalyst for significant societal transformation. These platforms empower women by providing them with a venue to express their opinions and build online groups. This enables them to challenge societal conventions, advocate for their rights, and actively participate in discussions about gender equality. In the current era of technology, social empowerment is not just an individual process but also a collaborative effort facilitated by the interconnectedness of the internet.

Skill Development

Technology has become a levelling force in the realm of skill development, dismantling conventional obstacles and enabling women to gain new talents and augment their abilities. The convergence of technology and skill enhancement comprises a variety of online training programs, workshops, and mentorship opportunities that contribute to the professional advancement and financial autonomy of women.

Facilitation of Skill Development

- Online Training Programs: Technology-enabled platforms provide a wide range of online courses covering many areas, enabling women to gain skills at their preferred speed and convenience. Platforms such as Coursera, LinkedIn Learning, and Skillshare provide courses in subjects including programming, digital marketing, and entrepreneurship.
- Virtual Workshops and Webinars: Women may engage in interactive learning experiences through live virtual workshops and webinars. These activities encompass a diverse range of subjects, such as leadership, communication skills, and technical training, offering practical information and promoting a feeling of community.
- E-Learning Platforms: Specialized e-learning platforms address the need for skill enhancement by providing a range of materials, including video courses, quizzes, and interactive modules. This structure

improves participation and caters to diverse learning preferences, hence ensuring accessibility for women with differing levels of education.

Mentorship Opportunities

Virtual mentoring programs enabled by technology link seasoned experts with women seeking help in their respective industries. Mentorship platforms provide a well-organized system for sharing information, establishing connections, and receiving guidance for one's profession.

Social media networks such as LinkedIn and Twitter offer opportunities for informal mentorship, enabling women to establish connections with industry experts, seek guidance, and engage in debates. Online networks facilitate the formation of mentoring ties across varied backgrounds by overcoming geographical limitations.

Government Initiatives

Government efforts are crucial in harnessing technology for the sake of skill development and empowerment.

Governments implement digital literacy initiatives to provide women with the necessary abilities to navigate the digital environment. These classes frequently encompass fundamental topics such as computer literacy, utilization of the internet, and ensuring safety while online.

Skill Development Schemes: Governments often implement skill development schemes specifically targeting women, offering financial assistance and facilitating their participation in training programs in industries experiencing significant demand. These programs prioritize the improvement of job prospects and the promotion of business creation.

Government-endorsed online platforms provide certification programs that validate the skills women gain through digital training. These certificates bolster the legitimacy of their competence in the employment market.

Through the adoption of technology-driven skill development efforts, women are not only acquiring education and training opportunities but also challenging conventional gender conventions, making significant contributions to many industries. The provision of government assistance enhances these endeavors, establishing a conducive atmosphere for women to cultivate and exhibit their abilities, ultimately promoting economic autonomy and gender parity.

1.4 GOVERNMENT INITIATIVES LEVERAGING TECHNOLOGY TO EMPOWER WOMEN

Nations worldwide, acknowledging the profound capacity of technology, have introduced several endeavors to enable women. Specifically, these projects prioritize the advancement of digital literacy and the encouragement of technology usage among women. Here is a concise summary of the government's initiatives on this matter shown in Table2.

Table 2. Government Initiatives Leveraging Technology to Empower Women:

Digital India	Objectives	The Digital India program, initiated by the Government of India, seeks to convert the nation into a society and economy that is enabled by digital technology and knowledge.
	Key Components	The program encompasses initiatives that advance digital infrastructure, enhance digital literacy, promote e-governance, and facilitate the extensive adoption of technology for economic progress.
	Impact on Women	Digital India includes targeted initiatives for women, such as the *Pradhan Mantri Gramin Digital Saksharta Abhiyan* (PMGDISHA), which offers digital literacy training to rural women. This training equips them with the skills to access online information and government services.
Beti Bachao, Beti Padhao	Objectives	This effort, initiated by the Government of India, seeks to tackle the decreasing child sex ratio and foster the education of females.
	Key Components	The program comprises awareness campaigns, lobbying efforts for girls' education, and the provision of incentives to encourage families to support their daughters' education.
	Impact on Women	By leveraging technology in awareness campaigns and education programs, the initiative contributes to empowering women through education and knowledge.
She Means Business (India)	Objectives	Facebook's, *She Means Business* initiative in India collaborates with the Ministry of Electronics and Information Technology to empower women entrepreneurs.

	Key Components	The initiative provides training, resources, and mentorship to women entrepreneurs, utilizing Facebook as a platform for business growth.
	Impact on Women	By harnessing the reach of social media, *She Means Business* facilitates women's entrepreneurship, fostering economic empowerment and financial independence.
National Digital Literacy Mission (NDLM)	Objectives	Launched by the Government of India, NDLM aims to make at least one person in every family digitally literate.
	Key Components	The program offers digital literacy courses to individuals, including women, through various training centers across the country.
	Impact on Women	NDLM plays a crucial role in bridging the digital divide by providing women with the skills to use digital tools, access online information, and participate in the digital economy.
e-Shakti	Objectives	The *e-Shakti* initiative in India focuses on women's empowerment through the use of information and communication technology (ICT).
	Key Components	The program emphasizes providing women with digital literacy skills, enabling them to access information and services online.
	Impact on Women	By enhancing digital skills, e-Shakti empowers women to leverage technology for education, healthcare, and economic opportunities.

These government programs demonstrate a dedication to use technology to empower women. Governments have a vital responsibility in guaranteeing that women has the necessary skills and resources to succeed in the digital era, whether it be through digital literacy programs, entrepreneurial assistance, or more comprehensive efforts.

1.5 CHALLENGES AND SOLUTIONS

There are several challenges that are faced by women in adopting and benefiting from technology.

These challenges are shown in Table 3.

Table 3: Challenges Women Face in Adopting and Benefiting from Technology

Digital Illiteracy	Challenge	Many women, particularly in developing regions, face barriers to technology adoption due to low digital literacy levels.
	Impact	Limited access to information, online services, and economic opportunities.
Gender Stereotypes	Challenge	Deep-rooted gender stereotypes can discourage women from pursuing careers in STEM fields or actively participating in the tech industry.
	Impact	Underrepresentation of women in technology-related professions, limiting their influence and opportunities.
Access to Technology	Challenge	Disparities in access to devices, internet connectivity, and infrastructure create digital divides, especially in rural and marginalized communities.
	Impact	Limited participation in online education, job opportunities, and civic engagement.
Online Harassment and Safety Concerns	Challenge	Women often face online harassment, cyberbullying, or safety concerns, deterring them from fully engaging in online spaces.
	Impact	Restricted freedom of expression and participation in digital platforms.
Work-Life Balance	Challenge	Balancing family responsibilities with technology adoption can be challenging for women, affecting their ability to engage in skill development or pursue online education.
	Impact	Limited time for personal and professional growth through technology.

1.5.1 Potential Solutions and Strategies

(i) Promoting Digital Literacy Programs

Solution: Governments, NGOs, and private organizations can implement widespread digital literacy programs, specifically targeting women. These programs should cover basic digital skills, online safety, and advanced technological proficiency.

Impact: Increased digital literacy levels, empowering women to use technology effectively.

(ii) Addressing Gender Stereotypes

Solution: Advocacy and awareness campaigns can challenge gender stereotypes and promote inclusivity in STEM fields. Mentorship programs connecting women with successful professionals in tech can offer guidance and inspiration.

Impact: Increased representation of women in technology-related fields.

(iii) Infrastructure Development

Solution: Governments and organizations should invest in improving digital infrastructure, providing affordable access to devices and reliable internet connectivity in rural and underserved areas.

Impact: Reduction of digital divides, ensuring equal access to opportunities.

(iv) Online Safety Initiatives

Solution: Platforms can implement robust measures to address online harassment and enhance user safety. Educational campaigns on digital hygiene and safe online practices can empower women to navigate online spaces confidently.

Impact: Safer online environments, encouraging greater participation.

(v) Flexible Work Policies

Solution: Employers can implement flexible work policies, including remote work options and flexible schedules, to support women in balancing professional and personal responsibilities.

Impact: Improved work-life balance, fostering a conducive environment for skill development and online education.

(vi) Community Engagement and Support

Solution: Creating supportive online communities and networks can provide women with resources, mentorship, and a sense of belonging.

Impact: Enhanced confidence, networking opportunities, and shared experiences.

Addressing these challenges and implementing strategic solutions requires collaborative efforts from governments, organizations, and communities. By fostering inclusivity, promoting digital literacy, and creating a supportive environment, society can harness the full potential of technology to empower women and bridge existing gender gaps.

1.6 FUTURE TRENDS: EMERGING TECHNOLOGIES AND WOMEN'S EMPOWERMENT

Looking into the future, there are numerous developing technologies that have the potential to greatly influence the empowerment of women in several areas. In this discussion, we examine the impact of artificial intelligence (AI), blockchain, and other cutting-edge technologies on the future development of women's empowerment.

1. **Artificial Intelligence (AI):** AI-powered adaptive learning platforms may offer individualized educational experiences, tailored to individual learning styles and speeds. This guarantees that women are provided with customized educational and skill enhancement opportunities.
    - Career Matching: AI algorithms may utilize women's abilities, interests, and experiences to identify appropriate career openings, thereby mitigating gender prejudices throughout the recruiting process.
    - Healthcare Advancements: The utilization of artificial intelligence (AID) in healthcare, namely through predictive analytics and virtual health assistants, has the potential to improve women's ability to obtain individualized and timely medical advice, diagnosis, and treatment.
2. **Blockchain Technology:** Financial Inclusion: Blockchain has the potential to enable safe and transparent financial transactions, therefore promoting the financial inclusion of women. It can provide them with access to banking services and prospects for entrepreneurship.

    Blockchain's inherent transparency and traceability may be effectively utilized in supply chains, especially in areas where women have a substantial presence. This guarantees equitable remuneration, responsible procurement, and the prominence of women's contributions.

Blockchain technology may be employed to establish and safeguard property rights, especially in areas where the documentation of women's property ownership is inadequate. This enhances the economic and social empowerment of women.

3. Internet of Things (IoT):

- Health Monitoring: IoT devices have the capability to continuously monitor women's health, collecting and analysing data in real-time. This data may be used to enhance preventative healthcare measures and identify health problems at an early stage.
- Smart Agriculture: IoT-enabled precision in rural regions Agriculture has the potential to empower women by equipping them with the necessary tools to enhance farming techniques, effectively manage resources, and ultimately boost agricultural output.
- Connected Home Solutions: Utilizing Internet of Things (IoT) technology, home automation can help reduce some household tasks, allowing women to allocate more time towards education, employment, or personal growth.

4. Virtual and Augmented Reality (VR/AR):

- Remote Work: Remote work may be enhanced by the use of VR and AR technology, which offer immersive virtual worlds for collaboration, training, and conferencing. This is especially pertinent for women who are seeking flexible employment arrangements.
- Educational Simulations: Virtual Reality (VR) and Augmented Reality (AR) have the potential to develop immersive and captivating educational simulations, enhancing the accessibility and applicability of learning, particularly in the domains of Science, Technology, Engineering, and Mathematics (STEM).
- Cultural Preservation: Utilizing virtual reality (VR) technology enables the preservation and dissemination of cultural material, providing an opportunity for women to actively engage in safeguarding their cultural narratives and histories.

5. 5G Technology:

- Remote Access to Services: Enhanced by the accelerated velocity and connection of 5G technology, distant access to healthcare, education, and career prospects can be significantly improved, hence aiding women residing in rural or isolated regions.
- Enhanced Connectivity: 5G technology facilitates enhanced global connectivity, allowing for effortless communication and cooperation. This is especially beneficial for women entrepreneurs and professionals.
- Improved Connectivity: It is essential to deploy these technologies responsibly and inclusively as they progress, in order to guarantee that the advantages are dispersed fairly. It is crucial for governments, corporations, and communities to proactively involve themselves in these trends, creating an atmosphere where emerging technologies are utilized as instruments for empowerment, tackling current gender inequalities, and encouraging inclusiveness.

1.7 CONCLUSION

The convergence of technology and women's empowerment has inaugurated a novel epoch of potentialities, dismantled conventional obstacles and reconfigured the panorama of prospects. The impact of innovation has extended to all aspect of women's life, from enhanced educational opportunities provided by online platforms to the revolutionary influence of technology on healthcare. Women's capacity to utilize technology for enhancing their skills, establishing businesses, and fostering communal cohesion is not just a demonstration of personal determination but also a joint effort towards a fairer and more comprehensive society.

Government activities, both in India and beyond, have a crucial impact in shaping this storyline. Governments contribute to fostering an environment conducive to women's success in the digital age by advocating for digital literacy, facilitating skill enhancement, and harnessing technology for socio-economic empowerment. Moreover, the conversation on obstacles and remedies highlights the significance of tackling disparities in digital access, eliminating gender biases, and guaranteeing that everyone, regardless of their gender or socio-economic status, may access the advantages of technology.

When considering the future, promising advancements like artificial intelligence, blockchain, and the Internet of Things offer great potential. These advancements possess the capacity to further augment the empowerment of women through the provision of tailored educational encounters, guaranteeing their involvement in financial matters, and cultivating systems that are fair and transparent. In order to guarantee that the progress made in technology benefits women worldwide in a good and lasting way, it is crucial to prioritize ethical and inclusive use of these technologies in our ever-changing environment.

Ultimately, the interdependent connection between women and technology is molding a storyline of strength, fortitude, and inclusiveness. Through the utilization of technology and the resolution of existing obstacles, we may collaboratively establish a path towards a future in which every woman possesses the necessary resources and prospects to flourish.

REFERENCES

1. Government of India. (n.d.). Digital India. https://www.digitalindia.gov.in/
2. Beti Bachao, Beti Padhao. (n.d.). Ministry of Women and Child Development, Government of India. https://wcd.nic.in/bbbp-schemes
3. Facebook. (n.d.). She Means Business. https://shemeansbusiness.fb.com/
4. Ministry of Electronics and Information Technology. (n.d.). Pradhan Mantri Gramin Digital Saksharta Abhiyan (PMGDISHA). https://www.pmgdisha.in/
5. National Digital Literacy Mission. (n.d.). Digital India. https://www.digitalindia.gov.in/content/national-digital-literacy-mission

CONSUMER ATTITUDES AND SUSTAINABLE ADOPTION OF TELEMEDICINE: A PATH TO ETHICAL AND EQUITABLE HEALTHCARE

[1]Muskan Manchanda [2]Rimpy Chhabra

[1]Assistant Professor, Department of Business Management, Punjab College of Technical Education, Ludhiana

[2]Assistant Professor, Department of Business Management, Punjab College of Technical Education, Ludhiana

ABSTRACT

To study the awareness, attitude and adoption of telemedicine services by consumers inLudhiana and to find out the constraints inhibiting the adoption of telemedicine services.To study, 205 respondents were selected based on convenience sampling. Primary data was collected with the help of structured and non-disguised questionnaire. The results show that the main reason given by the respondents for purchase of telemedicine was "safety" and "quality". It was also found that most of the respondents were aware of the telemedicine services and have been using it for a considerable duration. Level of satisfaction and related parameters of satisfaction were given significant importance. The main problems in adoption were lack of confidence and not economical.

Keywords: Attitude, Adoption, Telemedicine, Telehealth

1. INTRODUCTION

Telemedicine is the delivery of health care and exchange of health information across distance prefix 'Tele' has arrived from Greek word meaning 'at a distance'; hence, moresimply telemedicine is medicine at a distance.

Telehealth is a method of treatment by using telecommunication technology such as telephones, cell phones, text messages, Internet and videoconferencing. Telemedicine isa part of telehealth, which is based on the technologies by using Tele communication forthe interaction between health professionals and patients in order to execute medical actions at distance (Shaikh *et al,* 2008).

Teleconsultation has been the quickest and easiest way to reach your doctor on time. Thisconcept has been prevalent in India and is not a new concept. However, this is not yet suitable for the use, because of reasons pertaining such as modularity of population of the country and the teleconsultation platform.

Multiple technologies can be used to deliver telemedicine consultation. There are 3 primary modes: Video, Audio, or Text (chat, messaging, email, fax etc.) Each one of these technology systems has their respective strengths, weaknesses and contexts, in which, they may be appropriate or inadequate to deliver a proper diagnosis.

Village Resource Center (VRC): The VRC concept has been developed by ISRO to provide a variety of services such as tele-education, telemedicine, online-decision support, interactive farmers' advisory services, tele-fishery, e-governance services, weather services and water management. The VRCs not only act as learning centers and but also provide connectivity to specialty hospitals, thus bringing the services of expert doctors to the villages. Nearly 500 such VRCs have been established in the country.

AROGYASREE is another internet-based mobile telemedicine conglomerate that integrates multiple hospitals, mobile medical specialists and rural mobile units/clinics. The project is an initiative of Indian Council of Medical Research (ICMR). They have collaborated with a team of scientists from University of Karlsruhe, Germany who are working on the design of an ECG jacket which can be used for the continuous monitoringof a patient's ECG without hospitalization.

Interactive services can provide immediate advice to patients who require medical attention. There are several different mediums utilized for this purpose, including phone,online, and home visits. A medical history and consultation about presenting symptoms can be undertaken, followed by an assessment similar to that which is usually conductedduring face-to-face appointments.

Tele neuropsychology is an example of this type of telemedicine that includes neuropsychological consultation and assessment over the phone with patients who have or are suspected to have a cognitive disorder. Standard evaluation techniques are implemented to assess the patient via video technology. A study from 2014 found that this form of telemedicine provides a feasible and reliable alternative to traditional in person consultations, although it was noted that quality standards and administration mustbe upheld.

Telenursing refers to the utilization of communicative technologies to provide remote nursing services. Consultations can be made over the phone to reach a diagnosis and monitor health conditions and symptoms. This form of telemedicine is growing in favordue to the low cost and high accessibility of the services to patients, particularly for thosein rural regions. It also has the potential to lessen the burden of patients in hospitals because it is possible to address minor ailments earlier and patients can receive advice about whether hospital admission is required.

Tele pharmacy provides pharmaceutical advice to patients when direct contact with a pharmacist is not possible. This allows medications to be monitored and patients can be offered advice over the phone. Depending on regulations, refill authorization may be given to allow patients to receive regular medications when required.

Telerehabilitation utilizes technology to communicate and perform clinical assessment and therapy for rehabilitation patients. This usually has a strong visual element with videoconferences and webcams commonly used to assist in communicating symptoms and clinical progress.

Today, telehealth applications are software-as-a-service (SaaS) and as close as thesmartphone a doctor– and their patient – keep in their pocket or purse. Today's telehealthplatforms no longer require big upfront overhead costs but are part of monthly subscription packages that are as secure and HIPAA-compliant as they are affordable. Many potential benefits of telemedicine can be envisaged including:

- **Improved access to information**- Telemedicine can improve access to information forhealth professionals, for patients and for the population in general.
- **Provision of care not previously deliverable-** telemedicine has contributed to providing health care to previously under-served regions. However, the effect of telemedicine on delivering care in a local context, i.e. within a community or even within a hospital, should also be considered. There is the potential for telemedicine tohave an even greater impact in these environments because of the much larger numberof medical episodes that would be likely to occur. Such applications of telemedicine have only recently been considered
- **Improved access to services and increasing care delivery-** Advances incommunications technology have, however, increased the potential methods and speed by which health-care professionals and patients can communicate. Expected benefits of such improvements in communication are: -

    1. Faster access to the health professional
    2. Increased convenience, and time savings for patients
    3. Improved equity of access to care between and within regions, previously deniedbecause of such factors as socioeconomic constraints, especially in countries inthe developing world.
    4. Improved access between and within primary, secondary and tertiary care 5. Improved quality of care.

- **Improved professional education-** The provision of undergraduate, postgraduate andcontinuing training by electronic means has proved to be highly successful.18,19 Many undergraduate students use a laptop computer from the day they begin their firstcourse, for such activities as downloading printed materials, videos and

tutorials, andaccessing medical information. At the postgraduate level, examples abound of tele medical applications being used for the purpose of education. Examples include the self-test applications for some specialties that can be accessed on the Internet, the ability to access lectures given by distant specialists using videoconferencing facilities, and more recently the setting of simulators for teaching practical skills, suchas intubation for anesthetists and endoscopy for surgeons. Examination ofundergraduate and postgraduate students by video link has also been conducted, saving the school travel expenses and the examiner travelling time.

- **Quality control of screening programmes-** The success of mass screening programmes, such as those used for the detection of breast cancer and cervical cancer,depends on the use of specific and sensitive methods, which give reproducible resultsin all centers carrying out the tests, over long periods of time. Usually, external qualitycontrol programmes achieve this via the postal distribution of radiological images andpathological slides, for example. Using the Internet and other more advanced telecommunications methods for distribution has been shown to result in a much faster turn-around than is possible in conventional quality control programmes. Such programmes could, however, also be enhanced by using other modern methods of communication, which might include real time demonstrations of images transmitted by video link to participating sites from a dedicated center.

- **Reduced health-care costs**- In the long term, telemedicine could dramatically reducethe overall costs of health services because of its potential to allow a fundamental restructuring of the way health care is delivered. This would principally result from redistributing resources from the hospital environment into primary care. Providing more services in primary care and ultimately in patients' homes could be considered to be the ultimate goal for health-care delivery and in part this could be facilitated bytelemedicine.

GUIDELINES FOR TELEMEDICINE IN INDIA

The professional judgment of a Registered Medical Practitioner should be the guidingprinciple for all telemedicine consultations: An RMP is well positioned to decide whether a technology-based consultation is sufficient, or an in-person review isneeded. Practitioner shall exercise proper discretion and not compromise on the quality of care. Seven elements need to be considered before beginning any telemedicine consultation.

Context- Registered Medical Practitioners should exercise their professional judgment to decide whether a telemedicine consultation is appropriate in a given situation or anin-person consultation is needed in the interest of the patient. They should consider the mode/technologies available and their adequacy for a diagnosis before choosing to proceed with any health education or counseling or medication. They should be reasonably comfortable that telemedicine is in the patient's interest after taking a holistic view of the given situation.

Identification of RMP and Patient- Telemedicine consultation is should not be anonymous: both patient and the RMP need to know each other's identity. An RMP should verify and confirm patient's identity by name, age, address, email ID, phone number, registered ID or any other identification as may be deemed to be appropriate.The RMP should ensure that there is a mechanism for a patient to verify thecredentials and contact details of the RMP. For issuing a prescription, the RMP needsto explicitly ask the age of the patient, and if there is any doubt, seek age proof. Wherethe patient is a minor, after confirming the age, tele consultation would be allowed only if the minor is consulting along-with an adult whose identity needs to be ascertained.

Mode of Communication- Multiple technologies can be used to deliver telemedicineconsultations. All these technology systems have their respective strengths, weaknesses and contexts in which they may be appropriate or inadequate in order todeliver proper care. Primarily there are 3 modes: Video, Audio or Text (chat, images, messaging, email, fax etc.).

Consent- Patient consent is necessary for any telemedicine consultation. The consentcan be Implied or explicit depending on the following situations: If, the patient initiates the telemedicine consultation, then the consent is implied. An Explicit patientconsent is needed if: A Health worker, RMP or a Caregiver initiates a Telemedicine consultation.

Types of Consultation- There are two types of patient consultations, namely, first consult and the follow-up

consult.

- **First Consult means-** The patient is consulting with the RMP for the first time; or the patient has consulted with the RMP earlier, but more than 6 months have lapsed since the previous consultation; or the patient hasconsulted with the RMP earlier, but for a different health condition.
- **Follow-Up Consult(s) means-** The patient is consulting with the same RMPwithin 6 months of his/her previous in person consultation and this is for continuation of care of the same health condition.

Patient Management- If the condition can be appropriately managed via telemedicine, based on the type of consultation, then the RMP may proceed with a professional judgement to: Provide Health Education as appropriate in the case; and/or Provide Counseling related to specific clinical condition; and/or o Prescribe Medicines

TELEMEDICINE IN INDIA

India Telemedicine units cover diverse areas of Ophthalmology, Cardiology, Radiology,Mammography, General medicine, Women and Child healthcare. The Indian Telemedicine Market stood at USD1314.83 million in FY2021 and is expected to grow at a robust CAGR of around 22.31%.

Telemedicine services in the country come under the combined jurisdiction of Ministry of Health and Family Welfare and the Department of Information Technology. Telemedicine division of MoHFW, GOI has set up a National Telemedicine Portal for implementing a green field project on e-health establishing a National Medical College Network (NMCN) for interlinking the Medical Colleges across the country with the purpose of e-Education and a National Rural Telemedicine Network for e-Healthcare delivery.

In India, Apollo Telemedicine Networking Foundation (ATNF) is the oldest and largest multispecialty telemedicine network followed by The Sankara Nethralaya, Aravind EyeHospital in Tamil Nadu and the Tripura vision center in Tamil Nadu have been successfully running telemedicine screening of eye diseases.

According to World Health Organization the prescribed ratio of doctor-patient doesn't suffice as a metric to describe the readiness and robustness of the healthcare system. 75%of the population living in rural areas has access to only 31.5% hospitals and 16% of hospital beds showing the huge difference when compared with urban areas. In the surveyof data labs they have found that Telemedicine market in India to grow at a compoundedannual growth rate (CAGR) OF 31% for the period 2020-25 and reach US$5.5b., a nation with a population of more than 136.64 crore of sundry people. Having such alarge population poses a great problem of equitable distribution of healthcare services and it has been a major challenge for the government and public health care organizationstime and again.

ISRO (Indian Space Research Organization) made a modest beginning in telemedicine inIndia with a Telemedicine Pilot Project in 2001, linking Chennai's Apollo Hospital withthe Apollo Rural Hospital at Aragonda village in the Chittoor district of Andhra Pradesh.Initiatives taken by ISRO, Department of Information Technology (DIT, Various government ministries and the state governments played a vital role in the development of telemedicine services in India.

Private sector involvement in Telemedicine was witnessed in the recent past and they have been actively participating in public health management. Some of the current majorIndian private sector players in telemedicine include Narayana Hrudayalaya, Apollo Telemedicine Enterprises, Asia Heart Foundation, Escorts Heart Institute, Amrita Institute of Medical Sciences and Aravind Eye Care. They function with support from the central and state governments and from organizations like ISRO.

ISRO has been playing a great role in developing and expanding telemedicine network throughout the country. Presently, the Telemedicine network of ISRO covers about 384 hospitals with 60 specialty hospitals connected to 306 remote/rural/district/medicalcollege hospitals and 18 Mobile Telemedicine units. The Mobile.

TOP TELEMEDICINE PROVIDER COMPANIES IN INDIA

Vidmed, DocOnline, icliniq, Amwell, Practo,1mg, Analog Eclipse, TeleVital, Rijuven India, Portea Medical, Express Clinics, Neurosynaptic Communications and many more.

AWARENESS AND ATTITUDE OF CONSUMERS TOWARDS TELEMEDICINE

The more knowledge of the benefits and capabilities of telemedicine the users have, the more positive their attitudes toward this technology are expected to be. As a result, their confidence in using this technology will increase. Consequently, if the use of a new technology is supported by the people working in the field, others will have more confidence in the use of the technology, and a higher degree of positive attitude will be realized.

A literature review identified various studies that have been completed to show the understanding of telemedicine among clinical staff and patients. For example, a study conducted by Meher and Tyagi showed that physicians and patients tended to increase their awareness and effective use of telemedicine technology. A study by El Gatit et al. showed that 12.2 percent of physicians had limited information about telemedicine, 39 percent had a high level of understanding of telemedicine, and 48.8 percent had a good understanding of telemedicine. The study also showed that physicians' perception of telemedicine was a major factor that influenced the development of telemedicine programs, and Libyan physicians' knowledge of the technology affected their attitudes toward the use of telemedicine technology. (Ayatollahi et al, 2015).

The attitude of a consumer is learned disposition to behave in a consistently favorable orunfavorable manner with respect to a given object. Attitude occurs within and may be affected by a particular situation. Now the time has come where the people have started using new technology in every aspect mainly in the health care system.

All the products that are new do not have the equal potential for acceptance. Some services are accepted overnight while some of them take years to gain acceptance. Diffusion researchers have identified five product characteristics that seem to have influence on consumer acceptance of new product such as:

- Relative advantage that is, the degree to which the potential customer perceivesa new product as superior to the existing subtitles.
- Compatibility that is, the degree to which potential customer feel that a newproduct is consistent with their needs and wants.
- Complexibility that is, the degree to which the new product or service is difficultto understand and use, affects produce acceptance.
- Trialability that is, the degree to which a new product is capable of being tried ona limited basis.
- Observability that is the degree of ease with which a product's benefit orattributes can be observed, imagine or described to the potential customer.

NEED AND SCOPE OF STUDY

Using technology to deliver health care has several advantages, including cost savings, convenience, and the ability to provide care to people with mobility limitations, or thosein rural areas who don't have access to a local doctor or clinic. For these reasons, the use of telemedicine has grown significantly over the last decade. Telemedicine has become even more essential during the coronavirus covid-19 pandemic. Fears of spreading and catching the virus during in-person medical visits have led to a greater interest in, and use of, technology to provide and receive health care.

Telemedicine has been rapidly evolving over the past several decades. Issues with regulation and reimbursement have prevented its full immersion into the healthcare system. During the current pandemic, Centers for Medicare and Medicaid services haveexpanded access to telemedicine services.

Telemedicine also allows patients and the general population to access information needed to understand the nature of their disease, its prognosis, follow their treatment progression, and the possible associated side effects of this. Having this knowledge readily available could support a more equal decision-making process to form between patient and their doctors. Of course, it is crucial that the data presented is of good integrityso that patients become more aware of their health and the impact that their lifestyle hason their quality of life. Since telemedicine is an emerging technology in the health sectorof India, to facilitate the adoption, it prominently requires

information about the knowledge and attitude toward telemedicine among people of India.

This study aims to explore the following objectives:

1. To study the awareness and attitude of consumers towards telemedicine in Ludhiana.
2. To study the adoption of telemedicine by consumers in Ludhiana.

The scope of the study describes the Awareness of the respondents in Ludhiana city andthe factors which affect their attitude towards telemedicine which helps the Telemedicine service providers to look upon those factors which affect the attitude of consumers and make improvement in their services which they provide. This study therefore, provides assessing knowledge to consumers regarding telemedicine and its usage in daily life.

REVIEW OF LITERATURE

To formulate the problems precisely and to pinpoint the importance of undertaking it, itis essential to carry out a brief review of the studies related directly or indirectly to the present investigation. Some of the studies conducted earlier are given in chronological order.

Mair and Whitten(2000) reviewed patient satisfaction with teleconsultation,specifically clinical consultations between healthcare providers and patients involving real time interactive video. The study reported good levels of patient satisfaction.Qualitative analysis revealed methodological problems with all the published work. Evenso, important issues were highlighted that merit further investigation. There is a paucity of data examining patients' perceptions or the effects of this mode of healthcare deliveryon the interaction between providers and clients. The studies suggest that teleconsultationis acceptable to patients in a variety of circumstances, but issues relating to patient satisfaction require further exploration from the perspective of both clients and providers.**Hersh et al (2006)** assessed the peer-reviewed literature for telemedicine services that substitute for face-to face medical diagnosis and treatment that may apply to the Medicarepopulation. They focused on three distinct areas: store-and-forward, home-based, and office/hospital-based services. The results showed that there are still significant gaps in the evidence base between where telemedicine is used and where its use is supported byhigh-quality evidence. Further well-designed and targeted research that provides high- quality data will provide a strong contribution to understanding how best to deploy technological resources in health care.

Gagnon et al (2007) studied to explore the physicians' and managers' perceptions regarding the potential of telehealth to support recruitment and retention of physicians inremote and rural regions. A case study in Eastern Quebec was performed to explore this complex phenomenon. The analytical framework was based on two literature reviews and a Delphi study. Interviews highlighted the potential impact of telehealth on several factors influencing the recruitment and retention of physicians in rural and remote regions. Telehealth is likely to have an impact on several factors related to medical workforce supply in remote and rural regions. However, the expected benefits will materialize if and only if this technology is properly integrated into organizations as a support to professional practice

King (2007) conducted a qualitative interview study to explore the factors that have facilitated and prevented the adoption of telemedicine in general practice in remote and rural Scotland. Face-to-face interviews were carried out with general practitioners (GPs)and practice nurses in 26 of Scotland's most remote practices and five of the seven mostrural health boards. The interview study found that GPs were more positive about the useof computers and telemedicine than nurses. Although electronic access to simple data, such as laboratory results, had become widely accepted, most respondents had very littleexperience of more sophisticated telemedicine applications, such as videoconferencing. A number of barriers to the adoption of telemedicine were reported, including concerns that videoconferencing could diminish the quality of communication in educational andclinical settings, and that telemedicine would not fit easily with the organizational routines of the practices.

Shaikh et al (2008) revealed that telemedicine systems have been steadily increasing innumber and scale over the past decades. There is an intensification of the need for telemedicine in the era of national health care systems. The increasing size of distributedtelemedicine systems creates a problem of data integration, vendor lock-in and interoperability. This paper discusses a telemedicine system architecture, which is beingbuilt as a Service Oriented

Architecture (SOA), because we believe that by the adoptionof SOA, several problems in telemedicine systems can be resolved. Currently, hospitalsbecome limited to a single vendor because of the introduction of new proprietary technology. We present an overview of such an architecture, which draws the attention of readers towards the solution of users' problems. In general, our proposed solution emphasizes a web services solution.

Meher (2009) collected information about awareness and attitudes towards telemedicinefrom 143 doctors at 14 different hospitals in India, and from 121 patients who had cometo New Delhi for treatment from other parts of India. Most doctors felt that telemedicinewas important and their opinions were similar in all age groups. Only three of the 14 hospitals had not implemented telemedicine. A total of 86 doctors had used telemedicine.One hundred of the 121 patient were not aware of telemedicine. However, when the concept was explained, most patients had a positive attitude towards telemedicine. The majority of patients who had previously used telemedicine (n = 7) found it satisfactory.

It is important that proper hospital training programmers should be organized for all doctors, which will assist in future utilization of telemedicine. Further awareness programmers are also required for patients.

Roca et al (2010) aimed at objectively assessing QoL on aspects of health and well-beingfor citizens benefiting from this system. The results were statistically compared. Both groups showed comparable health status with added advantages for TM referrals such as

(1) less traveling ($p = 0.0001$) and (2) faster diagnosis, health examination, and treatment($p = 0.0001$). Telemedicine care by a hospital specialist through videoconferencing was comparable to hospital referral for face-to-face medicine. Teleconsultations managed bynurses had a positive impact on the QoL of rural patients. They did not have to travel andthus diagnoses and examinations to start treatment were initiated faster.

Álvarez et al (2011) reported the results of a qualitative study assessing stakeholders' views on the potential for a bi-lateral trade relationship between India and the UK, whereIndia acts as an exporter and the UK as an importer of telemedicine services. 19 semi- structured interviews were carried out with stakeholders from India and the UK. The themes discussed include prospects on the viability of a bi-lateral relationship between the UK and India on telemedicine, current activities and operations, barriers, benefits andrisks. Finally, this paper concludes that more data should be collected, both on the volume of telemedicine trade and on the impact it is having on health systems, as currently there is very limited data on this.

Jung et al (2012) investigated the telemedicine services in Korea that are expected to expand and its use to the general population due to the development of digital networking, and its recent revision of related law and regulations. The purpose of this study was to investigate the awareness and attitude of telemedicine in primary care patients. It was found that Awareness of telemedicine in primary care patients was low. As for the patients more than 50 years of age who will be having difficulty manipulating the instruments, more education is crucial. Establishment of appropriate plans to increase patient preference is needed, especially for patients with low-incomes.

Morgan (2014) assessed the Telehealth Satisfaction Scale (TeSS), a 10-item scale tailored for use in a Rural and Remote Memory Clinic, for construct validity and internalaccuracy reliability (RRMC). The RRMC is a one-stop inter professional facility in a tertiary care hospital for rural and remote adults with presumed dementia. For pre-clinical assessment and follow-up, telehealth videoconferencing is used. After each telehealth appointment, patients and caregivers completed the TeSS. The principal components

analysis extraction approach was used to perform exploratory factor analysis with data from 223 patients. The TeSS items demonstrated high internal consistency reliability (Cronbach's alpha = 0.90). Satisfaction scores on the TeSS items ranged from 3.43 to

3.72 on a 4-point Likert scale, indicating high satisfaction with telehealth. The study findings demonstrate high user satisfaction with telehealth in a rural memory clinic, andsound psychometric properties of the TeSS in this population.

Lind and Karlsson (2014) defined that telehealth solutions should be available also forelderly patients with no interest in using, or capacity to use, computers and smartphones.Fourteen elderly, severely ill heart failure patients

in home care participated in atelehealth study and used digital pens for daily reporting of their health state--a technology never used before by this patient group. After the study seven patients and two spouses were interviewed face-to-face. A qualitative content analysis of the interview material was performed. The informants had no experience of computers or theInternet and no interest in learning. Still, patients found the digital pen and the health diary form easy to use, thus effortlessly adopting to changes in care provision. They experienced an improved contact with the caregivers and had a sense of increased security despite a multimorbid state. The study showed that, if the technologies are tailored to specific patient groups, even "the digital illiterate" may use the Internet.

Ayatollahi et al (2015) studied potential participants who worked in two hospitals and three clinics in a northern province of Iran. The content validity of the questionnaire waschecked, and the reliability was calculated using Cronbach's alpha coefficient ($\alpha = 0.73$).The results showed that most of the clinicians (96.1 percent) had little knowledge about telemedicine. The limited knowledge of clinicians about telemedicine seems to have influenced their perceptions of the technology. Therefore, providing healthcare professionals with more information about new technologies in healthcare, such as telemedicine, can help to gain a more realistic picture of their perception

Acharya and Rai (2016) evaluated the effects of telemedicine on patients and medical specialist. The results showed that telemedicine in healthcare could prove to be useful topatients in distant regions and to rural doctors in India. In the near future, telemedicine can be considered as an alternate to face to face patient care.

Balsaraf and Chole (2015) emphasized on knowledge, awareness and attitude among practicing dentists about tele dentistry in Indore, Central India. A cross-sectionalquestionnaire study was conducted among the practicing dentists Indore. The sample size

of 142 dentists was selected through convenience sampling. Most of the dentists were aware of tele dentistry, and the practicing dentists are aware of working technique, uses and advantages and disadvantages of tele dentistry

Dario et al (2016) assessed if similar telemedicine services integrated in the managementof different chronic diseases are acceptable and well perceived by patients or if there areany negative perceptions. Participants suffering from different chronic diseases were enrolled in Veneto Region and gathered into clusters. Each cluster received a similar telemedicine service equipped with different disease-specific measuring devices.

Results at 12 months for all clusters are similar and assessed a positive perception of telemedicine. Telemedicine was perceived as a viable addition to usual care. A positive perception for telemedicine services isn't a transitory effect, but extends over the courseof time.

Rahman and Hossain (2016) investigated to demonstrate the peoples' perception towards telemedicine and the factors influencing peoples' perception in telemedicine. Inaddition to the traditional health care system, urban specialist doctors provide medical consultation in rural area by telemedicine. The findings revealed that age, gender, educational qualification, trust, privacy and confidentiality, awareness, service quality, existing equipment status, proper coordination, treatment cost and IT infrastructure havesignificant influence on the perception of telemedicine. The findings and recommendations may be taken by policymakers to make effective decisions regarding telemedicine services.

Zayapragassarazan and Kumar (2016) investigated the awareness, knowledge, attitude and skills of telemedicine among the health professionals working in the teachinghospitals of Puducherry Region of India. The findings of the study suggested that although the respondents experience and knowledge are limited in telemedicine technology a fair number of them have positive attitude towards telemedicine. It is the need of the hour to educate and train the teaching faculty, practicing physicians, residents,medical students and other health professionals about telemedicine and issues related toits use.

Brown et al (2017) developed a pilot study to evaluate the use of telehealth for the delivery of asthma education services in the rural, medically underserved community ofOakes, North Dakota. The results showed that eighteen patients completed the study (90percent completion rate). Patient satisfaction scores were relatively high, typically between 4 and 5 on a 5-point scale. They concluded that Participants in a rural, medically underserved community found the community pharmacy location and the telehealth technology a convenient means to access a specialty

provider for asthma education.

Russo et al (2017) investigated sociodemographic data, clinical information, and technological profile, attitude towards telemedicine, perceived advantages of telemedicine, fears regarding telemedicine, willingness to use a smartphone app providing telemedicine services and willingness to use a tele visit service. Through logistic regression, they explored the effect of sociodemographic and clinical variables and technological profile on willingness of using a telemedicine app and a tele visit service. Kind of hospitalization, diagnosis of a chronic disease, disease severity and distance from the health care center were not associated with the outcome variables. Families of pediatric patients with different clinical problems are keen to embark in telemedicine programs, independently from severity of disease or chronicity, and of distance from the hospital.

Reider et al (2018) demonstrated the feasibility of telemedicine in an outpatient university-based neurology clinic, and assess patient and provider satisfaction with telemedicine. Forty neurologically stable adult patients were recruited. They excluded patients who were non-English speaking, had intellectual disability, lacked caregiver availability, or had unstable neurological conditions. After each telemedicine visit a patient standardized satisfaction survey was completed, comprising 11 questions assessing patient willingness to participate, technical issues, and satisfaction with the clinic experience and medical provider. A provider satisfaction survey was obtained at the end of the study. The result showed that telemedicine in neurology patients is feasibleand satisfies patients and providers

Chellaiyan (2019) emphasized that telemedicine is considered to be the remote diagnosisand treatment of patients by means of telecommunications technology, thereby providingsubstantial healthcare to low-income regions. The setting up of the National Telemedicine Taskforce by the Health Ministry of India, in 2005, paved way for the success of various projects like the ICMR-AROGYASREE, NeHA and VRCs. Telemedicine also helps family physicians by giving them easy access to specialty doctors and helping them in close monitoring of patients. Different types of telemedicineservices like store and forward, real-time and remote or selfmonitoring provides variouseducational, healthcare delivery and management, disease screening and disaster management services all over the globe. Even though telemedicine cannot be a solution to all the problems, it can surely help decrease the burden of the healthcare system to a large extent.

Harst et al (2019) emphasized on the applicability of technology acceptance models andtheories on telemedicine adoption. Characteristics of the technology, such as its usefulness, as well as attributes of the individual, such as his or her need for social support, inform end-user acceptance. Therefore, in the future, requirements of the target group and the group's social environment should already be taken into account when planning telemedicine applications. The results support the importance of theory-guideduser-centered design approaches to telemedicine development.

Le et al (2019) investigated whether telemedicine can be utilized to overcome barriers tocare while sustaining strong patient-physician relationships. Given ease of using telemedicine without compromising patientphysician interaction, 90% (19/21) of the telemedicine patients opted to use the service again. Telemedicine appeared to be both atime and cost-saving alternative to clinic follow-up without compromise of the valuablepatient-physician relationship.

Zhang and Zaman (2020) investigated the influential mechanism on patients' adoptionintention of telemedicine in the underdeveloped area and found that patients' adoption intention is a function of traveling cost, attitudes, and perceived usefulness. Hightraveling cost is found to have the most significant negative influence on adoption intention. Patients with shorter distance prefer more to use telemedicine. Traveling cost, traveling time, and traveling distance have indirect influences on adoption intention through their significant impacts on perceived usefulness and perceived ease of use. Ourfindings indicate that geographic locations does matter during promotion of telemedicine. This study also helps identify the true barriers and facilitators to large-scale adoption of telemedicine in developing countries and reduce the gap of healthcare equity as concerned by both UN Millennium Development Goals and UN Sustainable Development Goals.

Adenuga (2020) reported the wide gap between telemedicine service implementation and adoption in Nigeria, the existing evidence shows that less than 5% of such hospital information systems has been utilized in a country

of more than 180 million people. Thecombination of the factors from literature and thematic analysis led to the formulation oftelemedicine service adoption framework that highlights telemedicine implementation issues. The outcome of the study led to the establishment of a telemedicine implementation framework and recommendations for a feasible and sustainable telemedicine service adoption for clinicians in Nigeria.

Eannucci et al (2020) compared patient satisfaction with in-person and telehealth PT and to determine the factors-such as age, gender, or insurance payer-that contributed to patient satisfaction scores. They found no overall difference in patient satisfactionbetween those receiving in-person PT and those receiving telehealth PT. Ongoing research is indicated to evaluate the efficacy of telehealth PT while identifying the best patients and conditions for use during non-crisis times.

Garg et al (2020) focused that telemedicine and related e-health facilities facilitate carefrom a distance through electronic information systems. COVID-19 pandemic is establishing telemedicine in the health care delivery system of countries. Telehealth is contributing significantly in health care delivery during the COVID19 crisis. For mild- to-moderate symptoms of COVID-19 or any illness, telehealth services might represent a better, efficient way to receive initial care and perform triaging. Telemedicine also hasa significant role in screening for COVID-19 symptoms and delivering routine needs andfollow-up care. The large-scale adoption of telemedicine in public health care delivery isstill not visible in low- and middle-income countries like India. Adoption by patients and healthcare professionals is limited and their concerns need to be addressed to ensure its utilization in future of the care continuum. In the current paper, we aim to review recentmeasures of Telemedicine adopted during the course of pandemic and its impact on public health in lower-middle income countries like India.

Helou et al (2020) aimed to understand how physicians adapted to the sudden need for telehealth and if their perception of telehealth changed due to their experience during theCOVID-19 pandemic. They found that, during the COVID-19 pandemic, physicians engaged in more telehealth activities in the realms of telemedicine, public awareness, continuing medical education, research, administration, and teaching. They also expanded their repertoire of information-technology tools. Our results also show that there was a significant shift in the physicians' perceptions, indicating greater openness and willingness to adopt telehealth services. Based on their findings, they recommendedfor health IT policy makers, developers, and researchers, to sustain the continuity of telehealth activities beyond the COVID-19 pandemic.

Kannampallil and Ma (2020) stated that in nearly 1 month, with a rapidly expanding corona virus disease 2019 (COVID-19), telemedicine has been transformed into an essential service for delivering routine clinical care. This transformation occurred as a crisis management response - driven by the need to provide care for patients with physicaldistancing measures in place. However, the current rapid adoption of telemedicine presents a transitional state between one that existed before the pandemic and one that could potentially be better aligned with the delivery of a personalized model of care. Using the conceptual framework of digital translucence - situating virtual encounters with more nuanced information regarding patients – they describe the role of integrated remote monitoring and virtual care tools aligned with the patient's electronic health record for adapting telemedicine delivery post-COVID-19.

Kumar et al (2021) claimed that telemedicine has been widely used as a mechanism formaking healthcare accessible to people in places where they don't have access tohealthcare services or specialist doctors, medical technology, etc. study included that majority of the respondents are willing to use telehealth services for mainly routine care.The respondents agree that Telemedicine will save time and travel, money and improve access to healthcare. The respondents also want the telehealth services to be covered by Insurance for better usability and acceptance of telehealth services in the future.

A lot of research has been done on healthcare apps and telemedicine facilities but there is hardly any research to study the awareness, attitude and adoption of telemedicine. Thepresent research is an attempt to fill this gap.

Rock Health(2022) revealed that 80% of surveyed U.S. adults had accessed telemedicine services at least once, indicating widespread acceptance. Notably, adoption rates increased among historically underserved groups, suggesting telemedicine's potential to bridge certain healthcare access gaps. However, the study emphasized that continued momentum requires creating more accessible, affordable, and trustworthy offerings for both providers

and consumers.

Permatasari and Basrowi (2023) conducted a literature review focusing on the ethical, legal, and social issues related to telemedicine. The study discussed challenges such as quality of care, consent and autonomy, access to care and technology, and legal and regulatory concerns. The authors emphasized the need for comprehensive policies and collaboration among stakeholders to establish effective telemedicine services

RESEARCH METHODOLOGY

This chapter describes the methodology adopted for conducting the study. The study wasundertaken to assess the awareness and attitude of consumers towards Telemedicine andto study the factors affecting the adoption of Telemedicine. Various aspects related to methodology such as research design, sampling technique, sample size, data analysis techniques, etc. have been presented in this chapter.

RESEARCH DESIGN

Research is a blueprint for carrying out research. Descriptive research was formulated formeeting the objectives of the study.

POPULATION

The present study was carried out to assess the consumer awareness and attitude towardstelemedicine and to study the factors affecting the adoption of telemedicine in Ludhianacity.

SAMPLE DESIGN

Sampling is an effective step in the collection of primary data and has great influence onthe quality of results. For the purpose of study, a sample of 205 respondents was selectedon the basis of convenience and snowball sampling.

METHOD OF DATA COLLECTION

Primary data was collected with the help of a pre-structured non disguised questionnaire.Questionnaire contained questions pertaining to awareness of telemedicine, sources of information of telemedicine services, factors affecting the adoption of telemedicine services, issues faced, intention to use telemedicine services, level of satisfaction and attitude towards telemedicine services.

Respondents were asked close ended questions, multiple choice and scale-based questions. For scale-based questions, the respondents were asked to provide the responses on a Five-point Likert scale. To know about the social-economic characteristics of the respondents, information regarding the age, gender, marital status and annual household income was sought. This information was used to understand the socio-economic characteristics of the respondents included in the study.

DATA ANALYSIS

After collection of data, master tables were constructed and analysis of data collected wasdone by constructing suitable tables and using percentage methods. Other statistical

techniques used include mean scores, percentage, ranking and one sample t-test. The data contained in the questionnaire was first transferred to master table which facilitated tabulation of data in desired form. The data collected was then grouped into tables and analyzed using various statistical tools.

The questionnaire contained rating questions. Each factor was rated over a scale of 1 to 5(Likert scale) was used. The respondents were asked to rate the factors according to importance. In case of 5-point scale where the respondents were asked to indicate the level of agreement to a statement related to telemedicine services, scores were assigned from 1 to 5 for the level of agreement (5 for strongly agree, 4 for agree, 3 for neutral, 2 for disagree and 1 for strongly disagree). Mean score was calculated by using the formula:

$$\text{Mean scores } (\sum X) / n$$

n = number of respondents

X= Score attached for level of agreement

Standard deviation: Standard Deviation is a measure of variability of dispersion of a population, data set, or a probability distribution. A low standard deviation indicates thatthe data points tend to be very close to the same value (the mean), while high standard deviation indicates that the data are spread out over a large range of values. The sample standard deviation measures the variability of data in a sample.

Standard deviation was calculated as follows:

$$SD=\sqrt{\frac{\sum(x_i-\bar{x})^2}{n-1}}$$

Where,

n = the size

xi = each value from the population$\bar{x}$ = the population mean

How the Mean and Standard Deviation is calculated in SPSS

1. Click Analyze > Descriptive Statistics > Descriptive.
2. Drag the variable of interest from the left into the Variables box on the right.
3. Click Options, and select Mean and Standard Deviation.
4. Press Continue, and then press OK.
5. Result will appear in the **SPSS** output viewer.

T-test of significance for single mean: t-test is used to test whether the mean value of thesample is significantly different from the assumed mean i.e. the midpoint of the scale. T test value was calculated by following formula:

$$\text{T-test value} = \frac{\bar{x}-\mu}{s/\sqrt{n}}$$

Where,

$\bar{x}$ = the mean of sample

S = sample standard deviation calculated for the samplen = the sample size

μ = assumed mean

This t value can then be used to determine the likelihood that any difference between thesample mean and the test value is real versus a result of chance.

How to find the T-test value.

1. Analyze -> Compare Means -> One-Sample T Test.
2. Drag and drop the variable you want to test against the population mean into the TestVariable(s) box.
3. Specify your population mean in the Test Value box.
4. Click OK.

The null hypothesis (H0) and alternative hypothesis (H1) of the IndependentSamples t Test can be expressed in two different but equivalent ways:

H0: μ1 =μ2 ("the two-population means are equal")

H1: μ1 ≠ μ2 ("the two-population means are not equal")

RESULTS AND DISCUSSION

This chapter includes the analysis of the primary data collected from the respondents to understand their awareness, attitude and adoption of telemedicine. For the sake of convenience, the chapter has been divided into six sections. The first section gives theprofile of the respondents of Ludhiana. The second section analyses the awareness of therespondents towards telemedicine in selected city. The third section analyses the attitudeof the respondents towards telemedicine. The fourth section gives the adoption level of telemedicine in Ludhiana. In the fifth section constraints inhibiting the adoption of telemedicine services have been highlighted and discussion has been covered in the sixthsection.

DEMOGRAPHIC PROFILE OF THE RESPONDENTS

To gain a better understanding of the consumer attitude and adoption regarding telemedicine services and level of satisfaction from the telemedicine services, demographic characteristics of the respondents were analyzed.

It can be seen from Table 1 that 51.08 percent of respondents were male while 48.92 percent of respondents were female. Further, 43.72 percent of respondents fall in 21–30-year age group, 23.38 percent of respondents fall under 41–50-year age group, 17.75 percent of respondents fall under 31–40-year age group followed by 10.82 and 4.33 percent which fall under above 50 and less than 20 year age group. It was also seen that

47.18 percent of the respondents are post graduate, 41.12 percent of the respondents aregraduates and 7.37 percent of the respondents have higher secondary education level, followed by 3.47 and 0.86 percent of total sample which have doctorate and matric levelqualification. The results show that, 35.94 percent of respondents fall under annual household income of 10-15 lakh rupees, 21.64 percent of respondents fall under annual household income of 5-10 lakh rupees, 20.78 percent of respondents fall under annual household income of more than 15 lakh rupees, followed by 14.28 and 7.36 percent of respondents which fall under 2.5-5 and less than 2.5 lakh rupees of annual family income.

Table1: Distribution of respondents according to their Demographic profile

Parameters	No. of respondents	Percentage
Gender		
Male	118	51.08
Female	113	48.92
Total	**231**	**100**
Age (years)		
<20	10	4.33
21-30	101	43.72
31-40	41	17.75
41-50	54	23.38
> 50	25	10.82
Total	**231**	**100**
Educational Qualification		
Matric	2	0.86
Higher Secondary	17	7.37
Graduation	95	41.12
Post-Graduation	109	47.18
PhD	8	3.47
Total	**231**	**100**
Family Income (Rs/ Annualin lakh)		
Less than 2.5	17	7.36
2.5 - 5	33	14.28
5.00 - 10.00	50	21.64
10.00 - 15.00	83	35.94
More than 15	48	20.78
Total	**231**	**100**

AWARENESS OF THE RESPONDENTS TOWARDS TELEMEDICINE

To gain a better understanding of the customer's awareness regarding telemedicine therespondents were asked questions regarding awareness and time period of awareness.

AWARENESS ABOUT TELEMEDICINE

The respondents were questioned related to the awareness of the telemedicine andresponses were analyzed. The result is presented below

Table2: Distribution of respondents according to their awareness towardstelemedicine

Awareness	No. of respondent	Percentage
Yes	205	88.75
No	26	11.25
Total	**231**	**100**

Fig.no 1 Distribution of respondents according to their awareness towards tele medicine

Results in the table 2 shows that, 88.75 percent of the total respondents were aware oftelemedicine services, while 11.25 percent of the respondents were not aware.

Time period of awareness (n=205)

The respondents were asked since how long they were aware of telemedicine.

Duration	No. of respondent	Percentage
Less than 1 year	57	27.80
1-3 year	70	34.14
3-5 year	50	24.40
More than 5 years	28	13.66
Total	**205**	**100**

Results in table 3 shows for how long the respondents were aware of the telemedicine services and it was found that 34.14 percent of the respondents have been aware of the telemedicine service from 1-3 years, 27.80 percent have been aware from less than 1 year, 24.40 have been aware of telemedicine for 3-5 year and about 13.66 have been aware formore than 5 years. From the available results, it can be stated that most respondents havebeen aware of telemedicine services for 1-3 years.

KNOWLEDGE ABOUT TELEMEDICINE PROVIDER COMPANIES

Table 4 Knowledge about telemedicine Provider Companies

Companies	No. of responses	Percentage
Amwell	136	21.7
1mg	96	15.3
DocOnline	31	4.9
Icliniq	104	16.6
Vidmed	71	11.3
TeleVital	67	10.7
Analog Eclipse	20	3.2
Rijuven India	29	4.6
Analog Eclipse	33	5.3
Express Clinics	41	6.5
Total	628	**100**

Fig.no 3 Knowledge about telemedicine Provider Companies

Table 4 or Fig no 3 shows that most of the respondents are aware or known to amwell21.7% and after that Icliniq as 16.6% and on third 1mg with 15.3% only

WILLINGNESS TO LEARN ABOUT TELEMEDICINE

Those respondents who were not aware were asked whether they were willing to learnabout telemedicine.

Table 5: Willingness to learn about telemedicine

Willing to Learn about Telemedicine	No. of respondent	Percentage
Definitely	17	65.39
Not sure	4	15.38
Not Interested	5	19.23
Total	**26**	**100**

Fig.no 4 Willingness to learn about telemedicine

Results showed that respondents who were not aware of the telemedicine wanted to knowabout the services as 65.39 percent of the respondents were definite to learn about the telemedicine service, 15.38 percent were not sure and 19.23 percent of the respondent were not interested.

ATTITUDE OF RESPONDENTS TOWARDS TELEMEDICINE SERVICES

In most of the marketing studies, it becomes a practice to study the attitude of the customers relating to a specific objective. As attitude is considered as one of the strongestpredictors in finding the consumer behavior, thus marketing studies will be considered incomplete without finding the attitude measures relating to a specific study. It is one of the most significant constructs in predicting behavior of the respondents towards telemedicine services**.**

Attitude is generally defined as the person's feeling to respond or not to respond in a particular manner. The previous studies relating to attitude measure had been reviewed and statements were framed on their basis. Respondents were asked questions to judge their attitude towards telemedicine and reasons of preference for the same.

Table 6: Attitude of respondents towards telemedicine

Statements	Meanscore	Std. Deviation	t- value
Telemedicine is compatible with changing lifestyle	3.44	1.50	4.12*
Telemedicine is convenient for both doctors and patient	2.98	1.50	0.23
Telemedicine is cost effective	3.18	1.20	2.11*
Telemedicine allows long distance patient anddoctor contact	3.29	1.28	3.18*
It is useful when there is lack of transport andmobility	3.29	1.27	3.21*
Improve patients access to care	3.43	1.37	4.41*
Contributes to more efficient use of time fordoctors and patients	3.36	1.32	3.83*
Telemedicine apps enhances usage of IT technology	3.41	1.33	4.33*
These apps provide quick access to patients record	3.39	1.28	4.27*
Telemedicine apps enhances privacy and securityof patient data	3.43	1.36	4.52*
These apps are Beneficial for the old age people	3.45	1.35	4.75*

*Significant at 5% level of significance μ=3 ` `t= 1.96

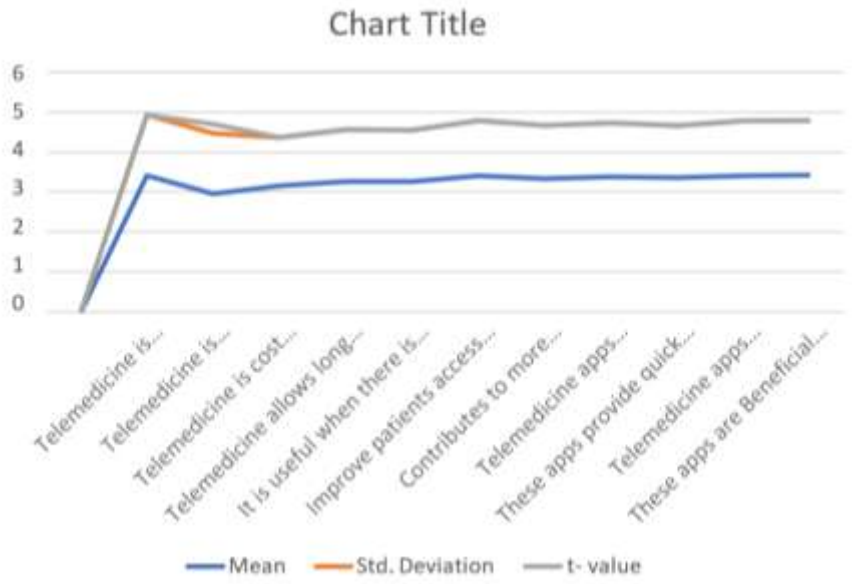


Fig.no 5 Attitude of respondents towards telemedicine

An examination of Table 6 shows that, amongst the attitude towards telemedicine, the most important factor having highest mean score (3.45) was "These apps are Beneficial for the oldage people" followed by the "Telemedicine is compatible with changing lifestyle" with a mean score of (3.44). "Telemedicine apps enhances privacy and security of patient data", "Improve patients access to care" were also the attributes with a favorable attitude by the respondents with the mean score of (3.43) on the other hand, it was interesting to note that

"Telemedicine is convenient for both doctors and patients" was having the lowest mean scoreof (2.98) and "Telemedicine is cost effective" was having the mean score of 3.18.

In table, one sample t-test at 5 percent level of significance shows that all the statement regarding attitude of consumers towards telemedicine was found to be significant except the statements that Telemedicine is cost effective, and Telemedicine is convenient for both doctors and patients. (t= 0.23). This means that in general all the respondents agree with the attitude statements.

Adoption of telemedicine by the telemedicine

The term "adoption" refers to the decision of potential users to make full use of an innovationas the best course of action available. An innovation is fully adopted when most potential users employ it. The adoption process is the mental process through which an individual passes from first learning about an innovation to final adoption. The individual passes throughfive stages i.e., awareness, interest, evaluation, trust and adoption.

Sources of awareness of Telemedicine

The respondents were asked about the sources of information regarding the telemedicine service awareness. The results examined in the table 6 show that there are multiple sources ofawareness used by the respondents.

Table 7: Distribution of respondents according to sources of awareness ofTelemedicine (N=205)

Sources of Awareness	No. of respondents	Percentage
Newspaper & Magazines	78	38.04
Doctor	68	33.17
Internet	73	35.60
T.V	84	40.97
Relatives/ friends	82	40.00

*Multiple choice

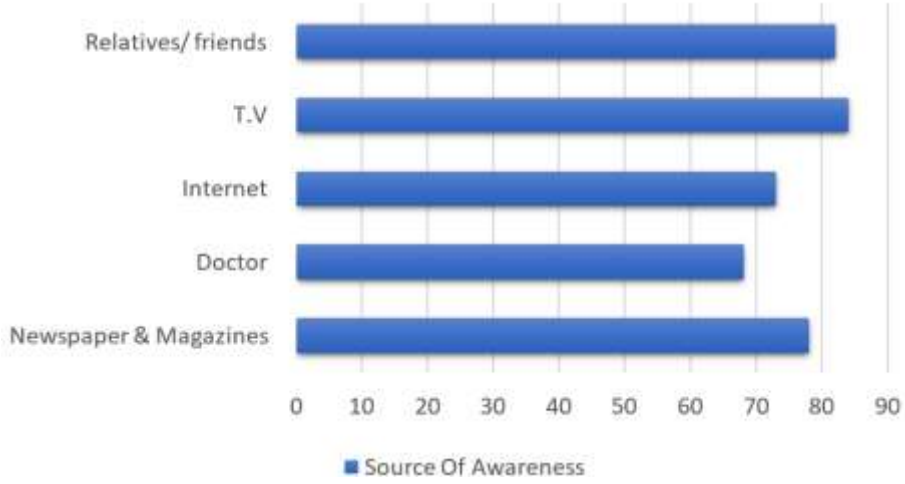


Fig.no 6 Distribution of respondents according to sources of awareness ofTelemedicine

The results in table 7 shows that 40.97 percent of the respondents of Ludhiana receivedawareness regarding telemedicine services from T.V. 40 percent respondents received awareness from friends/ relatives.

The respondents got information from other sources such as newspaper & magazines,internet, and doctor.

TIME PERIOD OF USAGE OF TELEMEDICINE

The respondents were asked about the time since when they were using tele-medicine. The results presented in table 7 shows most of the respondents are using telemedicine since long.

Table 8: Distribution of respondents according to time Period of usage of tele medicine

Year	No. of respondents	Percentage
Less than 1 year	72	35.12
1-3 year	79	38.54
3-5 year	40	19.51
More than 5 years	14	6.83
Total	205	100

Fig.no 7 Distribution of respondents according to time Period of usage oftelemedicine

Table 8 shows the time period of usage of telemedicine by the respondents. 38.54 percentof the respondents have been using telemedicine for the period of 1-3years. Among the other respondent's 35.12 percent have recently started using telemedicine service i.e., forless than 1 year 19.51 and 6.83 percent respondents fall in 3-5 year and more than 5 years.

TRUSTING TELEMEDICINE W.R.T PERSONAL DATA

The respondents were asked about whether they have trust in telemedicine in relation tothe personal data. The results examined in the table below shows trust and level of confidence of respondents.

Table 9: Distribution of respondents according to their trust in telemedicine withtheir personal data

Trust	No. of respondents	Percentage
Yes	185	90.24
No	20	9.76
Total	205	100

Fig.no 8 Distribution of respondents according to their trust in telemedicine withtheir personal data

Respondents were asked whether they trust telemedicine with respect to their personal data. It can be seen from table 9 that 90.24 percent of the respondents have trust in the telemedicine service with respect to their personal data, while the rest 9.76 percent of therespondents do not trust telemedicine in relation to their personal data.

SERVICES USED FOR ROUTINE PROBLEMS

The respondents were enquired about the services they use for routine problems.Different parameters were presented and one of the parameters was to be answered by the respondents. In Table 10 the examined results are presented.

Table 10: Distribution of respondents according to the services used for routineproblems

Service adopted	No. of respondent	Percentage
Only telemedicine	56	27.32
Visit doctor physically	32	15.60
Both telemedicine and physical visit to doctor	117	57.08
Total	**205**	**100**

Fig.no 9 Distribution of respondents according to the service used for routineproblems

The results in table 10 shows that for the routine medical check-up or routine problem respondents were using both telemedicine and physical visit to doctor as the percentagewas 57.08 followed by only telemedicine (27.32) and visit doctor physically (15.60) percent.

Further the respondents were asked which services were availed in case of emergency. Theresponse is given in Table 11.

ISBN: 978-93-5680-531-6
www.npapublishing.in

Table 11: Distribution of respondents according to the services used for Emergencyproblems (N=205)

Service adopted	No. of respondents	Percentage
Telemedicine	26	12.68
Physical visit to doctor	120	58.54
Both	59	28.78
Total	**205**	**100**

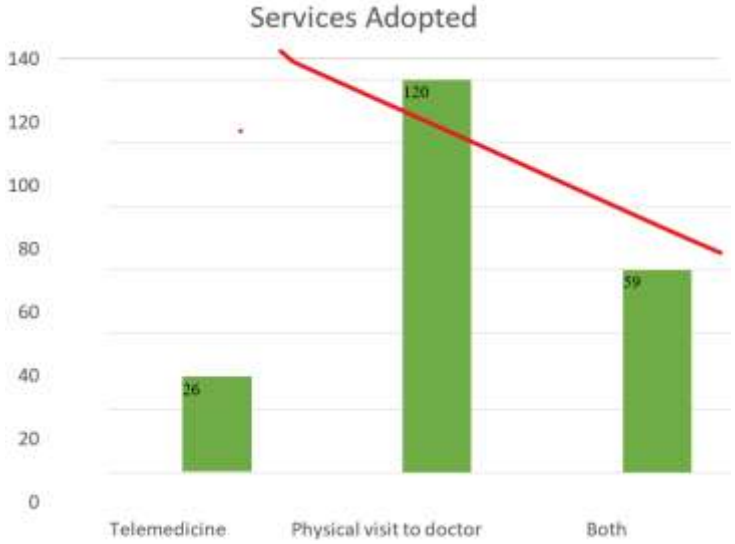


Fig.no 10 Distribution of respondents according to the services used forEmergency problems

In table 11 respondents were asked about the service they adopt when they haveemergency medical condition and it can be seen that respondents prefer to physically visitthe doctor as 58.54 percent of them did so. Both of the ways were adopted by 28.78 percent of respondents followed by 12.68 percent which used only telemedicine service.

4.3.1 Benefits from Telemedicine

Benefits are the relative advantages that a person accrues from using any service or product. The respondents were asked about what kind of benefits they receive from usingthe telemedicine services.

The results were presented in Table 12.

Table 12: Distribution of respondents according to the benefits of telemedicine (N=205)

Statement	Mean	Std. Deviation	t- value
Reduce cost of health care	3.29	1.50	2.56*
Reduced travel time	3.44	1.43	4.01*
Shorter or fewer hospitalstays	3.36	1.34	3.40*
Increase efficiency of management of chronic disease	3.42	1.21	4.53*
Better patient engagement	3.47	1.23	4.9*
Open access to morepatients	3.44	1.27	4.48*
Better medical support forrural areas	3.27	1.38	2.60*
Useful in disasters andepidemics	3.21	1.43	1.92*
Availability of health careservices made easier specially during pandemic conditions	3.32	1.35	3.10*
Better way to save medicalinformation	3.26	1.45	2.36*

Significant at 5% level of significance μ=3 ` `t= 1.96

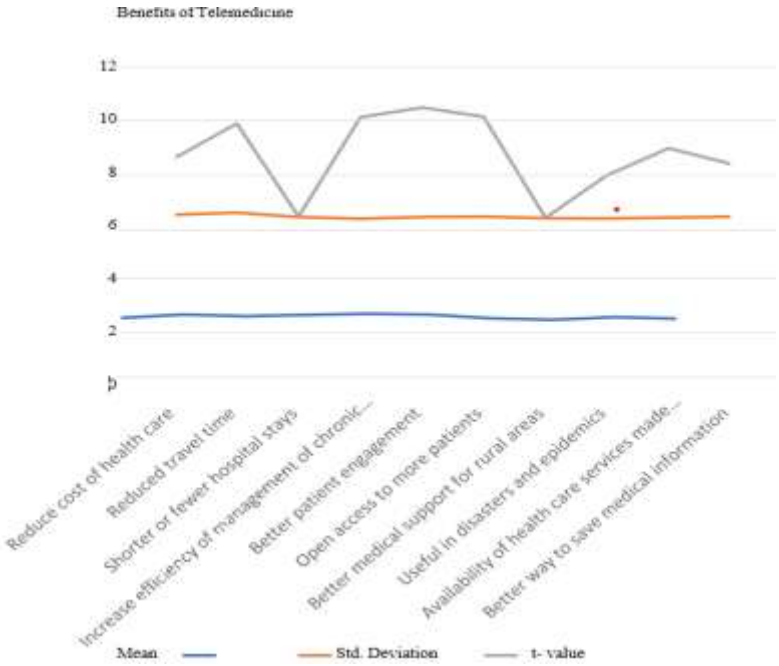


Fig.no 11 Distribution of respondents according to the benefits of telemedicine

In table 12 respondents were asked about the relative benefits that they accrue from telemedicine service and according to the highest mean score of (3.47) it was found that"Better patient engagement" was the most beneficial followed by two other major benefits which were "Open access to more patients and "Reduced travel time" with a mean score of 3.44. "Increase efficiency of management of chronic disease", "Shorter orfewer hospital stays" and Availability of health care services made easier especially during pandemic conditions were amongst the benefits which were of utmost importancefor the respondents. It was also noted that "Useful in disasters and epidemics and "Bettermedical support for rural areas" were not considered much beneficial by the respondentsas the mean score was (3.21) and (3.27) these means were lowest in the given set of benefits.

In table, one sample t-test at 5 percent level of significance shows that all the statement regarding benefits of telemedicine was found to be significant except the statements thatUseful in disasters and epidemics. (t= 1.92). This implies that all the statements of benefits made have significant importance for the respondents.

Attributes considered by respondents while purchasing telemedicine

In general, while purchasing some product or service we often tend to see the relative factors which decides whether to buy something or not. The respondents were asked about the factors they considered when purchasing telemedicine services. The results obtained are highlighted in Table 13.

Table 13: Attributes considered for purchase consideration of telemedicine (N=205)

Parameter	Mean	Std. Deviation	t- value
Price	3.17	1.59	1.38*
Quality	3.35	1.33	3.20*
Feasibility	3.27	1.41	2.54
Time factor	3.28	1.33	2.75*
Comfort	3.30	1.32	2.99*
Availability	3.27	1.40	2.51*
Diagnostic accuracy	3.26	1.33	2.57*
Safety	3.39	1.36	3.71*

*Significant at 5% level of significance μ=3 ` `t= 1.96

ISBN: 978-93-5680-531-6
www.npapublishing.in

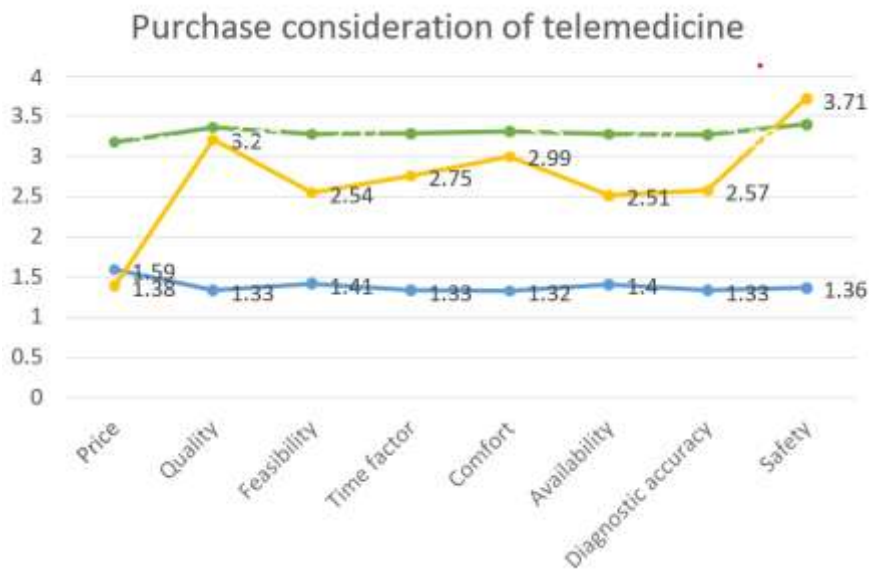


Fig.no 12 Attributes considered for purchase consideration of telemedicine

It can be clearly seen from the table 12 that the most important attributes for respondentswhile making a purchase consideration for a telemedicine service are Safety and Qualityof telemedicine since they have the highest mean scores of (3.71) and (3.320) respectively. Comfort, time factor and diagnostic accuracy are also considered important parameters by the respondents while deciding the purchase of telemedicine as they also have the highest mean score of (3.30), (3.28) and (3.26). Relatively less considered attributes by respondents while making a purchase consideration for a telemedicine service is the price factor which has a mean score of (3.17).

In table, one sample t-test at 5 percent level of significance shows that all the statement regarding purchase consideration of consumers towards telemedicine was found to be significant except for price. (t=1.38).

4.3.2 Level of satisfaction of respondent's w.r.t Telemedicine services

Satisfaction is the kind of fulfillment of one's need or expectation. The respondents were askedabout the satisfaction level of toward the use of telemedicine. The results obtained regarding the level of satisfaction are highlighted in Table 14.

Table 14: Distribution of respondents in terms of their level of satisfaction w.r.tthe telemedicine services.

Parameter	Mean	Std. Deviation	t- value
Ease of registration/scheduling	3.15	1.35	1.40
Quality and visualimage	3.36	1.36	3.48*
Quality of audio sound	3.26	1.50	2.28*
Ability to talk freelywith doctors	3.48	1.35	4.62*
Ability to understand the diagnosis made and recommendations	3.43	1.26	4.39*
Quality and care received from the doctors	3.50	1.30	5.04*
Cost-benefit received	3.52	1.19	5.72*
Relationship withdoctors	3.50	1.31	4.95*
Overall telemedicineservices consultation experience	3.55	1.28	5.57*

*Significant at 5% level of significance μ=3 ` `t= 1.96

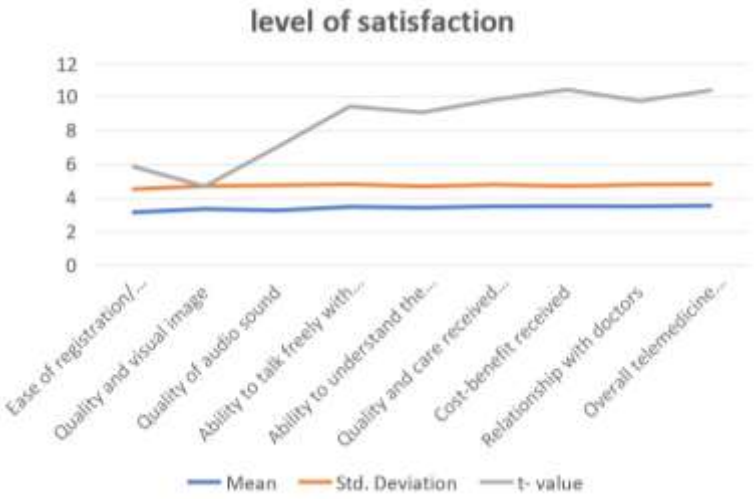


Fig no 13 shows respondents' level of satisfaction in terms of number of parameters.

Respondent satisfaction was high for "Overall telemedicine services consultation experience" as it has the highest mean score of (3.55), respondents were also satisfied with cost benefit received from telemedicine as it was the second parameter which has the highest mean score of (3.52). Some of the parameters didn't provide much satisfactionto the respondents towards telemedicine which included "Ease of registration/ scheduling" with the lowest mean score of (3.15) and "Quality of audio sound" which hasmean score (3.26).

In table, one sample t-test at 5 percent level of significance shows that all the statement regarding level of satisfaction towards telemedicine was found to be significant except for Ease of registration/ scheduling. (t=1.38). This implies that all the satisfactionparameters were obtained by the respondents.

4.4 Problems and issues relating to telemedicine services

In this section respondents were enquired about the problems they faced while using telemedicine and whether they will recommend to others or not.

4.4.1 Problems faced while using telemedicine services

The respondents were asked about the problems related to telemedicine services.

They were asked to respond on a 5-point scale from 1 to 5 with '1' representing 'Never' and '5' representing 'very often'. Results based on the responses have been shown in thefollowing table.

Problems/Issues	Mean	Std. Deviation	t- value
Trust concern	1.81	.972	16.04*
Poor quality	2.08	.946	12.77*
Poor functionality	1.86	.849	17.55*
Lack of confidence	2.18	.954	11.30*
Not economical	2.06	1.041	11.75*
Time consuming	1.99	1.012	13.07*

Table 15: Problems/issues related to telemedicine service(N=205)

*Significant at 5% level of significance μ=3 ` `t= 1.96

Fig no 14 Problems/issues related to telemedicine service

ISBN: 978-93-5680-531-6
www.npapublishing.in

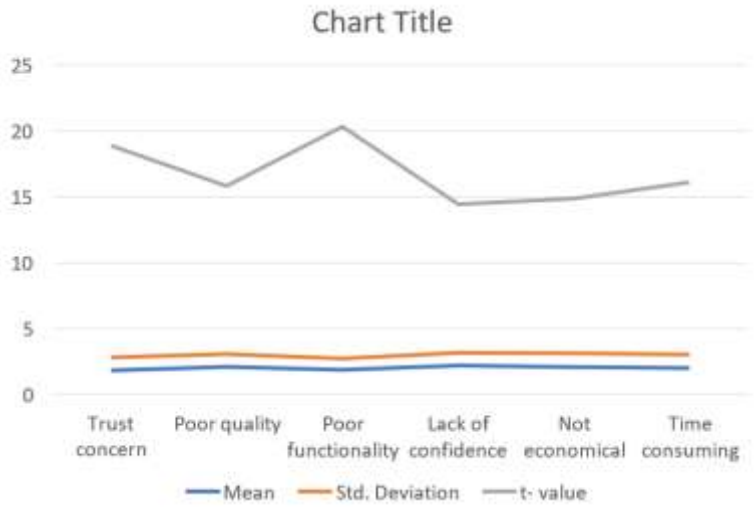


Table 15 shows the problems/issues faced by the respondents in terms of usage and purchase telemedicine services. It can be seen that most prevalent problem/ issues faced by the respondents were "Lack of confidence" with the highest mean score of (2.18) followed by the "Poor Quality" which has the mean value (2.08). The least prevalent problem/issue was poor functionality and trust concern with mean score (1.86) and (1.81). Further, one sample t-test was applied which shows that all the factors were significant at5% level of significance. Therefore, the respondents had similar opinion regarding the issues faced while using telemedicine services.

4.4.2 Recommendation to others

The respondents were asked whether they would recommend the telemedicine services to other family members and friends.

Table 16: Distribution of respondents in terms of recommendation to others

Recommendation	No. of respondents	Percentage
Yes	187	91.22
No	18	8.78
Total	205	100

Fig no 15 Distribution of respondents in terms of recommendation to others

The results presented in the above table shows that, respondents were ready to recommendtelemedicine services to their friends and family member. Among the respondent's 91.22 percent of them would recommend the telemedicine service, whereas only 8.78 percent won't recommend telemedicine services to others.

4.5 Discussion

Results of the study provide valuable insights into assessment of consumer awareness, attitude, and adoption towards telemedicine. Several important dimensions have emergedfrom the findings of the study, and these are discussed in the following paragraph.

The study shows that 89 percent of the respondents were aware of telemedicine servicesand the period of awareness ranged from 1-3 years followed by the less than 1 year. Therespondents were categorized into different age groups and various other demographic parameters. It was also seen that 51.08 percent of respondents were male while 48.92 percent of respondents were female. Further, 43.72 percent of respondents fall in 21–30-year age group. It was also seen that 47.18 percent of the respondents are post graduate while 41.12 percent of the respondents are graduates.

The most beneficial aspect for the respondents was better patient engagement and they considered telemedicine as "These apps are Beneficial for the old age people", followedby the "Telemedicine is compatible with changing lifestyle" with a mean score of (3.44)."Telemedicine apps enhances privacy and security of patient data", "Improve patients access to care" were also the attributes with a favorable attitude by the respondents. All the respondents agreed on attitude statements.

The major source of awareness of telemedicine was T.V as 40.97 percent of the respondents of Ludhiana received awareness regarding telemedicine services from it.

38.54 percent of the respondents were using telemedicine between 1-3 years. However, results were differentiating as for routine problems respondents were using both the methods physical visit to doctor and telemedicine but for emergency problems the most common method was physical visit to doctor. Open access to more patients, better patientengagement reduced travel time, and increase efficiency of management of chronic disease were some of the benefits which were considered as important by the respondents. According to the response given by the respondents it can be clearly seen that the most important attributes for respondents while making a purchase consideration for a telemedicine service are Safety and Quality of telemedicine having the highest mean score of (3.71) and (3.20. Respondents were mostly satisfied with the overall telemedicine service consultation than the other variable. Therefore, companies need to address these kinds of problems so as win the trust level of the consumers. Lastly, the respondents reported considerable intent to recommend the telemedicine services to friends and relatives. This means word of mouth has important role in adoption of these products

In this chapter summary and conclusions of the study have been presented, to understandthe implications of the findings. Telemedicine is now no more a privilege of people of developed countries or elite class. Telemedicine will soon be an integral part of mainstream medical practice in India. India has already joined the small band of nationsthat have held international conferences on telemedicine. As a result, / not only the rich but also higher middle class in the metro cities of India are aware of telemedicine serviceand wants to avail telemedicine service. The exponential growth in information and communication technology, as well as the plummeting costs and increasing awareness oftelemedicine leave no doubt that telemedicine is certainly revolutionizing healthcare delivery in India.

With the increase in awareness among the consumers and the technology advancement among people, it is expected that more and more people may opt for telemedicine services. Therefore, the present study aims to explore the consumer's awareness, attitudeand adoption of telemedicine services. Thus, the present research was undertaken with the following specific objectives.

1. To study the awareness and attitude of consumers towards telemedicine in Ludhiana
2. To study the adoption of telemedicine by consumers in Ludhiana.

The study was undertaken in Ludhiana city. The population for the study consisted of allthe consumers who have potential or willingness to buy telemedicine services. To study,231 respondents were selected on the basis of convenience and snowball sampling. The primary data was collected with the help of structured and non- disguised questionnaire.Questions were asked related to consumer awareness, attitude, interest, constrain, evaluation of biodegradable packaging. The data/ information contained in the questionnaire were first transferred to master table which facilitated tabulation of data indesired form. Various tools were used such as standard deviation, percentages, one sample t-test to check whether there is significant difference between the mean scores of attributes.

MAIN FINDINGS OF THE STUDY

Main findings of the study are given below:

Profile of the respondents

- It was seen that 51.08 percent of respondents were male while 48.92 percent of respondents were female. Further, 43.72 percent of respondents fall in 21–30- year age group, 23.38 percent of respondents fall

under 41-50 year age group,

17.75 percent of respondents fall under 31-40 year age group followed by 10.82 and 4.33 percent which fall under above 50 and less than 20 year age group. It was also seen that 47.18 percent of the respondents are post graduate, 41.12 percent of the respondents are graduates and 7.37 percent of the respondents havehigher secondary education level, followed by 3.47 and 0.86 percent of total sample which have doctorate and matric level qualification. The results show that,

35.94 percent of respondents fall under annual household income of 10-15 lakh rupees, 21.64 percent of respondents fall under annual household income of 5-10lakh rupees, 20.78 percent of respondents fall under annual household income ofmore than 15 lakh rupees, followed by 14.28 and 7.36 percent of respondents which fall under 2.5-5 and less than 2.5 lakh rupees of annual family income.

AWARENESS OF RESPONDENTS REGARDING TELEMEDICINE

- The result presented that 88.75 percent of the total respondents were aware of telemedicine services While 11.25 percent of the respondents were not aware. It was found that 34.14 percent of the respondents have been aware of the telemedicine service from 1-3 years, 27.80 percent have been aware from less than1 year, 24.40 have been aware of telemedicine for 3-5 year and about 13.66 have been aware for more than 5 years. It was also seen that respondents who were not aware of the telemedicine wanted to know about the services as 65.39 percent of the respondents were definite to learn about the telemedicine service, 15.38 percentwere not sure and 19.23 percent of the respondent were not interested.

ATTITUDE OF RESPONDENTS TOWARDS TELEMEDICINE

- According to the responses given it was seen that, amongst the attitude towards telemedicine, the most important factor having highest mean score (3.45) was "These apps are Beneficial for the old age people" followed by the "Telemedicine is compatible with changing lifestyle" with a mean score of (3.44). "Telemedicineapps enhances privacy and security of patient data", "Improve patients access tocare" were also the attributes with a favorable attitude by the respondents with the mean score of (3.43) on the other hand, it was interesting to note that "Telemedicine is convenient for both doctors and patients" was having the lowest mean score of (2.98) and "Telemedicine is cost effective" was having the mean score of 3.18.

- one sample t-test at 5 percent level of significance showed that all the statement regarding attitude of consumers towards telemedicine was significant except thestatements that Telemedicine is cost effective, and Telemedicine is convenient for both doctors and patients. (t= 0.23). This means that in general all the respondents agree with the attitude statements.

ADOPTION OF RESPONDENTS ABOUT TELEMEDICINE

- According to the response the sources of information regarding the telemedicineservice awareness was T.V as 40.97 percent of the respondents of Ludhiana received awareness regarding telemedicine services from it. The respondents gotinformation from other sources such as newspaper & magazines, internet, and doctor.

- Based on responses received regarding time since when the respondents were using tele-medicine. It was seen that 38.54 percent of the respondents have beenusing telemedicine for the period of 1-3years. Among the other respondent's 35.12 percent have recently started using telemedicine service i.e., for less than 1year 19.51.

- The respondents were enquired about the services they use for routine problems.The results showed that for the routine medical check-up or routine problem respondents were using both telemedicine and physical visit to doctor as the percentage was 57.08 followed by only telemedicine (27.32) and visit doctor physically (15.60) percent. Respondents were also asked about the services theyused in emergency problems. It was seen that respondents prefer to physically visit the doctor as 58.54 percent of them did

so. Both ways were adopted by 28.78percent of respondents followed by 12.68 percent which used only telemedicine service.

- Respondents trusted telemedicine in respect to their personal data as it can be seen that 90.24 percent of the respondents answered yes they have trust in telemedicine because of their data privacy.
- According to the responses regarding the Benefits that respondents received fromusing the telemedicine services. It was found that "Better patient engagement" (3.47) was the most beneficial followed by two other major benefits which were "Open access to more patients and "Reduced travel time" with a mean score of 3.44. "Increase efficiency of management of chronic disease", "Shorter or fewerhospital stays" and Availability of health care services made easier especially during pandemic conditions were amongst the benefits which were of utmost importance for the respondents. It was also noted that "Useful in disasters and epidemics and "Better medical support for rural areas" were not considered muchbeneficial by the respondents as the mean score was (3.21) and (3.27) these meanswere lowest in the given set of benefits.
- one sample t-test at 5 percent level of significance shows that all the statement regarding benefits of telemedicine was found to be significant except the statements that Useful in disasters and epidemics. (t= 1.92). This implies that allthe statements of benefits made have significant importance for the respondents.
- The respondents were asked about the factors they considered when purchasing telemedicine services. It was seen that the most important attributes for respondents while making a purchase consideration for a telemedicine service areSafety and Quality of telemedicine since they have the highest mean scores of (3.71) and (3.320) respectively. Comfort, time factor and diagnostic accuracy are also considered important parameters by the respondents while deciding the purchase of telemedicine as they also have the highest mean score of (3.30), (3.28) and (3.26). Relatively less considered attributes by respondents while making a purchase consideration for a telemedicine service is the price factor which has a mean score of (3.17).one sample t-test at 5 percent level of significance shows that all the statement regarding purchase consideration of consumers towards telemedicine was found to be significant except for price. (t=1.38).
- The respondents were asked about the satisfaction level of toward the use of telemedicine. The results obtained regarding the level of satisfaction showed that,"Overall telemedicine services consultation experience" was the most satisfied parameter as it has the highest mean score of (3.55), respondents were also satisfied with cost benefit received from telemedicine as it was the second parameter which has the highest mean score of (3.52). Some of the parameters did not provide much satisfaction to the respondents towards telemedicine whichincluded "Ease of registration/ scheduling" with the lowest mean score of (3.15)and "Quality of audio sound" which has mean score (3.26).one sample t-test at 5 percent level of significance shows that all the statement regarding level of satisfaction towards telemedicine was found to be significant except for Ease of registration/ scheduling. (t=1.38). This implies that all the satisfaction parameterswere obtained by the respondents.
- From responses it was seen that most prevalent problem/ issues faced by the respondents were "Lack of confidence" with the highest mean score of (2.18) followed by the "Poor Quality" which has the mean value (2.08). One sample t- test was applied at 5% level of significance to see whether there was significant difference among the problems/issues faced by respondents while purchasing or using telemedicine. Among the parameters considered lack of confidence, not economical and poor qualities were the major problems/issues.
- Respondents were most likely to recommend telemedicine services to theirfriends and family member. Among the respondent's 91.22 percent of them would recommend the telemedicine service.

LIMITATIONS OF THE STUDY

Any study based on employee survey through a pre- designed questionnaire suffer from the basic limitation of the possibility of difference between what is recorded and what isthe truth no matter how carefully the questionnaire has been designed and field investigation has been conducted. This is because the consumers may not deliberately report their true preferences and even if they want to do so, there are problems bound todifferences owing to problems in filters of communication process. The error has been tried to be minimized by conducting interviews personally yet there is no proof way of obviate the possibility of error creeping in. In addition, there are limitations regarding scope of validity of conclusion as follows:

1. The sample size taken at convenience might have affected the results of thestudy.
2. Some biasness might have crept in the response or some information could havebeen concealed due to human nature.
3. Due to time and cost constraints, the study could not be conducted covering morecities.
4. Best efforts were made to incorporate all important variables in the study. Yetthe chances of some variables not appearing in the study are not ruled out.
5. There was some problem in getting the information from respondents as they were interviewed in a very short time and few of them were quite busy to give proper thought to the questions.
6. The study being based on data available from personal opinions of the respondents may suffer from the personal bias up to some extent.
7. Due to ongoing pandemic situation, most of the respondents were not willing toreply. The reliability of the findings depends upon the tools and the techniques used in the analysis.

CONCLUSION

Telemedicine in the home has several advantages over hospitalization. It promotes moreefficient use of hospital beds, resulting in cost savings, and patients tend to convalesce more rapidly at home. This latter phenomenon may be related to several factors, includingremoval of the patient from a passive dependent posture in the hospital to more active participation in his or her own medical care at home. The active involvement of patientsin their own care results in a sense of empowerment over their illness.

Cost analysis provides facilities and provides with the significant figures when determining the value of implementing a telemedicine system. The greatest value associated with telemedicine is not only the lower wait times and the reduced costs that are achieved but the improvement in patient satisfaction and allowing the patient more involvement in the care they receive.

The study reveals that majority of respondents had knowledge about telemedicineservices and most of the respondents have positive attitude towards telemedicine services. The most important reason to purchase telemedicine was the safety and qualityand to most beneficial aspect for them was these apps are beneficial for the old age peopleand convenience for both doctors and patients. The most important source of informationawareness was television and for routine check-up both telemedicine and physical visit to doctor was used. In case of emergency only physical visit was preferred. The highest satisfaction was obtained from Overall telemedicine services consultation experience. Itwas also found that constraints inhibiting the adoption of telemedicine services are lack of confidence and poor quality.

- More awareness among the people should be created by the telemedicine providercompanies as well as the doctors to better engage the patients to follow this method of consultation.
- As safety and quality were the most important factor for purchase consideration with the highest mean score, due importance should be given to these factors, andother factors should also be promoted.

- As the most beneficial aspect of telemedicine service is benefit for old age peopleand compatible with changing lifestyle methods should be followed to enhance the other beneficial aspects also.
- Trust of the respondents has to be increased in terms of their personal data.
- Routine problems should be more addressed by the telemedicine so doctorsshould encourage their patients to follow the telemedicine consultation method.
- The constraints inhibiting the adoption of telemedicine service should becorrected and special care should be taken that consumers don't face any issue.
- Telemedicine services should be promoted by the government of India and shouldbe followed in each and every government hospital.

REFERENCES

1. Acharya R V and Rai J J (2016) Evaluation of patient and doctor perception toward the use of telemedicine in Apollo Tele Health Services, India. *J Family Med Prim Care* **5:**798-803.
2. Adenuga K L, Lahad N A and Miskon S (2020) Telemedicine system: service adoption and implementation issues in Nigeria. *Indian J Sci Technol* **13:** 1321-27.
3. Agarwal N, Jain P, Pathak R, Gupta R (2020) Telemedicine in India: A tool fortransforming health care in the era of COVID-19 pandemic. *J Edu Health Promot***9:**190.
4. Álvarez M M, Chanda R and Smith R D (2011) How is Telemedicine perceived? A qualitative study of perspectives from the UK and India. *Globalization and health***7:** 17.
5. Ayatollahi H, Sarabi F Z and Langarizadeh M (2015) Clinicians' knowledge and perception of Telemedicine Technology. *Perspectives in health informationmanagement* **12:** 1-15.
6. Balsaraf S V and Chole R H (2015) Knowledge, awareness and attitude among practicingdentists about teledentistry in Indore, Central India. *J Indian Assoc Public HealthDent* **13:** 434-37.
7. Bokolo A J (2020) Use of Telemedicine and Virtual Care for Remote Treatment in Response to COVID-19 Pandemic. *J Med Syst* **44**:132.
8. Brown, W, Schmitz T, Scott M, and Friesner D (2017) Is telehealth right for your practiceand your patients with asthma? *J Patient Exp* **4:** 46–49.
9. Chellaiyan V G, Nirupama AY and Taneja N (2019) Telemedicine in India: Where do we stand? *J Family Med Prim Care* **8:**1872-76.
10. Dario C, Luisotto E, Dal P E, Mancin S, Aletras V, Newman S, Gubian L and SaccaviniC (2016) Assessment of patients' perception of telemedicine services using the service user technology acceptability questionnaire. *Int J Integr Care* **16:** 13-14.
11. Eannucci E F, Hazel K, Grundstein M J, Nguyen J T and Gallegro J (2020) Patient satisfaction for telehealth physical therapy services was comparable to that ofin-person services during the COVID-19 pandemic. *HSS J* **16:** 1–7.
12. Gagnon M P, Duplantie J, Fortin J P and Landry R (2007) Exploring the effects of telehealth on medical human resources supply: a qualitative case study in remoteregions. *BMC health services research* **7:**
13. Garg S, Gangadharan N, Bhatnagar N, Singh M M, Raina S K and Galwankar S(2020)Telemedicine: embracing virtual care during COVID-19 pandemic. *J Family Med Prim Care* **9:**4516-20.
14. Harst L, Lantzsch H and Scheibe M (2019) Theories predicting end-user acceptance oftelemedicine use: systematic review. *J Med Internet Res* **21**:e13117
15. Helou S, Helou EL E, Abou K V, Wakim J, Helou EL J, Daher A and Hachem EL C (2020) The Effect of the COVID-19 pandemic on physicians' use and perceptionof telehealth: The case of Lebanon. . *Int J Environ Res Public Health* **17:**4866.
16. Hersh W R, Hickam D H, Severance S M, Dana T L, Krages K P and Helfand M (2006)Diagnosis, access and outcomes: Update of a systematic review of telemedicine services. *J Telemed and Telecare* **12:** 3–31.
17. Hjelm NM (2005) Benefits and drawbacks of telemedicine. *J Telemed Telecare* **11**:60- 70.
18. Jung S G, Kweon H J, Kim E T, Kim S A, Choi J K and Cho D Y (2012) Preference andawareness of telemedicine in primary care patients. *Korean J family med* **33:**25–33.

19. Kane J, Boulger J, Crouse B and Bergeron D (1995) Rural Minnesota family physicians'attitudes toward telemedicine. *Minnesota med* **78**:19–23.

20. Kannampallil T and Ma J (2020) Digital translucence: adapting telemedicine delivery post-COVID-

21. 19. *Telemed J E Health* **26:**1120-1122.

22. King G, Richards H and Godden D (2007) Adoption of telemedicine in Scottish remote and rural general practices: a qualitative study. *J telemed and telecare* **13:** 382– 86.

23. Le L B, Rahal H K, Viramontes M R, Meneses K G, Dong T S and Saab S (2019)Patient satisfaction and healthcare utilization using telemedicine in liver transplant recipients. *Digestive diseases and sciences* **64:** 1150–1157.

24. Lind L and Karlsson D (2014) Telehealth for "the digital illiterate"--elderly heart failurepatients experiences.

25. *Stud Health Technol Inform* **20:** 353–357.

26. Mair F and Whitten, P (2000). Systematic review of studies of patient satisfaction withtelemedicine. *BMJ Clinical research ed* **32:** 1517–1520.

27. Meher S K, Tyagi R S and Chaudhry T (2009) Awareness and attitudes to telemedicine among doctors and patients in India. *J Telemed Telecare* **15**:139-41.

28. Morgan D G, Kosteniuk J, Stewart N, O'Connell M E, Karunanayake C and Beever R(2014) The telehealth satisfaction scale: reliability, validity, and satisfaction with telehealth in a rural memory clinic population. *Telemed J E Health* **20:** 997–1003.

29. Rahman T and Hossain MA (2016) Peoples' perception towards telemedicine: A case study on rural area of Bangladesh. *J. Inf. Knowl. Manag* **6:** 43-50.

30. Reider D M M and Eliashiv D (2018) expanding the use of telemedicine in neurology: APilot Study. *J Mob Technol Med* **7:** 46-50.

31. Roca F O, Garcia N A and Pelaez C (2010) The impact of telemedicine on quality of lifein rural areas: the Extremadura model of specialized care delivery. *Telemed J E health* **16:** 233–243.

32. Russo L, Campagna I, Ferretti B, Agricola E, Pandolfi E, Carloni E, D'Ambrosio A, Gesualdo Fand Tozzi A E (2017) What drives attitude towards telemedicine among families of pediatric patients? A survey. *BMC Pediatrics* **17:** 21.

33. Shaikh A, Misbahuddin M and Memon M S (2008). A system design for a telemedicinehealth care system. *IMTIC* **20:** 295-305.

34. Singh A, Roy A and Goyal P (2016) Telemedicine and telehealth - The Indian scenario.

35. *J Integr Health Sci* **4:**3-8.

36. Sravan Kumar, Kavita Bhalekar, Pretty Bhalla (2020) Consumer's response to telemedicine as a healthcare delivery model in UAE. *SSRG* int. j. nurs. health sci**6:** 17-2.

37. Zachrison K S, Boggs K M, Hayden E M, Cash R E, Espinola J A, Samuels-Kalow M E,Sullivan A F, Mehrotra, A and Camargo C A Jr (2020) Factors associated with emergency department adoption of telemedicine: 2014 to 2018. *J Am Coll EmergPhysicians Open* **1:** 1304–1311.

38. Zayapragassarazan Z and Kumar S (2016) Awareness, knowledge, attitude and skills of telemedicine among health professional faculty working in teaching hospitals. *J Clin Diagn Res* **10:**1–4.

39. Zhang X and Zaman U B (2020) Adoption mechanism of telemedicine in underdevelopedcountry. *Health informatics J* **26:**1088–1103.

ABOUT THE EDITOR'S

Sushendra Kumar Misra is working with IK Gujral Punjab Technical University and heading Centre for Executive Education. He is member secretary of BoG, FC, AC, Senate etc and chairman, BOS and other committee. He worked at Dr. B. R Ambedkar National Institute of Technology (NIT), Jalandhar as Registrar and Head, Center for Continuing Education. He has also worked as Director, Controller and Dean in Punjab Technical University, Jalandhar.

He is an alumnus of IIM Bangalore and Syracuse University, New York, USA. He has done his M.B.A and Ph. D in Management. He has more than 25 years of experience in the field of Academic Administration, Educational Planning and Management, Financial Management, Human Resource Management, Public Policy, Skill Development, skill Training etc. He has published many research papers, books, patent, organized conferences, seminars workshop and training in India and abroad. He has visited many countries like Malaysia, Thailand, Australia, Slovenia, Singapore, Austria and USA. He is a Life Member of All India Management Association (AIMA), New Delhi, Indian Society for Technical Education (ISTE), New Delhi, Youth Hostels Association of India, New Delhi, Association of Indian Management Scholars International (AIMS), Houston, USA, Associate Fellow of World Business Institute, Australia and Member of International Economic Development Research Center, Hong Kong. is member secretary of BoG, FC, AC, Senate etc and chairman, BOS and other committee.

Rashmi Gujrati is a Professor & Dean of International Affairs in India. She is a Researcher, Teacher Educator, Administrator. She has managerial skills in direction of achieving the goal of success to stature the academic community and demonstrates ample credibility for educational leadership, strategic thinking, team building, and resources developed for research and consultancy activities with emphasis on entrepreneurship skills contributing towards the development of the society. She has 30 years of experience in teaching. Her teaching area is International Trade, Finance, Export & Import management, Business environment, Indian economy, Entrepreneurship, Organization Behavior. Consumer behavior, Service marketing, Marketing Management. She has significantly contributed to enhancing Management understanding by participating in over 100 above management conferences, Symposia, Seminars, workshops, FDP's EDP by chairing technical sessions and delivering in plenary and invited talks National and International. She has about 150 papers published in International Journal and 40 papers in National Journal and various chapters in Book. She is a Life Member of the Indian Commerce Association Indian Accounting Association, Indian College Principals Association. She is Regulatory board Member, Scientific & Review Committee, Advisory Board, Editorial research project/trainer/consultant/ researcher, AASE Member Chung Yaun Christiana University Taiwan, Regulatory board, Reviewer & Scientific Board Committee member of InTraders Academic Platform, Sakarya University Turkey, Laescuela Education Scientific & Research Synergy Foundation (RSF) Indonesia, (IJEFMS) Science Publish Group, USA,FSSER Malaysia, GI-SSF Malaysia, Reviewer IBIMA Association Spain, Common Ground Research Networks University of Illinois USA. Executive Director and editor of Tradepreneur Academic Platform Southampton UK.

Asena Boztas completed her undergraduate and graduate studies at Sakarya University, Department of International Relations. She started her doctorate at Sakarya University in the department of Public Administration and transferred to the international relations department where she completed it. She stepped into the academic community as a research assistant at Sakarya University in 2007, became an Assistant Professor in 2012 and an Associate Professor in 2020, stepped into she got her title. Today, as a part of the Sakarya University of Applied Sciences family, Boztaş conducts studies on Africa, international security, and intern ational trade. Academicians who have published many international book chapters, books, articles, and papers have worked in international and national projects, and their studies are continuing.

Naresh Sachdev, Ph.D. in Management, is a distinguished academic and industry leader, serving as Professor cum Director at Punjab College of Technical Education, Ludhiana, and Chair of the Student Forum and Joint Secretary at Ludhiana Management Association affiliated with AIMA. With over 30 years of entrepreneurial experience, he possesses extensive expertise in sales, marketing, operations, and more, having held leadership roles in the Fastener Manufacturer Association of India (FMAI) and serving as a Mentor for Change at NITI Aayog. Dr. Sachdev is a recipient of the GEMS of MENTOR India award from Atal Innovation Mission (AIM) for 2023-2024, Business Coach for the Business Blasters Program, Ambassador of Institution Innovation Council, Director of PCTE Hatch Lab Incubator, and Member Punjab Start -up Cell, and other prominent organizations. Has authored numerous research papers on fintech, entrepreneurship, and innovation, published in reputable journals like Inderscience, Emerald Publishing, and Taylor & Francis.

Published By:

PCTE Group :

Punjab College of Technical Education

PCTE Group of Institutes

PCTE Institute of Engineering and Technology

Ludhiana, Punjab

Printed By

National Press Associates

Head Office: C-24, Ground Floor, Panchsheel Vihar, Malviya Nagar, New Delhi-110017, India

Regional Office: 79, GAD Nagar, Flower Enclave, Dugri, Ludhiana, Punjab-141013, India

Branch Office: G-1003,Prakriti Society, Baner-Balewadi Road, Balewadi Pune, 411045 Maharashtra, India

Email: npapublishing@gmail.com / www.npapublishing.in

Helpline: +91-9888934889, 7986925354

ISBN 978-93-5680-531-6