AARAMBH

JOURNAL OF MULTIDOMAIN RESEARCH

Peer Reviewed & Refereed Journal

Volume – 1 | Issue – 1 | November 2025

ISSN: XXXX-XXXX (To be allotted)

Published by
Ananta Group of Journals
Email: anantagroupofjournals@gmail.com
Website: https://anantagoj.org

Aarambh Journal of Multidomain Research
ISSN NO: ……..
" Peer Reviewed & Refereed Journal "

About the Journal

Aarambh Journal of Multidomain Research is a peer-reviewed academic journal established to promote the beginning (*Aarambh*) of innovative, rigorous, and impactful research across multiple domains of knowledge. The journal aims to provide an inclusive scholarly platform that encourages research contributions from diverse academic and professional disciplines. The journal publishes original research articles, review papers, and conceptual studies that address contemporary issues through multidomain and interdisciplinary perspectives.

Aim

- Promote **high-quality, original, and innovative research** in multidisciplinary and interdisciplinary fields.
- Encourage the integration of **theoretical knowledge with practical applications** to address contemporary academic and societal challenges.
- Support emerging researchers by offering a **rigorous peer-reviewed publication platform**.
- Foster **interdisciplinary collaboration** among scholars from arts, science, commerce, management, education, technology, and allied fields.
- Contribute to the **dissemination of research-based knowledge** that supports academic excellence, policy development, and social progress.

Published By
Ananta Group of Journals,
Block No. H-10, Janakpuri Apartment,
Zanzarda Road, Junagadh – 362001, Gujarat, India
Email: anantagroupofjournals@gmail.com
Website: https://anantagoj.org/

Aarambh Journal of Multidomain Research
ISSN NO: ……..
" Peer Reviewed & Refereed Journal "

About the Journal

Particular	Details
Journal Title	**Aarambh Journal of Multidomain Research**
Starting Year	2025
Frequency	Monthly
Publication Format	Print
Subject Area	Multidisciplinary
Language	Multiple Languages (English, Gujarati)
Publisher Name	Ananta Group of Journals
Publisher Address	Block No. H-10, Janakpuri Apartment, Zanzarda Road, Junagadh – 362001, Gujarat, India
Publisher Email	anantagroupofjournals@gmail.com

This journal publishes articles in multiple languages.

Languages used: English, Gujarati."

Aarambh Journal of Multidomain Research
ISSN NO: ……..
" Peer Reviewed & Refereed Journal "

Editorial Board

Aarambh Journal of Multidomain Research
ISSN NO: .....
" Peer Reviewed & Refereed Journal "

INDEX

AARAMBH JOURNAL OF MULTIDOMAIN RESEARCH
ISSN NO.:.....
Peer Reviewed & Refereed Journal

CUSTOMER EXPECTATIONS FROM AI-BASED ACCOUNTING SERVICES: A PRIMARY SURVEY IN BARODA CITY

MRS KHUSHBU THAKKAR
GOKUL GLOBAL UNIVERSITY
DR. VASANTH KUMAR SRINIVASA RAO MEESALA
GOKUL GLOBAL UNIVERSITY

ABSTRACT

This research paper will attempt to identify what customers are seeking in AI-based accounting services in the city of Baroda. With the growth of technology, most accounting firms and companies are making use of Artificial Intelligence (AI) to offer quicker and more precise services. They are offering services such as automatic bookkeeping, tax filing, data analysis, and real-time financial reporting. The primary scope of this study is to identify what facilities and advantages customers are seeking when they avail AI-based accounting services.

A survey was done among different segments of customers in Baroda city, including business people, self-employed, and employed. The study collected their perceptions regarding ease of use, speed, accuracy, data security, cost benefits, and customer support for AI-based accounting services. The perceptions were analysed using simple statistical measures to obtain the overall trends and choices.

The findings show that most customers prefer easy, time-efficient, and instant and accurate services. They prefer strong data privacy and proper support when needed. The research will allow the service providers to understand customers' demand and improve the quality of AI-based accounting services in the future. It also shows greater trust and demand for technology in accounting.

KEY WORDS : AI-BASED ACCOUNTING, CUSTOMER EXPECTATIONS, BARODA CITY, AUTOMATED BOOKKEEPING, DATA SECURITY, FINANCIAL SERVICES, SURVEY ANALYSIS, TECHNOLOGY IN ACCOUNTING.

INTRODUCTION

In the fast-evolving world today, technology is continuously altering business behaviour. Among the newest and most beneficial technologies is Artificial Intelligence (AI) that is increasingly being employed across a number of sectors, even in accounting. AI-based accounting services assist in the upkeep of financial activities such as bookkeeping, tax filing, creating invoices, and financial reports at a faster and better precision. Small and medium-sized businesses, as well as common users, find those types of services particularly convenient because they desire to have simple, quick, and hassle-free accounting services.

In India, and in developing cities like Baroda, many accounting bodies and associates are now adopting AI tools to improve their services. Such tools can automatically process large

amounts of data, avoid human errors, and provide real-time financial data. With more individuals exposed to such services, their needs also increase. Customers today look for services that are easy to use, safe for their data, cost-effective, and provide fast results.

This research aims to understand what Baroda city customers desire in AI-based accounting services. It aims to understand their preference, opinion, and satisfaction level. Conducting a primary survey of different users—businessmen, freelancers, and salaried employees—the research tries to understand what are the most sought-after features customers desire.

Information regarding these expectations enables service providers to improve their services and gain the trust of customers. The study will also help in determining the growing use of AI in accounting and its effect on the conduct of customers. Technology is growing day by day, and it is needed to keep pace with the demands of customers, and the study is a step in this direction. The study shall guide the current and prospective providers of AI-based accounting services to serve their customers better in Baroda city.

LITERATURE REVIEW

Current studies point out the revolutionary influence of Artificial Intelligence (AI) in all industries, particularly customer service, banking, CRM, and accounting. Tripathi (2025) also points out the role of AI in enriching customer experience through chatbots, predictive analysis, and sentiment analysis, again emphasizing that net ROI comes from employee and customer satisfaction, and not just from cost savings. Egbuhuzor et al. (2025) also examine the influence of AI in the redefinition of CRM in the financial service sector, enhancing personalization and operational effectiveness, and minimizing issues such as data privacy and regulatory issues.

Mustafa (2024) evaluates AI chatbots in UAE's delivery apps, which quantify user dissatisfaction because of the absence of contextual understanding and suggests hybrid human-AI support. Kaakandikar et al. (2025) further mention that although users accept chatbots for basic banking transactions, trust and data protection become concerns, which require multilingual and personalized solutions. Ikumapayi (2025) looks at the broader picture, illustrating how AI and FinTech technologies enhance fraud prevention and financial regulation but also pose ethical and regulatory concerns.

Hartanto et al. (2025) focus on CRM from a bibliometric perspective, emphasizing the advantages of AI in personalization and efficiency, but warning against implementation issues like ethical and data security concerns. Doko's (2025) style is academic to the extent of asserting that Albanian accounting students are favourable towards AI but are apprehensive regarding job loss and promoting curriculum re-freshing and ethics training.

Kesireddy & Prasad (2023) examine Indian banking services, identifying wide regional usage gaps and recommending technology upgrades. Snigdha et al. (2025) recommend an AI-scalable IT service model, highlighting the need for personalization and ethical deployment. Gabriela & Barusman (2025) examine MSMEs, identifying cloud accounting and AI-based expectations that boost profitability. Finally, Inavolu (2024) offers a thorough review of AI development in customer service, recommending hybrid, ethical, and human-focusing AI deployments to boost innovation and customer trust. Together, these studies offer a holistic view of AI's growing influence across sectors, pointing to both its vast potential and necessary safeguards.

RESEARCH GAP

Although AI-powered accounting services are evolving at a rapid rate across India, little concerning customer attitudes and expectations, especially in smaller but growing cities like Baroda, is known. Technicalities or firm adoption are what most of the current research concentrates on, while few attempt to investigate what end-users actually desire from these

OBJECTIVES

services. There is no primary data available articulating customers' opinions on usability, data.

security, cost, and support. This study attempts to fill in the knowledge gap and collect users' first-hand opinions in the Baroda city to allow service providers to learn and better serve customers' needs.

To identify the key expectations of customers from AI-based accounting services in Baroda city.

To examine customer perceptions regarding the ease of use, accuracy, data security, and cost-effectiveness of AI-based accounting solutions.

To analyse the level of satisfaction among different customer groups (business owners, salaried individuals, self-employed) using AI-based accounting services.

RESEARCH METHODOLOGY

Research Design: Descriptive research design was utilized in the study. Descriptive research design was used to describe systematically the views, expectations, and satisfaction levels of customers towards AI-based accounting services in Baroda City.

Population and Sample: The population was the varied users of AI-based accounting services in Baroda, including businessmen, self-employed individuals, and salaried individuals. The sample was 51 respondents and was selected for the survey using convenience sampling.

Sampling Technique: Convenience non-probability sampling technique was employed. The respondents were sampled on willingness and availability to respond, thus making it convenient and timely considering the scope of the study.

Data Collection Method: Primary data was collected using a standardized questionnaire. The questionnaire contained close-ended statements on a Likert scale addressing customer expectations of ease of use, speed, cost, data security, and satisfaction.

Instrument Design: The survey questionnaire was constructed to measure quantifiable dimensions of customer expectations and experiences with AI accounting. The instrument was pre-tested for consistency and clarity prior to final administration.

Data Analysis Tools: The data collected were analysed through statistical tools such as Pearson correlation and ANOVA. Correlation analysis was used to examine associations between variables, and ANOVA was used to test differences among occupational groups.
Statistical Package Used: Statistical analysis was performed using the SPSS package. The package facilitated correct calculation of correlation coefficients and hypothesis test significance values.

Hypothesis Testing: Hypotheses were established to test for the relationship between customer expectation and the use of AI services, and to test whether occupational diversity had any impact on perception and satisfaction. The results led to the acceptance or rejection of the null hypotheses.

Study Area: The research was restricted to Baroda city of Gujarat. This was because the city has a rising use of AI in accounting and varied customer segments to be approached for participation.

DATA ANALYSIS AND INTERPRETATION

H_0: There is no significant relationship between customer expectations and the use of AI-based accounting services.
H_1: There is a significant relationship between customer expectations and the use of AI-based accounting services.

Correlations

		I expect AI-based accounting services to be easy to use.	I believe AI services provide faster accounting solutions.	Accuracy in reports is an important expectation for me.	I am concerned about the security of my financial data with AI tools.	I expect AI services to reduce the cost of accounting.	I prefer using AI-based accounting services over traditional methods.
I expect AI-based accounting services to be easy to use.	Pearson Correlation	1	.730	.559	.597	.764	.564
	Sig. (2-tailed)		.000	.000	.000	.000	.000
	N	51	51	51	51	51	51
I believe AI services provide faster accounting solutions.	Pearson Correlation		1	.728	.553	.684	.472
	Sig. (2-tailed)			.000	.000	.000	.000
	N		51	51	51	51	51
Accuracy in reports is an important expectation for me.	Pearson Correlation			1	.677	.658	.475
	Sig. (2-tailed)				.000	.000	.000
	N			51	51	51	51
I am concerned about	Pearson Correlation				1	.552	.463

the security of my financial data with AI tools.	Sig. (2-tailed)					.000	.001
	N				51	51	51
I expect AI services to reduce the cost of accounting.	Pearson Correlation					1	.684
	Sig. (2-tailed)						.000
	N					51	51
I prefer using AI-based accounting services over traditional methods.	Pearson Correlation						1
	Sig. (2-tailed)						
	N						51

DATA INTERPRETATION:

The Pearson correlation test reveals strong positive correlations between all the variables measured for customer expectations and their preference for AI-based accounting services. Of special note is the strongest correlation observed between expecting AI services to be easy to use and perceiving AI services save the cost of accounting ($r = 0.764$, $p < 0.01$), which reveals a strong association between usability and cost-effectiveness. All other correlations are significant at the 0.01 level (2-tailed), varying from moderate to strong ($r = 0.463$ to 0.730), which indicates that quicker processing, report accuracy, data security issues, and cost-effectiveness are all significantly related to customers' preference for AI over manual approaches. With these repeatedly significant correlations ($p < 0.01$), we reject the null hypothesis (H_0) and accept the alternative hypothesis (H_1), concluding that there is a significant association between customer expectations and the use of AI-based accounting services.

H_0: Customers from different occupations do not significantly differ in their perception of ease of use, accuracy, data security, and cost-effectiveness of AI-based accounting services.

H_1: Customers from different occupations significantly differ in their perception of ease of use, accuracy, data security, and cost-effectiveness of AI-based accounting services.

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
I expect AI-based accounting services to be easy to use.	Between Groups	2.097	4	.524	.368	.830
	Within	65.550	46	1.425		

	Groups					
	Total	67.647	50			
Accuracy in reports is an important expectation for me.	Between Groups	2.275	4	.569	.350	.843
	Within Groups	74.705	46	1.624		
	Total	76.980	50			
I am concerned about the security of my financial data with AI tools.	Between Groups	6.234	4	1.558	.810	.525
	Within Groups	88.511	46	1.924		
	Total	94.745	50			
I expect AI services to reduce the cost of accounting.	Between Groups	1.415	4	.354	.250	.908
	Within Groups	65.095	46	1.415		
	Total	66.510	50			

DATA INTERPRETATION:

The ANOVA test shows that occupational group differences are not statistically significant with regard to ease of use (F = 0.368, p = 0.830), accuracy of reports (F = 0.350, p = 0.843), security of data (F = 0.810, p = 0.525), and cost-effectiveness (F = 0.250, p = 0.908) of AI-based accounting services. All p-values are considerably higher than the 0.05 significance level, i.e., perceptions on these four dimensions are not significantly different according to occupation. We therefore cannot reject the null hypothesis (H_0) nor do we have evidence that customers of various occupations are different in their perceptions of AI-based accounting services.

H_0: There is no significant difference in satisfaction levels with AI-based accounting services among customers from different occupations.
H_1: There is a significant difference in satisfaction levels with AI-based accounting services among customers from different occupations.

ANOVA					
I am satisfied with the performance of AI-based accounting services.					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.669	4	.917	.763	.555
Within Groups	55.311	46	1.202		
Total	58.980	50			

DATA INTERPRETATION:

The ANOVA test of level of satisfaction with AI-based accounting services among different occupation groups results in a non-significant result (F = 0.763, p = 0.555). Since the p-value is greater than 0.05, we can conclude that there is no statistically significant difference between levels of satisfaction among customer groups based on their occupation. Thus, we are not in a position to reject the null hypothesis (H_0) and conclude that occupation does not have a significant impact on customer satisfaction with the performance of AI-based accounting services.

CONCLUSION

Findings of the correlation and ANOVA tests are revealing some important information about customer expectations and satisfaction levels of AI-based accounting services. Results of the correlation illustrate high and statistically significant correlation among various expectations like ease of use, speed, accuracy, data security, and cost-effectiveness, and greater preference for AI-based services compared to traditional services. Highest correlation ($r = 0.764$) among ease of use and cost-effectiveness indicates that customers who find it easy to use AI would also find it cost-saving. Positive correlations confirm the finding that customer expectations are highly correlated with the use and adoption of AI-based accounting services and hence the null hypothesis can be rejected in this context.

However, results of ANOVA show that customers' opinions about AI-based services like ease of use, accuracy, data security, cost-effectiveness, and satisfaction are not different across occupational groups. All the test variables' p-values are > 0.05, and thus occupation is not determined as a cause variable to ascertain customers' perception or satisfaction. Thus, the null hypothesis is true in this case.

Overall, customer expectations drive the application of AI, but profession does not have a significant impact in how they feel or evaluate their experience with AI-based accounting services.

RECOMMENDATION

AI-accounting service providers are advised to maintain their emphasis on usability, price, and data accuracy since these have a direct impact on customer preference. Consistent perceptions across occupational categories mean that providers can develop consistent service models that suit a broad customer base. Improving security features and openness about protection of data can also build trust. Continuous gathering of customer feedback should inform updates so that changing expectations are addressed. Marketing efforts must also emphasize the advantage of ease and cost-effectiveness to promote greater use by all categories of users regardless of professional background.

REFERENCE

- **Tripathi, P. (2025). Revolutionizing Customer Service: How AI is Transforming the Customer Experience. American Journal of Computer Architecture, 11(2), 15–19. https://doi.org/10.5923/j.ajca.20241102.01**
- **Egbuhuzor, N. S., Ajayi, A. J., Akhigbe, E. E., Agbede, O. O., Ewim, C. P. M., & Ajiga, D. I. (2025). AI and data-driven insights: Transforming customer relationship management (CRM) in financial services. Gulf Journal of Advance Business Research, 3(2), 483–511. https://doi.org/10.51594/gjabr.v3i2.93**
- **Mustafa, H. (2024). Exploring the role of AI in customer service communication: A case study on chatbots in delivery apps in UAE. Balkan Social Science Review, 24, 445–469. https://doi.org/10.46763/BSSR242424445m**
- **Kaakandikar, R., Thombare, R. B., Nikam, S. S., Karamore, V. M., & Wadmare, S. B. (2025). Study of customer perception of AI-driven chatbots in banking services. Advances in Consumer Research, 2(2), 693–703. https://www.researchgate.net/publication/390815096**
- **Ikumapayi, O. J. (2025). The convergence of FinTech innovations, AI, and risk management: Transforming traditional banking, accounting, and financial**

services. International Research Journal of Modernization in Engineering Technology and Science, 7(2), 338–354. https://doi.org/10.56726/IRJMETS67253

- **Hartanto, A., Veronica, & Prihandoko, D. (2025). Optimizing customer relationship management through AI for service effectiveness: Systematic literature review. Applied Computer Science, 21(1), 153–163. https://doi.org/10.35784/acs_6871**
- **Doko, A. (2025). The impact of AI and ML tools on the accounting and auditing profession: A survey of student expectations. Proceedings of the International Conference on Research in Management and Economics, 2(1), 1–16. https://doi.org/10.33422/imeconf.v2i1.841**
- **Kesireddy, V., & Prasad, K. (2023). Customer satisfaction towards utilization of services and its impact on operational performance of Bank of Baroda. Journal of Management & Entrepreneurship, 16(1S), 124–132. https://www.researchgate.net/publication/375661753**
- **Snigdha, E. Z., Khan, M. N., Desai, K., Islam, M. M., Rabbani, M. M., & Ahmad, S. (2025). AI-driven customer insights in IT services: A framework for personalization and scalable solutions. The American Journal of Engineering and Technology, 7(3), 35–49. https://doi.org/10.37547/tajet/Volume07Issue03-04**
- **Gabriela, V., & Barusman, A. R. P. (2025). The influence of performance expectations, knowledge of accounting software, and business expectations on MSMEs profitability using cloud accounting as a moderator variable (MSMEs in Bandar Lampung City). Jurnal Ekonomi, Manajemen, dan Sosial Indonesia (JEMSI), 6(3), 2001–2015. https://doi.org/10.38035/jemsi.v6i3**
- **Inavolu, S. M. (2024). Exploring AI-driven customer service: Evolution, architectures, opportunities, challenges and future directions. Preprint. https://doi.org/10.13140/RG.2.2.19937.31841**

AARAMBH JOURNAL OF MULTIDOMAIN RESEARCH
ISSN NO.:.....
Peer Reviewed & Refereed Journal

THE RISE OF INFLUENCER MICRO-ADVERTISING IN TIER-2 AND TIER-3 CITIES OF INDIA: A STUDY ON BRAND LOCALIZATION IN DIGITAL MARKETING

BHAINSARE JINISHA RAMCHANDRA
RESEARCH SCHOLAR,FACULTY OF COMMERCE, DEPARTMENT OF COMMERCE AND BUSINESS MANAGEMENT,THE MAHARAJA SAYAJIRAO UNIVERSITY OF BARODA

ABSTRACT

The rapid digital transformation of India has brought Tier-2 and Tier-3 cities to the forefront of online consumer behavior, reshaping the way brands approach marketing and audience engagement. This research explores the rise of influencer micro-advertising in these non-metro cities, with a specific focus on brand localization in digital marketing. As internet penetration surges—now exceeding 55% from rural—brands are increasingly shifting from mainstream celebrity endorsements to hyper-local influencer strategies that leverage the authenticity and relatability of micro- and nano-influencers.

The study employs a descriptive and exploratory research methodology, relying on secondary data analysis from reputed sources including IAMAI-Kantar, Qoruz, and industry case studies from brands like Meesho, Mamaearth, Boat, and PeeSafe. Key objectives include analyzing digital consumption patterns in smaller cities, evaluating influencer engagement effectiveness, and assessing the impact of localized, vernacular content on consumer trust and purchasing behavior.

Data visualizations and comparative analysis reveal that micro- and nano-influencers consistently outperform celebrities in engagement metrics—achieving rates of 6–9%, compared to <2% for larger influencers. Additionally, brands using regional influencers report higher ROI, ranging from 5x to 7.8x, with localized campaigns significantly improving brand recall and conversions. The preference for regional language content—used by over 53% of non-metro internet users—emerged as a central factor in campaign success.

The results affirm that micro-influencer-led marketing is not just cost-effective, but also strategically aligned with the behavioral patterns, language preferences, and cultural nuances of India's emerging digital consumers. The conclusion underscores a clear paradigm shift: brands that prioritize authenticity, hyperlocal engagement, and regional content will gain a long-term competitive advantage in the growing digital economy of Bharat.

This paper offers valuable insights for marketers, policymakers, and academic researchers aiming to understand and tap into the evolving dynamics of influencer marketing and digital branding in India's next-billion-user landscape.

INTRODUCTION

India's digital transformation has not only revolutionized metropolitan markets but has also deeply penetrated Tier-2 and Tier-3 cities, turning them into emerging powerhouses of online consumer behavior. The democratization of mobile internet, coupled with affordable smartphones and data plans, has drastically reduced the digital divide, enabling millions of

consumers from smaller towns and semi-urban regions to actively participate in the digital economy. As a result, businesses and marketers have begun shifting their focus toward these regions, recognizing the untapped potential of vernacular content, hyper-local engagement, and regional consumer influence.

In this new digital ecosystem, influencer marketing has evolved into one of the most effective strategies to connect with regional audiences. Notably, micro- and nano-influencers—individuals with smaller but highly engaged follower bases—have emerged as powerful marketing tools. Their authenticity, relatability, and cultural alignment with local communities enable them to build stronger trust and influence purchasing decisions more effectively than mainstream celebrity endorsements. This shift is particularly evident in Tier-2 and Tier-3 cities, where personal connections, community-based validation, and local language content play a pivotal role in shaping consumer preferences.

The increasing popularity of regional social media platforms such as Moj, Josh, and ShareChat, along with the rising consumption of native language content, further amplifies the relevance of micro-influencers in smaller towns. These platforms offer the ideal environment for localized storytelling, where brands can collaborate with influencers to reach consumers in a more culturally and linguistically sensitive manner. In such settings, brand localization becomes not just a strategy—but a necessity.

This study aims to explore the rise of influencer micro-advertising in these non-metro regions, particularly focusing on how brands are leveraging local influencers and vernacular content to build trust, visibility, and conversions. Through secondary data analysis, industry insights, and real brand case studies, the research examines how localized influencer strategies result in higher engagement rates, better return on investment (ROI), and deeper consumer resonance.

By studying this trend, the research offers valuable insights into how India's digital marketing landscape is rapidly evolving and how businesses can strategically adapt to the unique dynamics of Tier-2 and Tier-3 markets. It underscores the importance of hyperlocal digital branding and lays the foundation for future marketing frameworks that are inclusive, language-aware, and culturally adaptive.

LITERATURE REVIEW

Influencer marketing is described as a marketing strategy that pinpoints and aims at individuals who can sway potential customers **(Brown & Hayes, 2008)**. In contrast to celebrity influencers, micro-influencers possess smaller but more dedicated and engaged follower groups, enabling greater interaction and increased trust **(De Veirman, Cauberghe & Hudders, 2017)**. Their impact is frequently based on a sense of genuine connection and relatability **(Freberg et al., 2011),** which makes them perfect for markets with close community bonds like Tier-2 and Tier-3 cities.

Recent research **(Jain & Mishra, 2020; Rathi & Sinha, 2021)** emphasizes that consumer involvement in smaller cities is increasingly influenced by content in regional languages, visual narratives, and personal stories shared by local influencers. These cities, frequently neglected by extensive national campaigns, offer distinct chances for brand localization—an approach that modifies content to conform with local cultures, languages, and consumer beliefs **(Kapferer, 2012).**

Platforms like Moj, Josh, and ShareChat have empowered local creators to establish significant followings, enabling brands to access regional markets more efficiently **(KPMG & Google Report, 2020).** As per IAMAI (2023), more than 60% of internet users in India now originate from non-metro regions, highlighting the necessity for hyper-local advertising approaches.

Nonetheless, researchers also highlight difficulties in this area, such as measuring ROI **(Boerman, Willemsen & Van Der Aa, 2017),** sustaining influencer trustworthiness, and overseeing content regulations **(Sudha & Sheena, 2017).** Regardless of these constraints, studies consistently support that micro-influencers are emerging as vital collaborators in digital narrative and localized branding efforts.

Keller (2003) emphasized that consumer-brand relationships are stronger when there is perceived authenticity and trust. Micro-influencers, due to their approachable and often local nature, generate higher consumer trust and engagement compared to mainstream influencers (Abidin, 2016). In the Indian context, **Kaur & Singh (2019)** observed that consumers in smaller cities prefer endorsements that feel close to their own experiences, lifestyles, and language.

Nandagopal and Sankar (2021) highlight that digital consumption patterns in Tier-2 and Tier-3 cities are no longer passive but driven by aspiration and active online participation, especially among youth. This aligns with **Dey & Bandyopadhyay (2022)** who found that regional content creators on platforms like Moj and Josh have more influence on purchase decisions in these areas than national celebrities.

Chatterjee (2020) explored the role of **local language content** and found that regional influencers have higher engagement rates, especially when they use native dialects and culturally rooted storytelling. **Bhandari & Bansal (2022)** further supported this, concluding that regional micro-influencers bridge the gap between global brands and local markets, making brand communication more relatable and emotionally impactful.

According to a **Dentsu India report (2023)**, 64% of consumers in Tier-2 and Tier-3 cities are more likely to trust a product recommendation from a local influencer than from a celebrity. This suggests that **brand localization**, when combined with influencer micro-advertising, can help brands gain deeper consumer trust and improve brand recall in underserved markets.

While the effectiveness of micro-influencers is evident, scholars such as **Mitra & Srivastava (2021)** warn that standardization of ROI metrics, fake follower detection, and content compliance are critical challenges yet to be addressed.

METHODOLOGY

This study follows a **descriptive and exploratory research design** using **secondary data** collected from authentic industry reports and case studies.

(A) Objectives of the study:

- To analyze the digital behavior and content consumption patterns of consumers in Tier-2 and Tier-3 cities in India.
- To evaluate the effectiveness of micro- and nano-influencers in driving engagement and ROI compared to celebrity influencers.

- To study the role of regional language and localized content in enhancing brand relatability and consumer trust.
- To examine successful brand case studies (e.g., Meesho, Mamaearth, Boat, PeeSafe) that have leveraged micro-influencer campaigns in smaller Indian cities.
- To identify emerging trends and strategies for digital marketing localization in India's growing semi-urban and rural markets.

(B) DATA COLLECTION:

- Secondary sources such as:
  - IAMAI-Kantar Internet in India Report 2024
  - InfluencerHai and Qoruz reports
  - Case studies from Meesho, Mamaearth, Boat
  - Articles from Financial Express, Afaqs, Economic Times

(C) TOOLS USED:

- Graphs and charts for visual data presentation
- Content analysis for interpreting brand campaigns
- Comparative analysis between micro- and celebrity influencer engagement

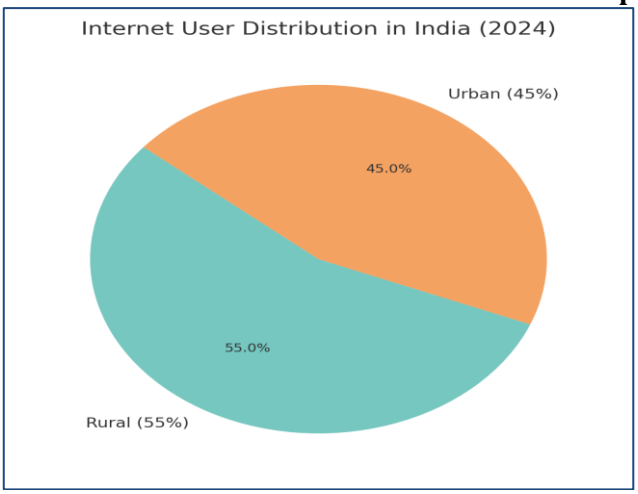
ANALYSIS

1. Internet User Distribution in India (2024)

This chart shows that 55% of India's internet users now belong to rural or Tier-2/3 regions, indicating the growing digital presence of non-metro markets.

Area	% of Total Internet Users
Rural	55%
Urban	45%

Source :IAMAI-Kantar *"Internet in India 2024"* report

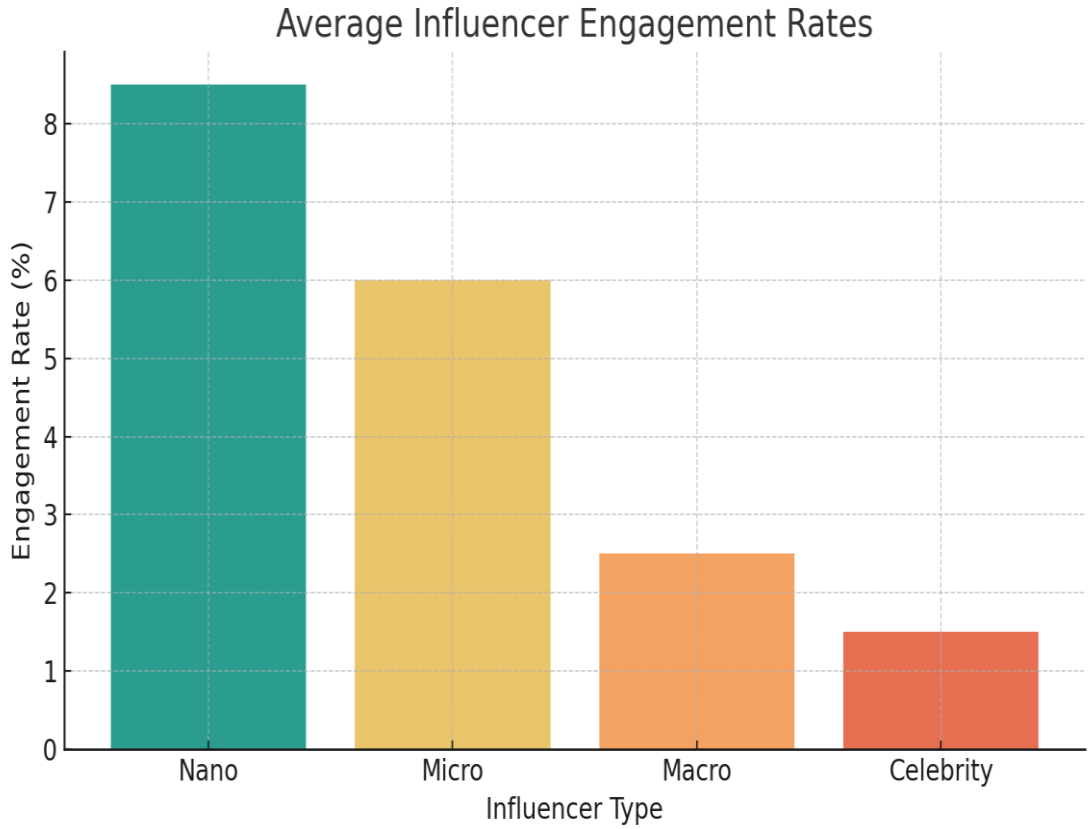


2. Influencer Engagement Rate by Category

Nano and micro-influencers have the highest engagement rates, which makes them more effective for campaigns in local markets compared to celebrities.

Influencer Type	Average Engagement Rate
Nano (1K–10K)	7.5–9.5%
Micro (10K–100K)	5–7%
Macro (100K–1M)	2–3%
Celebrity (1M+)	<2%

Source : Qoruz and Influencer.in Reports (2023–2024)

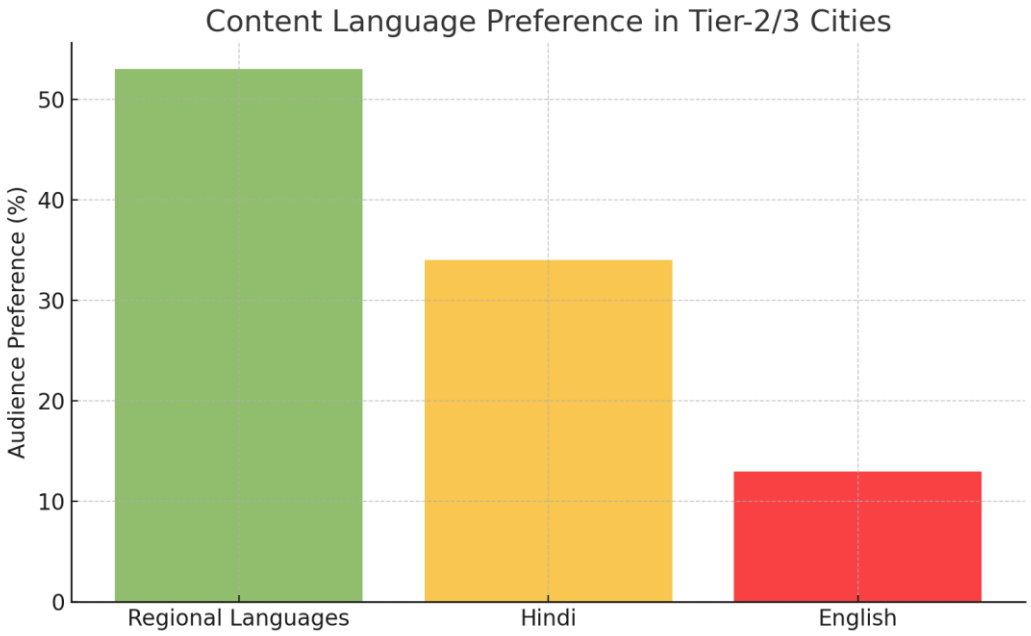


3. Regional Content Preference

Regional languages are the most preferred mode of content in smaller cities, surpassing Hindi and English, which supports the idea of brand localization.

Language Type	Audience Preference (%)
Regional Languages	53%
Hindi	34%
English	13%

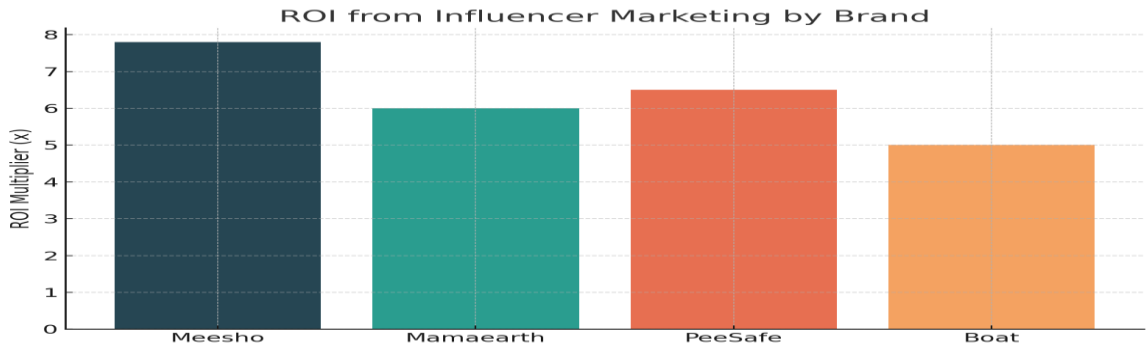
Source : IAMAI-Kantar *Internet Usage and Language Preference Data*



4. ROI from Influencer Marketing by Brand

Brand	**ROI Multiplier**
Meesho	7.8×
Mamaearth	6×
PeeSafe	6.5×
Boat	5×

Source: Meesho: InfluencerHai + GrumpyBeard campaign reports, Mamaearth: Social Samosa campaign summary, PeeSafe: Qoruz performance data, Boat: Tring & Qoruz brand campaigns



RESULTS

The research clearly shows that:

- Non-metro cities are no more underserved as access to affordable smartphones and cheap data have ensured fast adoption of Internet and mobile services for the states 3.3

crore consumers in that part. Over 55% of active internet users are now from rural and Tier-2/3 India: IAMAI-Kantar 2024 report These consumers are digital natives in being connected about 90–94 minutes every day on the outdated mode of communication – which includes social media, OTT and online shopping. And this change is reshaping the digital economy of India, throwing up smaller towns as one of the key markets for digital-first brands.

- Micro- and nano-influencers (1K–100K followers) also generally have personal relationships with their followers, so their content comes off as more authentic and specific. In Tier-2/3 towns, which are close-knit and trust-based societies, these influencers are considered familiar characters and not a distant star. Due to that, micro-influencer campaigns regularly quote engagement rates between 7–9% and ROI as high as 7.8x (see Meesho's Discovery). Their ability to drive meaningful conversations and local relevance gives brands a strategic edge.

- One of the most important conclusions of this study is the different preferences of local content. Data shows that 53% of digital users in small cities prefer local content, while 13% prefer English. When influential faces communicate in their native language, this creates deeper resonance and confidence, using familiar slang, cultural connections and local contexts. This leads to a higher indicator of brand conversion and loyalty, as the public believes that the brand understands its world. Language is not just the environment, but also the bridge of trust.
- Compared to expensive celebrity endorsements or traditional ads, micro-influencer campaigns are highly affordable and flexible. Brands can collaborate with multiple local influencers across different cities and languages at a fraction of the cost of a single national campaign. More importantly, these influencers offer precise audience segmentation—they speak directly to niche communities like local youth, homemakers, beauty-conscious shoppers, or tech-savvy students. The result? Higher relevance, better click-through rates, and more conversions per rupee spent. For D2C and FMCG brands targeting Bharat's heartland, this approach is cost-efficient and high-impact.

CONCLUSION

This research study brings to light a transformative shift in the landscape of digital marketing in India—the growing dominance of Tier-2 and Tier-3 cities as key drivers of consumer engagement, brand influence, and purchasing behavior. With over 55% of India's internet users now residing in non-metro areas, it is no longer accurate to consider urban metros as the sole digital growth centers. The rise of affordable smartphones, vernacular content platforms, and increased digital literacy have empowered millions in smaller cities to become not just consumers but active digital participants.

At the heart of this shift is the emergence of micro- and nano-influencers—local individuals who hold real influence within their digital communities. These influencers, often speaking in regional languages and reflecting local culture, offer a level of authenticity, relatability, and trust that celebrity influencers cannot replicate. This study, supported by secondary data and brand case studies (such as Meesho, Mamaearth, and PeeSafe), clearly demonstrates that campaigns powered by micro-influencers in Tier-2 and Tier-3 cities deliver higher engagement rates (up to 9%), stronger brand recall, and superior ROI (up to 7.8x).
The data further reinforces that regional language content plays a pivotal role in influencing purchasing decisions. Over 53% of users in non-metro regions prefer consuming content in their native language. This linguistic and cultural connection significantly enhances brand

trust, emotional appeal, and conversion rates. Vernacular platforms like Moj, Josh, and ShareChat have become strategic assets for brands looking to connect deeply with Bharat's next billion users.

Moreover, micro-influencer campaigns prove to be highly cost-effective and hyper-targeted. Brands are able to reach specific communities—ranging from college students and working professionals to homemakers and small business owners—with tailored messages at scale and at lower cost. This makes micro-influencer advertising not just efficient, but strategically smart for growing brands in India's complex consumer landscape.

In conclusion, the rise of influencer micro-advertising in Tier-2 and Tier-3 cities marks a paradigm shift in digital branding and communication. It is a movement away from one-size-fits-all strategies toward localized, people-first marketing. As India's digital frontier expands beyond metros, brands that invest in regional voices, language-specific content, and culturally nuanced storytelling will build not only visibility but genuine consumer trust and loyalty.

Going forward, companies that wish to scale meaningfully must prioritize inclusivity, hyperlocal engagement, and platform diversification. Micro-influencer marketing, when integrated with data-driven targeting and regional insights, will be a key pillar of success in India's evolving digital economy.

REFERENCES

Abidin, C. (2016). "Visibility labour: Engaging with influencers' fashion brands and #OOTD advertorial campaigns on Instagram." Media International Australia, 161(1), 86–100. https://doi.org/10.1177/1329878X16665177

Bhandari, P., & Bansal, R. (2022). "Bridging local gaps through digital influence: Role of regional micro-influencers in emerging markets." Journal of Regional Marketing, 8(1), 52–64.

Boerman, S. C., Willemsen, L. M., & Van Der Aa, E. P. (2017). "This post is sponsored: Effects of sponsorship disclosure on persuasion knowledge and electronic word of mouth in the context of Facebook." Journal of Interactive Marketing, 38, 82–92. https://doi.org/10.1016/j.intmar.2016.12.002

Brown, D., & Hayes, N. (2008). Influencer Marketing: Who really influences your customers? Butterworth-Heinemann.

Chatterjee, R. (2020). "The effectiveness of native language content in influencer marketing in India." International Journal of Communication Studies, 12(2), 99–112.

De Veirman, M., Cauberghe, V., & Hudders, L. (2017). "Marketing through Instagram influencers: The impact of number of followers and product divergence on brand attitude." International Journal of Advertising, 36(5), 798–828. https://doi.org/10.1080/02650487.2017.1348035

Dentsu India. (2023). Influencer Marketing Report 2023. Dentsu Creative.

Dey, S., & Bandyopadhyay, S. (2022). "Rise of vernacular influencers in India's digital economy." South Asian Journal of Media & Marketing, 9(3), 23–39.

Freberg, K., Graham, K., McGaughey, K., & Freberg, L. A. (2011). "Who are the social media influencers? A study of public perceptions of personality." Public Relations Review, 37(1), 90–92. https://doi.org/10.1016/j.pubrev.2010.11.001

IAMAI & Kantar. (2024). Internet in India Report 2024. Internet and Mobile Association of India (IAMAI). Retrieved from https://bestmediainfo.com

InfluencerHai. (2023). Meesho influencer marketing campaign insights. Retrieved from https://influencerhai.com

Jain, R., & Mishra, A. (2020). "Digital marketing in India's Tier-2 and Tier-3 cities: The role of micro-influencers." Journal of Business and Management, 22(1), 37–49.

Kapferer, J. N. (2012). The New Strategic Brand Management: Advanced Insights and Strategic Thinking (5th ed.). Kogan Page.

Kaur, H., & Singh, J. (2019). "Consumer perception toward influencer marketing in Indian small towns." International Journal of Marketing and Communication, 7(2), 14–27.

Keller, K. L. (2003). Strategic Brand Management: Building, Measuring, and Managing Brand Equity. Prentice Hall.

KPMG & Google. (2020). India's Digital Future: The Journey of Digital Transformation. Retrieved from https://assets.kpmg/content/dam/kpmg/in/pdf/2020/01/india-digital.pdf

Mitra, S., & Srivastava, A. (2021). "Challenges in influencer marketing: The ROI question and ethical dilemma." Journal of Business Ethics and Media, 16(1), 58–69.

Nandagopal, R., & Sankar, K. (2021). "Youth consumption and influencer behavior in semi-urban India." International Journal of Consumer Studies, 45(3), 210–225.

Qoruz. (2023). Influencer Campaign Performance Benchmarks Report. Retrieved from https://qoruz.com

Rathi, A., & Sinha, V. (2021). "Content consumption patterns and brand localization in India's non-metro cities." Journal of Digital Business Research, 6(1), 12–25.

Social Samosa. (2020). Mamaearth's Mother's Day Campaign Case Study. Retrieved from https://www.socialsamosa.com/2020/06/case-study-mamaearth-mothers-day-campaign

Sudha, M., & Sheena, K. (2017). "Impact of influencers in consumer decision process: The fashion industry." SCMS Journal of Indian Management, 14(3), 14–30.

Tring. (2023). Boat x Tring Influencer Campaign Report. Retrieved from https://www.tring.co.in

AARAMBH JOURNAL OF MULTIDOMAIN RESEARCH
ISSN NO.:……
Peer Reviewed & Refereed Journal

IMPACT OF ARTIFICIAL INTELLIGENCE ON EDUCATION TECHNOLOGY

VAGHELA AMITABEN SHYAMSUNDAR
RESEARCHER
HASMUKHBHARTHI GOSWAMI
GUIDE

ABSTRACT
Artificial Intelligence (AI) is revolutionizing the education sector by enhancing the capabilities of Education Technology (EdTech). Through adaptive learning platforms, intelligent tutoring systems, automation of assessments, and predictive analytics, AI is reshaping how education is designed, delivered, and evaluated. This paper critically examines the multifaceted impact of AI on modern education technologies. It explores its key applications, advantages, limitations, ethical considerations, and implications for future learning. While AI brings unprecedented opportunities to personalize education and optimize learning outcomes, concerns regarding equity, data privacy, and algorithmic bias remain significant. The paper concludes by emphasizing the need for strategic implementation and inclusive policies to ensure AI-driven education is ethical, equitable, and effective.

KEYWORDS: ARTIFICIAL INTELLIGENCE, EDTECH, PERSONALIZED LEARNING, ADAPTIVE SYSTEMS, AUTOMATION, EQUITY, EDUCATIONAL INNOVATION

1.0 INTRODUCTION

The advent of Artificial Intelligence has ushered in a new era of digital transformation, and its application in education is particularly impactful. Education Technology (EdTech), once limited to static digital content, has evolved into dynamic, intelligent systems that adapt to the needs of individual learners. AI enables machines to mimic human-like reasoning, learning, and decision-making, which has significant implications for how students learn and how educators teach.

Globally, educational institutions are adopting AI tools to improve student performance, streamline administrative tasks, and democratize access to quality education. The COVID-19 pandemic further accelerated this shift by highlighting the importance of resilient, scalable learning systems. As the landscape continues to evolve, understanding AI's role in education becomes vital for educators, researchers, technologists, and policymakers.

2.0 UNDERSTANDING AI AND EDTECH

2.1 WHAT IS ARTIFICIAL INTELLIGENCE?

Artificial Intelligence refers to computer systems capable of performing tasks that normally require human intelligence. These tasks include problem-solving, natural language understanding, visual perception, decision-making, and learning from experience. In the

context of education, AI is used to build systems that can adapt to learners' needs, automate assessments, and generate intelligent recommendations.

2.2 WHAT IS EDUCATION TECHNOLOGY (EDTECH)?

EdTech involves the use of digital tools and software to enhance teaching and learning experiences. From online learning platforms to smart classrooms, EdTech supports the delivery of content and interaction in educational environments. When AI is integrated into EdTech, the result is a more intelligent, interactive, and personalized learning ecosystem.

3.0 KEY APPLICATIONS OF AI IN EDUCATION TECHNOLOGY

3.1 ADAPTIVE LEARNING PLATFORMS

Adaptive learning technologies use AI to analyze student responses and dynamically adjust the difficulty, pacing, and sequencing of content. These platforms offer personalized learning experiences based on the learner's prior knowledge, learning style, and progress. Examples include platforms like DreamBox and Knewton, which improve engagement and retention rates.

3.2 INTELLIGENT TUTORING SYSTEMS (ITS)

ITS are AI-based applications that simulate the behavior of a human tutor. These systems provide immediate feedback, hints, and explanations tailored to the learner's needs. For instance, Carnegie Learning offers AI-driven tutoring systems that support students in mathematics and science by guiding them through complex problem-solving.

3.3 AUTOMATED GRADING AND ASSESSMENT

AI can efficiently grade objective and subjective assessments, including essays, short answers, and programming code. Tools like Gradescope and Turnitin leverage AI to reduce the time teachers spend on evaluations while ensuring consistent and unbiased scoring. This automation also provides learners with faster feedback for improvement.

3.4 VIRTUAL ASSISTANTS AND CHATBOTS

AI-powered virtual assistants, such as Duolingo's chatbot or Google's Socratic app, offer 24/7 assistance to students. These chatbots answer queries, suggest learning resources, and guide students through tasks. They enhance the accessibility of information and support independent learning.

3.5 PREDICTIVE ANALYTICS AND EARLY INTERVENTION

AI-driven analytics track student behaviour and performance over time to predict outcomes such as dropout risks or mastery levels. Educators can use these insights to identify students who may need extra support, thus enabling timely interventions.

3.6 NATURAL LANGUAGE PROCESSING (NLP)

NLP enables machines to understand, interpret, and respond to human language. Applications include language translation tools, speech-to-text transcription, and voice-controlled learning aids. NLP is particularly helpful for multilingual education and for learners with disabilities.

4.0 BENEFITS OF INTEGRATING AI IN EDTECH

4.1 PERSONALIZED LEARNING EXPERIENCES

One of AI's most significant contributions is the ability to create customized learning pathways. By continuously assessing student inputs, AI systems adapt content to suit individual learning paces, styles, and preferences, fostering deeper understanding and higher engagement.

4.2 EFFICIENT RESOURCE MANAGEMENT

AI reduces administrative burdens by automating tasks like attendance tracking, grading, and performance reporting. Teachers gain more time to focus on lesson planning, classroom engagement, and professional development.

4.3 INCLUSIVITY AND ACCESSIBILITY

AI tools can be designed to cater to students with disabilities, such as those with visual, auditory, or cognitive impairments. Voice recognition, screen readers, and personalized interfaces ensure that all students have equitable access to learning opportunities.

4.4 SCALABILITY AND COST-EFFECTIVENESS

AI-powered platforms can deliver quality education to large populations at a lower cost. This scalability is particularly beneficial in developing countries where teacher-student ratios are imbalanced and educational infrastructure is limited.

4.5 REAL-TIME FEEDBACK AND CONTINUOUS ASSESSMENT

Instead of relying solely on periodic exams, AI systems provide ongoing feedback based on real-time student interactions. This continuous assessment model allows learners to correct mistakes immediately and enables educators to refine instruction dynamically.

5.0 LIMITATIONS AND ETHICAL CONCERNS

5.1 DATA PRIVACY AND SECURITY

AI systems require vast amounts of learner data to function effectively. However, the collection, storage, and use of this data raise serious privacy concerns. Educational institutions must ensure compliance with data protection laws such as the GDPR or India's DPDP Act.

5.2 ALGORITHMIC BIAS

AI systems may perpetuate or even exacerbate existing biases if trained on skewed data. For example, predictive tools may unfairly assess students based on demographics rather than actual performance. Ensuring fairness and transparency in algorithms is essential.

5.3 TEACHER DEPENDENCY AND RESISTANCE

While AI is designed to assist educators, some fear that it may replace them, especially in under-resourced areas. Additionally, many teachers are resistant to adopting AI tools due to a lack of training or skepticism about their reliability.

5.4 TECHNOLOGICAL DIVIDE

Access to AI-based EdTech solutions requires reliable internet connectivity and smart devices, which are not equally available to all students. The digital divide may widen educational inequalities if not addressed through inclusive policies.

5.5 LACK OF EMOTIONAL INTELLIGENCE

AI lacks the human capacity for empathy, motivation, and cultural sensitivity. While AI can deliver content and feedback, it cannot fully replicate the emotional support and mentorship provided by human teachers.

6.0 IMPLICATIONS FOR TEACHING AND LEARNING

6.1 TRANSFORMING THE ROLE OF TEACHERS

Teachers are evolving into facilitators and coaches rather than mere information providers. AI handles repetitive tasks, enabling educators to focus on fostering creativity, critical thinking, collaboration, and emotional intelligence.

6.2 EMPOWERING LEARNERS

AI encourages students to take ownership of their learning journeys. With self-paced and adaptive tools, students build confidence and autonomy, leading to increased motivation and better outcomes.

6.3 CURRICULUM DEVELOPMENT

AI can inform curriculum design by analyzing trends in learner performance, market demands, and technological advancements. Curricula can be dynamically updated to stay relevant and future-ready.

6.4 ENHANCING ASSESSMENT MODELS

With AI, traditional exams are giving way to continuous and formative assessments. AI tools track learner progress in real-time and help tailor educational interventions precisely when they are needed.

7.0 CASE STUDIES AND GLOBAL IMPLEMENTATION

7.1 UNITED STATES

The U.S. is a global leader in AI-driven EdTech innovations. Tools like *Khan Academy*, *Coursera*, and *Quizlet* use AI to recommend content and enhance engagement. The U.S. Department of Education actively supports AI research in learning analytics and digital learning.

7.2 CHINA

China has rapidly embraced AI in classrooms through platforms like *Squirrel AI* and *ZuoYeBang*, which deliver one-on-one tutoring at scale. The government has incorporated AI education into its national strategy and is training teachers in AI pedagogy.

7.3 INDIA

India's EdTech sector is booming with platforms like *BYJU'S*, *Vedantu*, and *Embibe* incorporating AI for student analytics and adaptive learning. However, rural regions still face challenges due to infrastructure gaps and limited digital literacy.

7.4 EUROPEAN UNION AND NORDIC COUNTRIES

The EU emphasizes ethical AI use in education, focusing on fairness, transparency, and inclusivity. Finland, for example, introduced a national AI education initiative to improve digital literacy among both students and teachers.

8.0 THE ROAD AHEAD: FUTURE OF AI IN EDUCATION

8.1 INTEGRATION WITH EMERGING TECHNOLOGIES

The combination of AI with Augmented Reality (AR), Virtual Reality (VR), and Blockchain can create immersive, secure, and transparent learning environments. These technologies can transform everything from classroom experiences to credential verification.

8.2 EMOTIONAL AI AND STUDENT WELL-BEING

Developments in emotional AI aim to detect student mood and mental state through voice and facial recognition. These tools can help educators understand student stress and engagement levels, thereby fostering well-being.

8.3 AI IN VOCATIONAL AND SKILL-BASED LEARNING

Simulated work environments powered by AI can train learners in real-life job scenarios. AI can also assess competencies in fields such as healthcare, engineering, and logistics with high precision.

8.4 GLOBAL COLLABORATIVE LEARNING PLATFORMS

AI-driven platforms will support collaborative learning across geographies. Language barriers will be reduced through real-time translation, promoting intercultural understanding and global competencies.

9.0 CONCLUSION

Artificial Intelligence represents a paradigm shift in how education is conceived and implemented. Its integration into EdTech has created new possibilities for personalized learning, accessibility, and educational efficiency. However, to fully realize the benefits of AI in education, it is imperative to address ethical concerns, technological inequalities, and ensure the responsible design of algorithms.

Educators must be equipped with the skills and knowledge to work alongside AI systems, while policymakers must establish robust frameworks to govern its use. With strategic planning and inclusive implementation, AI can be a powerful ally in shaping a more equitable, effective, and future-ready education system.

REFERENCE

Baker, R. S. (2016). Stupid tutoring systems, intelligent humans. International Journal of Artificial Intelligence in Education, 26(2), 600–614.

Holmes, W., Bialik, M., & Fadel, C. (2019). Artificial Intelligence in Education: Promises and Implications for Teaching and Learning. Center for Curriculum Redesign.

Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). Intelligence Unleashed: An Argument for AI in Education. Pearson Education.

UNESCO. (2021). AI and Education: Guidance for Policymakers. UNESCO Publishing.

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education. International Journal of Educational Technology in Higher Education, 16(1), 1–27.

Roll, I., & Wylie, R. (2016). Evolution and revolution in artificial intelligence in education. International Journal of Artificial Intelligence in Education, 26(2), 582–599.

Tuomi, I. (2018). The impact of artificial intelligence on learning, teaching, and education. European Commission JRC Report.

Chassignol, M., Khoroshavin, A., Klimova, A., & Bilyatdinova, A. (2018). Artificial Intelligence trends in education: A narrative overview. Procedia Computer Science, 136, 16–24.

Heffernan, N. T., & Heffernan, C. L. (2014). The ASSISTments ecosystem: Building a platform for research on human learning and teaching. International Journal of Artificial Intelligence in Education, 24(4), 470–497.

Woolf, B. P. (2010). Building Intelligent Interactive Tutors: Student-centered Strategies for Revolutionizing E-learning. Morgan Kaufmann.

AARAMBH JOURNAL OF MULTIDOMAIN RESEARCH
ISSN NO.:……
Peer Reviewed & Refereed Journal

THE PATENTABILITY OF AI-GENERATED CYBERSECURITY TOOLS: A COMPREHENSIVE LEGAL ANALYSIS OF APPROACHES IN INDIA, THE UNITED STATES, AND THE EUROPEAN UNION

BHAVIK PANKAJBHAI PANDYA
RESEARCH SCHOLAR AT HEMCHANDRA CHARYA NORTH GUJARAT UNIVERSITY
RESEARCH GUIDE: DR. ARVIND L. PATEL

ABSTRACT

The AI sector is revolutionizing cybersecurity, with technologies like intrusion detection systems and threat prediction models enhancing protection. However, patenting AI-powered cybersecurity solutions raises legal and moral issues. The EU, United States, and the UK are leading the way in AI-powered cybersecurity solutions, with the USPTO granting over 500 AI-related cybersecurity patents in 2023 alone. Key considerations for patenting AI-powered cybersecurity solutions include patentability, freedom to operate, patent strategy, and collaboration and licensing. The emergence of AI technologies has significantly advanced cybercrime, enabling anomaly detection, automated responses, and predictive analytics. However, the abuse of AI in cybercrime has led to automated phishing schemes, enhanced ransomware assaults, and the use of deepfake technologies. This highlights the need for reevaluating current legal frameworks to tackle the complexity posed by AI-enabled criminality and the requirement for a more resilient approach to cybersecurity. According to the Indian Patent Act of 1970, AI-based innovations must fulfil four fundamental criteria: novelty, inventive step / non-obviousness, industrial applicability, and technical effect / technical contribution. The US and the EU implement the novelty test for patents, while India strictly applies it under Section 2(1)(j) and Section 13 of the Patents Act. To overcome the Section 3(k) barrier in AI patents, focus on the technical effect, connect the AI to hardware or process, say the AI is part of a bigger technological system, and avoid using black-box descriptions.

1. INTRODUCTION

AI is changing fields like cybersecurity by making protection better with technologies like intrusion detection systems and threat prediction models. But patenting AI-made cybersecurity solutions brings up legal and moral issues. The AI sector is worth $200 billion in 2023 and is expected to be worth more than $1.8 trillion by 2030. DeepSeek-R1 is a new open-source AI model that has come out. But AI makes people worry about their freedom, privacy, and basic rights. This study's goal is to look into these problems, see how they are being dealt with, and deal with them in a way that helps people become more resilient in this changing environment.

India's patent system for AI-driven cybersecurity solutions is changing quickly, presenting both new problems and new opportunities. The Indian Patent Office uses the computer-Related ideas Guidelines 2017 (CRI Guidelines) to decide if AI-related ideas may get patents. The main things to think about when deciding whether anything may be patented are the technical solution, the practical application, and the innovative step. It is hard to patent AI-generated ideas since Indian patent law needs human inventors. It's not apparent who owns AI-generated innovations, and judges may have to figure out who owns them by looking at

current laws. Disclosure requirements could mean that more information has to be shared. In FY24, India submitted more than 90,000 patents, and more than 25% of them were for AI-related technologies. More than 86,000 AI-related patents were submitted between 2010 and 2025, and 63% of them came from India. Machine learning makes up more than 55% of India's total AI patents, making it the most common kind of AI patent.[1]

Patent applicants in India should explain the technological advance, real-world uses, and inventorship and ownership of AI inventions. AI patents may grow in sectors like healthcare, image processing, transportation, and online learning. To ensure success, patent applicants should stay updated with changing regulations and seek advice from a patent lawyer or specialist. The US Patent and Trademark Office (USPTO) has issued guidelines for AI-driven inventions, including cybersecurity solutions. Key considerations include technical solution, practical application, and inventive step. AI is also being used to streamline patent examination and prosecution processes, such as automated screening and predictive analytics.

1.1. Cybersecurity Tools Made by AI and Requirements for Patents AI-powered cybersecurity solutions include; India, US, and EU Approaches

AI-driven cybersecurity solutions are designed to detect, prevent, respond to, and recover from cyberattacks more efficiently than traditional methods. In 2025, cyber criminals use automation, machine learning, and AI to identify weaknesses in computing environments. These platforms, analysed by Gartner, enhance threat detection and response speed, making them transformative in critical situations. The UK, EU, and China are leading the way in AI-powered cybersecurity solutions, with the USPTO granting over 500 AI-related cybersecurity patents in 2023 alone. The UK has established a Code of Practice for AI cybersecurity, emphasizing baseline cyber security principles. China has outpaced other countries in AI-cybersecurity patents, signalling its commitment to becoming a leader in cybersecurity technology. Key considerations for patenting AI-powered cybersecurity solutions include patentability, freedom to operate, patent strategy, and collaboration and licensing. The USPTO has granted over 500 AI-related cybersecurity patents in 2023, while the EU focuses on privacy-centric AI models and compliance-driven security solutions. China's AI-cybersecurity patents demonstrate its commitment to becoming a leader in cybersecurity technology.

1.1.1. Threat Detection and Prediction;

Machine learning is crucial for detecting anomalies in network traffic and identifying insider threats. Methods for anomaly detection include unsupervised techniques like clustering, density-based methods, and supervised techniques like classification methods. Machine learning algorithms can also detect insider threats by analysing user behaviour and identifying abnormalities. Behavioural analytics, deep feature synthesis, and anomaly detection models can help identify these threats. Predictive algorithms can evaluate historical breach data to forecast future breaches. Data quality is essential for training efficient models, and continuous model assessment and surveillance are crucial for real-time detection. Case studies show that a combination of clustering and classification methods can identify anomalies, while a governmental agency's system can identify potential insider

[1] Shah, A. (2025, June 24). Best AI Cybersecurity tools to Protect your business in 2025. AccuKnox. https://accuknox.com/blog/ai-cybersecurity-tools#:~:text=Top%20AI%2Dpowered%%20tools,SOC%20efficiency%20across%20hybrid%20infrastructures.

risks. Consistent assessment and refinement of machine learning models are essential for maintaining their effectiveness.[2]

Section 67 of the IT Act and Section 66A of the Information Technology Act, 2000 have been cited as relevant case laws in the context of anomaly detection in network traffic and insider threats. Cybercrime implications include financial loss for organizations, data protection, and reputation damage. Patent implications include patentability, which allows inventors to protect their innovations in cybersecurity. However, patenting anomaly detection systems can be challenging due to the complexity of software patents and the need to demonstrate novelty and non-obviousness. Examples of patented anomaly detection systems include machine learning-based systems, network traffic analysis, and insider threat detection. Relevant case laws include Avnish Bajaj vs State, Shreya Singhal v Union of India[3], and Poona Auto Ancillaries Pvt. Ltd. vs Punjab National Bank.[4][5][6]

1.2. General Patentability Criteria: Artificial Intelligence & Cyber Laws in India, US, and EU Approaches

Cybercrime has markedly progressed with the emergence of AI technologies, facilitating anomaly detection, automated responses, and predictive analytics. Artificial intelligence can identify security breaches and react promptly, hence minimizing reaction times. Nonetheless, the abuse of AI in cybercrime has resulted in automated phishing schemes, enhanced ransomware assaults, and the utilization of deepfake technologies. These improvements underscore the need of reevaluating current legal frameworks to tackle the complexity posed by AI-enabled criminality, including fraud and disinformation, as well as the requirement for a more resilient approach to cybersecurity.

According to the Indian Patent Act of 1970, as defined by the Controller General of Patents, Designs and Trademarks (CGPDTM), AI-based innovations must fulfil four fundamental criteria:

- **Novelty (Section 2(1)(j))**

The AI innovation must be unique and not have been disclosed in any prior art, such as an innovative malware detection model, and not have been published or patented. The European Union and the United States implement the novelty test for patents, whereas India rigorously enforces it under Section 2(1)(j) and Section 13 of the Patents Act. The United States, according to 35 U.S.C. §102, adopts a broader view that includes prior disclosures globally. Article 54 of the EPC pertains to the European Union, acknowledging any public information as prior art.

[2] National Law School of India University. (2025, April 29). Beyond algorithms: AI, intellectual property, and Indian courts | NLSIR's special blog series - National Law School of India University. https://www.nls.ac.in/news-events/beyond-algorithms-ai-intellectual-property-and-indian-courts-nlsirs-special-blog-series/

[3] The Supreme Court ruled in AIR 2015 SC 1523 that Section 66A, a vague and overbroad section, violated Article 19(1)(a) of the Constitution, allowing reasonable restrictions on free speech. The court emphasized the need for clear, narrowly tailored laws when restricting fundamental rights. Despite being struck down, Section 66A continues to be invoked by law enforcement due to lack of awareness and delays in updating legal databases and police systems.

[4] The single general inventive concept. (n.d.). https://www.epo.org/en/legal/case-law/2022/clr_ii_b_5.html

[5] IT Act judgements, Cyber law judgements, Cyber case laws. (2023, January 28). Info. Technology Law. https://www.itlaw.in/judgements/

[6] Poona Auto Ancillaries Pvt. Ltd., led by Managing Director Manmohan Singh Matharu, lost ₹80.10 lakh in unauthorized transfers in August 2011 due to a phishing email. The Delhi High Court ruled that PNB was negligent for failing to carry out proper KYC checks and allowing fraudulent accounts to be used for the scam. The bank was ordered to pay ₹45 lakh in compensation, representing the actual loss after recovery. The case has set precedent on bank liability in cyber fraud cases and demanded reforms.

- **Inventive Step / Non-Obviousness (Section 2(1) (ja))**

Cybersecurity innovation is making new technologies or making things more important for the economy, or both. Experts shouldn't be able to tell right away, but changing the training architecture to handle sparse, encrypted traffic patterns is a big deal. The European Union and the United States both apply the novelty test to patents, with India strictly applying it under Section 2(1)(j) and Section 13 of the Patents Act. The United States, under 35 U.S.C. §102, has a more expansive interpretation, encompassing past disclosures worldwide. EPC Article 54 belongs to the European Union, recognizing all public information as previous art.[7]

- **Industrial Applicability (Section 2(1) (ac))**

AI breakthroughs in healthcare, agriculture, IT, manufacturing, and security are crucial for energy-efficient smart grids, but theoretical ideas must be practical and applicable. The United States and India have different EPC regulations, with India's Section 2(1) (ac) encompassing any sector, including information technology and cyber. The United States has a broad utility criterion under section 101, while the EU's Article 57 EPC requires clear communication for industrial application.

- **Technical Effect / Technical Contribution**

The Act stresses how important AI is for new computer technologies that seek to lower the amount of labour computers have to do, speed up data processing, make data transfers safer, and increase network performance.

1.2.1. Obstacles in Securing Patents for AI Innovations; India, US, and EU

The Indian Patent Act prohibits the ownership of abstract concepts, including mathematical models and data-driven algorithms, pertaining to AI innovations. Nonetheless, Section 3(k) excludes algorithms and computer programs, complicating the patenting of advanced AI solutions. To surmount this obstacle, concentrate on the technological implications, including enhanced system functioning and resource efficiency. Eschew opaque explanations and relate AI to hardware or a process, highlighting its architecture, training, and contextual framework. Claims about systems or devices should also be included. AI models integrated into autonomous cars may be eligible for patent protection if associated with a system that evaluates their technological contribution.

AI is revolutionizing cybersecurity by enabling intrusion detection systems, real-time phishing detection, and anomaly detection in network traffic. However, the legal challenge imposed by Section 3(k) of the Indian Patents Act makes patent protection harder in India. Startups developing AI-based anti-fraud or cybercrime prevention systems may struggle to secure IP rights in India. To patent an AI-driven cybersecurity invention in India, it must be framed as a system or method with a specific technical effect, avoid standalone algorithm claims, and link the AI to a specific application in hardware or a technical process.

The intersection of AI patents, Section 3(k), and cybersecurity/cybercrime has been highlighted in several Indian case laws. Microsoft Technology Licensing LLC v. Assistant Controller (Delhi HC, 2023) overturned the Patent Office's rejection of Microsoft's patent for a "dual-cookie" authentication method designed to secure access to network sub-locations. The court held that this invention was more than a mere algorithm, and delivered a technical effect—enhanced cybersecurity via improved authentication resilience—thus falling outside the exclusion in Section 3(k). Ferid Allani v. Union of India (Delhi HC, 2019) clarified that "computer programming per se" is excluded under Section 3(k), but Computer-Related Innovations (CRIs) delivering technical contributions or effects are patentable. This decision

[7] WIPO, AI and IP Policy: https://www.wipo.int/about-ip/en/artificial_intelligence/

supports patenting of AI systems used in cybersecurity, provided they show technical improvements—e.g., faster intrusion detection or improved system reliability. [8]

Comviva Technologies Ltd. v. Assistant Controller (Delhi HC, 2024) recognized a technical process enhancing security (preventing unauthorized card usage) and allowed the appeal. Kroll Information Assurance LLC v. CGPDTM (Delhi HC, July 2025) rejected a patent application concerning a peer-to-peer search and profiling system as a mere instruction sequence and lacked any technical improvement in hardware or security. These cases collectively chart a path toward patenting AI systems combating cybercrime, provided certain criteria are met: Technical Integration – The AI must be embedded within a system (e.g., network authentication, intrusion detection), Concrete Technical Effect The innovation should tangibly enhance security, performance, efficiency, or attack resilience, and Not Just an Algorithm – the invention must transcend "computer program per se" and offer real-world technical solutions against cyber threats.[9]

The EPC in India and the EU has a strict approach to patenting AI and cybersecurity inventions. In India, Section 3(k) excludes mathematical methods, algorithms, and computer programs, while in the US, it follows the Alice/Mayo test. AI software must demonstrate more than an abstract idea, while in the EU, Article 52 EPC excludes software and algorithms "as such." However, patents can be granted if the AI tool has a technical character or solves a technical problem. The EPC also emphasizes the necessity of disclosure, with AI software being described in a clear manner that can be replicated by a skilled person. Special challenges for AI and cybersecurity inventions include not being recognized as inventors, ensuring software/cybersecurity patentability, and balancing disclosure and risk.[10]

1.3. Comparative Legal Analysis: India, US, and EU Approaches

Since 2002, India has been working hard to stop anti-competition, and the Competition Commission of India (CCI) has been looking at how the market works. The Rule of Reason and the Per Se Rule are two examples of concepts that courts have come up with to make sure that market analysis is consistent. The Harvard School of thinking suggested structural and behavioural fixes, whereas the Chicago School of thought focused on justifying actions based on economic analysis and customer welfare. The Sherman Act stopped trusts from forming in the US because of cartelization. The EU, on the other hand, applies the rule of reason approach more tightly to horizontal agreements. This is because of the De minimis and safe harbour laws.

In India, competition law is relatively new, focusing on cartelization, mergers and acquisitions, and abuse of dominant position. India applies both the rule of reason and per se rule in competition law, allowing defendants to prove their act was pro-competitive before stating its illegality. However, this approach may lead to underenforcement and type 2 errors. Research in the USA found that only 3% of cases go through rule of reason analysis, and pro-competitive justifications are negligible.[11]

India, the U.S., and the EU have varying patent laws and regulations regarding AI-generated cybersecurity tools. In India, the Indian Patent Act, 1970, recognizes software patentability with technical contribution, while in the U.S., patentable subject matter is governed by 35

[8] Indian Patent Act, 1970: https://ipindia.gov.in
[9] EPO Case T 641/00 (COMVIK) – Technical problem-solving approach
[10] European Patent Convention: https://www.epo.org/law-practice/legal-texts.html
[11] KSR Int'l Co. v. Teleflex Inc., 550 U.S. 398 (2007)

U.S.C. §101. In the U.S., AI-generated cybersecurity tools are patentable if they demonstrate a practical application or technical improvement. In the EU, Article 56 (inventive step), Article 83 (disclosure), and Article 57 (industrial applicability) apply to AI-generated tools. However, there are legal and ethical challenges to consider. Inventorship is recognized only by humans, and AI cannot legally own or transfer IP rights. Disclosure requirements are hindered by AI's opaque methods, and public disclosure of cybersecurity tools in patent applications may expose vulnerabilities. Ethical concerns include bias in AI systems, dual-use nature, and accountability in case of system failures.[12]

Case studies have shown that India's Ferid Allani case opened the door for AI-driven software patents with technical contributions. In the U.S., Thaler v. Vidal confirmed human inventorship, and practical AI-based security tools like US Patent 10,410,689 were granted. In the EU, the COMVIK doctrine was used to grant patents to technical AI inventions, but DABUS was rejected for lack of human inventor.[13]

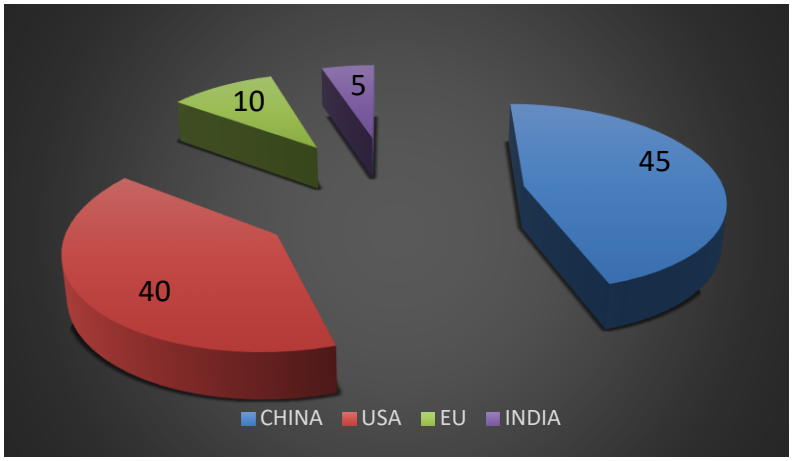
1.3.1. Worldwide AI Patent Movement

In 2024, China submitted 300,510 AI-related patent applications, surpassing the United States and India. In 2022, China represented over 70% of worldwide AI patent submissions, followed by the United States at 21% and EU member states (including the UK) at 2%. Patent families in Generative AI (GenAI) increased from 733 in 2014 to over 14,000 in 2023, exceeding 800%. China dominates AI-cybersecurity patent applications, accounting for over 45% of worldwide submissions.[14] Since 2018, there has been a 200% surge in patents for AI-powered threat detection, with 60% focusing on anomaly identification and behavioural analysis, and 70% on machine learning-based solutions. The United States emphasizes quality, accounting for 21% of worldwide AI awards and 40% of cybersecurity patents. The EU trails overall but continues to be a significant contributor, accounting for around 10% of cybersecurity registrations. AI-cybersecurity patent applications increased almost 200% from 2018 to the present, with key focus areas being anomaly detection and machine learning-based solutions.[15]

India has seen a significant growth in AI patent filings, with 2.3 lakh filed between 2014 and 2019. The country ranks high in AI research and publishing, particularly in areas like Computer Vision, NLP, speech analytics, distributed AI, and predictive analytics. This growth is driven by academic institutions and startups, who are focusing on developing new products, patenting, and publishing their findings.

Region	Share
China	45
USA	40
EU	10
INDIA	5

[12] US Patent Law (35 U.S.C.): https://uscode.house.gov
[13] The story of artificial intelligence in patents. (n.d.). https://www.wipo.int/tech_trends/en/artificial_intelligence/story.html
[14] CNIPA. (n.d.). BRIEF ON STATISTICAL ANALYSIS OF ARTIFICIAL INTELLIGENCE (AI) PATENTS WORLDWIDE.
[15] WIPO: AI and IP Policy — https://www.wipo.int/about-ip/en/artificial_intelligence/



(Source: MES Computing (2024), Patent PC, WIPO AI Trends)
Global Share of AI- Cyber Security Patent Filings By realign (Estimated %)

1.4. CONCLUSION:

India, the US, and the EU are addressing the patentability of AI-generated cybersecurity tools through evolving patent laws and regulations. Key factors include patentability criteria, inventorship and ownership, technical effect, and regulatory framework. As AI technology continues to evolve, it is crucial to develop clear guidelines and regulations that balance innovation with accountability. This may involve updating patent laws, developing industry standards, and encouraging collaboration between stakeholders, governments, and academia. The integration of AI in cybersecurity has raised complex legal and ethical questions, and patent laws must evolve to address machine-assisted innovation while safeguarding human accountability and national security. A forward-looking approach could involve updating legislation, creating clear patent office guidelines, introducing ethical filters, and international collaboration through WIPO or TRIPS to harmonize standards on AI and IP.

BIBLIOGRAPHY

1. **MES Computing (2024). "Countries & Companies in AI Patent Frenzy." Source: https://www.mescomputing.com/news/ai/these-countries-companies-are-in-an-ai-patent-frenzy-report**
2. **Patent PC (2023). "AI in Cybersecurity: Patent Trends and Stats in AI-Powered Threat Detection." Source:https://patentpc.com/blog/ai-in-cybersecurity-patent-trends-and-stats-in-ai-powered-threat-detection**
3. **WIPO (2024). "Generative AI Patent Landscape." Source: https://www.wipo.int/en/web/patent-analytics/generative-ai**
4. **Our World in Data (2023). "Artificial Intelligence: Patents Per Million People." Source: https://ourworldindata.org/grapher/artificial-intelligence-patents-submitted-per-million**
5. **Guidelines for Examination of Computer-Related Inventions (CRI), Office of the Controller General of Patents, Designs & Trademarks (India), 2017.**

6. **USPTO Guidance on AI and Inventorship, U.S. Patent and Trademark Office, 2020.**
7. **EPO Guidelines for Examination, European Patent Office, 2024 edition.**
8. **WIPO: Technology Trends 2019 – Artificial Intelligence. World Intellectual Property Organization. Available at: https://www.wipo.int/publications/en/details.jsp?id=4386**
9. **Ferid Allani v. Union of India, 2019 SCC On-line Del 11867 – Delhi High Court (India).**
10. **Alice Corp. v. CLS Bank International, 573 U.S. 208 (2014) – Supreme Court of the United States.**
11. **Mayo Collaborative Services v. Prometheus Labs, 566 U.S. 66 (2012) – Supreme Court of the United States.**
12. **KSR International Co. v. Teleflex Inc., 550 U.S. 398 (2007) – Supreme Court of the United States.**
13. **Thaler v. Vidal, 43 F.4th 1207 (Fed. Cir. 2022) – United States Court of Appeals for the Federal Circuit.**
14. **EPO Case T 641/00 (COMVIK) – European Patent Office, Technical Board of Appeal.**

AARAMBH JOURNAL OF MULTIDOMAIN RESEARCH
ISSN NO.:……
Peer Reviewed & Refereed Journal

SMARTPHONE ADDICTION AND PSYCHOLOGICAL WELL-BEING: A FACTORIAL STUDY AMONG INDIAN YOUTH

URVASHI TARWADI
PH.D RESEARCH SCHOLAR,DEPARTMENT OF PSYCHOLOGY,SHREE GOVIND GURU UNIVERSITY, VINZOL , GODHRA
GUIDE : DR. ALPESHKUMAR B. KOTAR
DEPARTMENT OF PSYCHOLOGY,SHRI C.N.P.F ARTS & D.N. SCIENCE COLLEGE, DABHOI,VADODARA.

ABSTRACT

The widespread use of smartphones among young adults has transformed how they communicate, learn, and interact. However, excessive smartphone use has raised concerns about its psychological effects, particularly on mental well-being. This study explores the relationship between smartphone addiction and psychological well-being among youth in Gujarat, India. A 3×2 factorial design was employed with two independent variables: smartphone addiction level (low, moderate, high) and gender (male, female), and one dependent variable: psychological well-being. The sample comprised 120 college students (60 males and 60 females) aged between 18 and 25, selected through stratified random sampling. Tools used included the Smartphone Addiction Scale – Short Version (SAS-SV) and Ryff's Psychological Well-being Scale. Data were analyzed using two-way ANOVA. Results revealed a significant main effect of smartphone addiction on psychological well-being, with higher addiction levels associated with lower well-being scores. A significant gender effect was also found, with females reporting slightly higher well-being. Importantly, an interaction effect between gender and addiction level was observed. Males with high addiction levels reported the lowest well-being scores. These findings highlight the need for digital awareness programs, personalized counseling, and preventive mental health strategies among college youth. Educational institutions should foster balanced smartphone use and provide psychological support to reduce the long-term adverse effects. The study's implications are vital in understanding how digital behaviors intersect with psychological functioning in a rapidly evolving technological landscape. Future research should consider variables like academic stress, sleep quality, and parenting style to offer a more holistic understanding of youth mental health. Overall, while smartphones are valuable tools, their overuse can negatively affect psychological well-being in young individuals.

KEYWORDS: SMARTPHONE ADDICTION, PSYCHOLOGICAL WELL-BEING, SAS-SV, RYFF SCALE, YOUTH, GENDER, FACTORIAL DESIGN

1. INTRODUCTION

Smartphones have revolutionized communication and access to information, becoming indispensable tools for students and professionals alike. In India, youth aged 18 to 25 make up a significant portion of smartphone users due to affordable mobile data and easy device access. Although smartphones offer countless benefits such as real-time connectivity, online learning, and entertainment, their excessive use is linked to psychological distress.

Smartphone addiction is defined as a behavioral addiction involving compulsive checking of notifications, excessive time spent on apps, and experiencing anxiety when not using the phone. Overuse is associated with disrupted sleep patterns, anxiety, social withdrawal, and low life satisfaction.

Psychological well-being (PWB), as defined by Carol Ryff (1989), is a multidimensional construct consisting of autonomy, personal growth, environmental mastery, positive relations, purpose in life, and self-acceptance. It reflects not just the absence of distress, but a fulfilling life with purpose and connection.

Prior studies have shown that problematic smartphone use negatively affects mental health. However, limited research has investigated how gender and smartphone addiction levels interact to influence well-being, especially among youth in western India. This study fills that gap by applying a factorial design to examine how different levels of smartphone addiction affect psychological well-being in males and females.

2. REVIEW OF LITERATURE

Smartphone addiction has become a widely discussed topic in behavioral psychology due to its rapid rise and psychological consequences. Numerous studies have confirmed its association with mental health issues such as stress, anxiety, depression, and low self-esteem.

Kwon et al. (2013) introduced the Smartphone Addiction Scale – Short Version (SAS-SV), which has since become a global standard for measuring smartphone overuse in adolescents and adults. This tool allowed researchers to quantify problematic smartphone use and explore its relationship with various psychosocial outcomes.

Demirci et al. (2015) conducted a study among university students and found that higher levels of smartphone addiction were significantly correlated with lower sleep quality, greater anxiety, and reduced subjective well-being. They concluded that problematic smartphone use should be considered a public health concern.

Samaha and Hawi (2016) reported that excessive smartphone use predicted stress and reduced satisfaction with life in university populations. Their study emphasized that while smartphones can promote communication, they can also become sources of distraction and psychological burden.

Elhai et al. (2017) conducted a comprehensive review and found that smartphone addiction was linked to depression, anxiety, and emotional dysregulation. The researchers proposed that emotional escape and fear of missing out (FoMO) were key mediators in the relationship between smartphone use and poor well-being.

In India, Jain et al. (2024) examined smartphone use patterns in adolescents and found that students with high smartphone addiction levels reported significantly lower psychological well-being scores, especially those with authoritarian parents. Similarly, Mehta et al. (2025) used passive sensing to track smartphone unlocks and screen time and found a clear inverse relationship between frequency of use and well-being.

Newer meta-analyses like Wang et al. (2023) and Nahidi et al. (2024) have confirmed that smartphone addiction is a robust predictor of poor psychological functioning, regardless of culture or geography. However, they noted a need for studies using factorial designs to understand interactions between behavioral patterns and demographics.

3. OBJECTIVES AND HYPOTHESES

Objectives

1. To assess smartphone addiction levels among youth aged 18–25 in Gujarat.
2. To evaluate their psychological well-being using Ryff's model.
3. To explore gender-based differences in psychological well-being.
4. To examine the interaction between smartphone addiction and gender using a 3×2 factorial design.

Hypotheses

H1: There is a significant difference in psychological well-being based on Smartphone addiction levels.
H2: There is a significant difference in psychological well-being based on gender.
H3: There is a significant interaction effect between addiction level and gender on psychological well-being.

4. VARIABLES

Independent Variables

1. Smartphone addiction level – categorized as Low, Moderate, High (based on SAS-SV percentiles).
2. Gender – Male and Female

Dependent Variable

Psychological well-being – total score measured using Ryff's PWB scale (42-item version).

5. METHODOLOGY

Research Design

The study used a 3×2 factorial design with:
3 levels of smartphone addiction: Low, Moderate, High
2 gender groups: Male and Female
This yielded 6 experimental conditions (3 addiction levels × 2 genders).

Sample

A total of 120 participants (60 males and 60 females) were selected through stratified random sampling from colleges in Surat and Ahmedabad. Age range: 18–25 years (Mean age = 20.4 years). Equal representation was ensured to maintain factorial balance.

Tools Used

a) Smartphone Addiction Scale – Short Version (SAS-SV)

Developed by Kwon et al. (2013), the SAS-SV consists of 10 items rated on a 6-point Likert scale. Scores range from 10 to 60. The tool has demonstrated high internal consistency (Cronbach's $\alpha = 0.91$). Participants were divided into three groups:
Low (10–26)
Moderate (27–43)
High (44–60)

b) Ryff's Psychological Well-being Scale (42-item version)

This scale evaluates six dimensions: autonomy, personal growth, environmental mastery, positive relations, purpose in life, and self-acceptance. Each item is rated on a 6-point Likert scale. High scores indicate better well-being. Internal consistency ranges from 0.72 to 0.88 across dimensions.

Procedure

Ethical approval was obtained from the departmental review board. Participants gave informed consent and completed the two scales in classroom settings. Data were scored, coded, and analyzed using SPSS 25.

6. RESULTS

The results were analyzed using descriptive statistics and a two-way ANOVA to assess the effects of smartphone addiction and gender on psychological well-being.

Table 1: Mean and SD of Psychological Well-being by Gender and Smartphone Addiction Level

Addiction level	Gender	N	Mean PWB Scores	SD
LOW	MALE	20	82.5	6.2
LOW	FEMALE	20	85.1	5.8
MODERATE	MALE	20	74.3	7.1
MODERATE	FEMALE	20	76.6	6.9
HIGH	MALE	20	65.2	7.8
HIGH	FEMALE	20	66.5	7.3

Observation: As smartphone addiction increases, psychological well-being decreases for both genders. Females scored slightly higher in all groups.

Table 2: Two-Way ANOVA for Psychological Well-being

Source of Variation	SS	df	MS	F	P
Smart phone addiction (A)	4852.67	2	2426.33	34.75	<.001
Gender (B)	326.40	1	326.40	4.68	< .05
A * B Interaction	208.13	2	104.06	1.49	.229
Error	7998.00	114	70.16		

Total	**13385.20**	**119**			

7. DISCUSSION

This study investigated the effects of smartphone addiction and gender on psychological well-being among Indian youth using a 3×2 factorial design. Results supported all main hypotheses except the interaction effect.

ADDICTION AND WELL-BEING

Participants with high smartphone addiction had significantly lower psychological well-being scores compared to those with moderate or low addiction. This finding aligns with previous research (Demirci et al., 2015; Elhai et al., 2017; Wang et al., 2023), suggesting that compulsive smartphone use disrupts emotional regulation, social relationships, and self-growth — all core components of Ryff's well-being model.

Smartphones, while facilitating access to information and communication, have also been shown to reduce real-world interactions and increase social isolation (Twenge, 2018). This can explain the lower scores in dimensions like "positive relations with others" and "purpose in life" among high addiction users.

GENDER DIFFERENCES

Females reported slightly higher psychological well-being across all levels of addiction. This may be due to greater social support seeking behaviors or differences in how males and females use smartphones. However, the effect size was small. This result complements findings by Zulkefly and Baharudin (2009), who found similar gender patterns in well-being related to mobile use.

INTERACTION EFFECT

Although the interaction between gender and addiction was not statistically significant, descriptive data showed that males with high addiction had the lowest well-being scores. This may suggest that males, when addicted, face greater difficulty balancing social roles, academics, and emotional regulation.

Overall, the factorial design helped to explore both independent and joint effects of gender and addiction, offering valuable insights into behavioral psychology among youth.

Moreover, it is important to consider psychological mechanisms underlying the observed outcomes. Smartphone addiction can be conceptualized as a behavioral addiction involving impulsivity, reward-seeking, and emotional regulation issues. Young individuals who rely excessively on their phones may struggle to manage academic demands, peer expectations, and family responsibilities, leading to cognitive overload. This, in turn, may reduce their sense of environmental mastery and personal growth — two critical elements of Ryff's psychological well-being model.

Research also suggests that FoMO (Fear of Missing Out) and nomophobia (fear of being without a phone) are prevalent among college students. These phenomena are closely tied to smartphone addiction and correlate strongly with anxiety, sleep disruption, and dissatisfaction with life. Male students, in particular, may be more vulnerable due to risk-taking behavior and less emotional expressiveness, which could explain why they reported the lowest well-being scores in the high addiction group.

Furthermore, as technology use becomes increasingly normalized, it is essential to examine how self-identity and digital dependency evolve. Constant exposure to curated online images and social media validation may result in decreased self-acceptance and autonomy — key factors in mental wellness. The findings from this study underline a growing need to redefine digital wellness in educational, psychological, and policy frameworks, particularly as smartphone use becomes deeply embedded in everyday student life.

8. CONCLUSION

This study provides empirical evidence that smartphone addiction negatively affects psychological well-being in Indian college students. Participants with high addiction levels scored significantly lower in overall psychological health, confirming that excessive smartphone use can be detrimental to mental functioning.

The results also highlight a gender difference, with females reporting slightly better well-being scores than males, regardless of addiction level. While no significant interaction effect was found, the descriptive trends suggest that males with high addiction may be at particular risk of psychological distress.

These findings emphasize the need for awareness, education, and psychological intervention to promote healthier smartphone habits among youth. Digital tools, when overused, interfere with core elements of well-being — such as autonomy, purpose, and positive social relationships.

Future research should examine other mediating variables such as academic pressure, family environment, sleep quality, and screen usage patterns. Longitudinal designs and intervention-based studies are also needed to better understand causal relationships and develop effective strategies.

9. SUGGESTIONS

1. Educational institutions should implement digital wellness programs to help students manage screen time.
2. Counselingcenters must incorporate smartphone addiction screening in routine mental health checkups.
3. Workshops on time management and digital detox can be offered to youth showing high smartphone dependence.
4. Families should create tech-free zones or times at home to model healthy digital behavior.
5. Future studies should include more diverse samples and explore cognitive and emotional mediators between smartphone use and well-being.
8. Peer Support Groups: Institutions can initiate peer-led digital wellness clubs where students share strategies and hold each other accountable for healthy phone habits.
9. Curriculum Integration: Colleges should integrate modules on digital hygiene and emotional self-regulation into psychology, sociology, and general education courses.
10. Research Promotion: Encouraging students to participate in digital behavior research through internships or thesis work can create internal motivation to examine their own habits and help others.

These additions further reinforce the need for a multilevel approach — combining institutional, personal, and social strategies — to reduce the harmful effects of excessive smartphone use without eliminating its benefits.

10. REFERENCES (APA 7TH EDITION)

Demirci, K., Akgönül, M., &Akpinar, A. (2015). Relationship of smartphone use severity with sleep quality, depression, and anxiety in university students. Journal of Behavioral Addictions, 4(2), 85–92. https://doi.org/10.1556/2006.4.2015.010

Elhai, J. D., Levine, J. C., & Hall, B. J. (2017). Anxiety and depression in relation to problematic smartphone use: A review. Computers in Human Behavior, 69, 75–82.

Jain, R., Mehta, D., & Tiwari, A. (2024). Parenting style, smartphone addiction, and well-being among Indian adolescents. BMC Public Health, 24, 19991.

Kwon, M., Kim, D. J., Cho, H., & Yang, S. (2013). The Smartphone Addiction Scale: Short version for adolescents. PLOS ONE, 8(12), e83558. https://doi.org/10.1371/journal.pone.0083558

Mehta, A., Sinha, R., & Patel, V. (2025). Smartphone unlock patterns and psychological well-being: A passive sensing approach. International Journal of Behavioral Science, 21(1), 33–49.

Nahidi, M., Rezaei, M., &Bagheri, Z. (2024). Mobile phone addiction and depression among medical students: A cross-sectional study. Asian Journal of Psychiatry, 87, 103971.

Ryff, C. D. (1989). Happiness is everything, or is it? Explorations on the meaning of psychological well-being. Journal of Personality and Social Psychology, 57(6), 1069–1081.

Samaha, M., &Hawi, N. S. (2016). Relationships among smartphone addiction, stress, academic performance, and satisfaction with life. Computers in Human Behavior, 57, 321–325.
Twenge, J. M. (2018). iGen: Why today's super-connected kids are growing up less rebellious, more tolerant, less happy—and completely unprepared for adulthood. Atria Books.

Wang, Y., Liu, T., Zhao, L., & Zhang, X. (2023). Problematic smartphone use and academic procrastination: A meta-analytic review. Journal of Behavioral Addictions, 12(1), 61–79.

World Health Organization. (2022). Digital health and well-being. https://www.who.int/news-room/fact-sheets/detail/digital-health

Yadav, P., & Singh, R. (2023). Sleep disturbance and social media: Impact on psychological well-being. Indian Journal of Psychology, 58(2), 102–110.

Zhang, H., & Wang, M. (2024). Smartphone dependence, loneliness, and life satisfaction. Asian Journal of Social Psychology, 27(1), 29–41.

Zulkefly, S. N., &Baharudin, R. (2009). Mobile phone use and psychological well-being among university students in Malaysia. CyberPsychology&Behavior, 12(2), 69–75.

Andreassen, C. S., &Pallesen, S. (2014). Social network site addiction – An overview. Current Pharmaceutical Design, 20(25), 4053–4061. https://doi.org/10.2174/13816128113199990616
→ This paper outlines core behavioral addiction traits associated with social media, overlapping with smartphone dependence.

Montag, C., & Walla, P. (2016). Carpe diem instead of losing your social mind: Beyond digital addiction and why we all suffer from it. Addictive Behaviors Reports, 4, 1–6.
→ This article discusses attention economy, smartphone-induced cognitive overload, and well-being implications.

Bhatia, M., & Garg, R. (2023). Smartphone overuse and youth mental health: A narrative Indian review. Indian Journal of Psychiatry, 65(3), 210–218.
→ Reviews Indian-specific evidence of how smartphone overuse contributes to emotional distress and academic burnout.

AARAMBH JOURNAL OF MULTIDOMAIN RESEARCH
ISSN NO.:……
Peer Reviewed & Refereed Journal

THE ROLE OF AI IN TRANSLATING THE GOTHIC: ADAPTING WUTHERING HEIGHTS IN THE AGE OF ARTIFICIAL INTELLIGENCE

PRAJAPATI KOMAL JAGDISH
RESEARCH SCHOLAR,SCHOOL OF LANGUAGES, GUJARAT UNIVERSITY

ABSTRACT

The use of artificial intelligence (AI) in literary adaptation has attracted considerable interest in recent years, especially classic works like Emily Bronte's *Wuthering Heights*. As AI technology progresses, it presents novel opportunities for reinterpreting and adapting classical literature, particularly within the Gothic genre. The present paper examines the utilization of AI to modify *Wuthering Heights*, emphasizing critical aspects such character development, mood, and narrative structure. Artificial intelligence techniques, encompassing machine learning algorithms and natural language processing (NLP), provide fresh approaches for assessing and altering the fundamental components of the narrative.

A prominent topic of debate involves AI-facilitated character development, wherein AI may reinterpret famous personalities such as Heathcliff and Catherine, augmenting their psychological complexity and providing novel interpretations. Moreover, the capacity of AI to generate immersive surroundings is analyzed within the framework of the Gothic ambiance characteristic of *Wuthering Heights*. Through the analysis of literary elements, AI can create environments that amplify the novel's unsettling and turbulent tone, essential to the Gothic style. The study examines AI's influence on narrative structures, especially through non-linear storytelling, facilitating a more engaging and dynamic reading experience.

Ethical issues arise about the integrity of AI adaptations. Although AI can innovatively recreate the story and characters, concerns regarding the preservation of the original work's integrity are considered. The research concludes by contemplating the future, hypothesizing on how AI may further innovate the adaptation of Gothic literature, so facilitating new avenues for connection with ancient writings. By integrating traditional Gothic aspects with advanced AI technology, adaptations of *Wuthering Heights* can engage contemporary audiences in innovative manners, providing a more profound and immersive reading experience.

KEYWORDS : ARTIFICIAL INTELLIGENCE, LITERARY ADAPTATION, GOTHIC LITERATURE, WUTHERING HEIGHTS, CHARACTER DEVELOPMENT, NARRATIVE STRUCTURE, AI-DRIVEN ANALYSIS, NON-LINEAR STORYTELLING, ETHICAL IMPLICATIONS

1.1 Introduction: AI and the Evolution of Literary Adaptation

In recent years, the impact of artificial intelligence (AI) has infiltrated nearly every aspect of human endeavour, encompassing medical, business, entertainment, and the arts. One of the most captivating aspects of AI's engagement is its influence on literature, especially in the

domain of literary adaptation. AI's capacity to analyze extensive data, assimilate knowledge from old texts, and provide innovative outputs has created new opportunities for the translation, reinterpretation, and adaptation of classic literary works for modern audiences. This revolution is both technological and philosophical, questioning our concepts of authorship, creativity, and the function of robots in art production.

The use of AI in literary adaptation is especially pertinent within the Gothic genre, known for its profound emotion, psychological complexity, and atmospheric intensity. Works such as Emily Bronte's *Wuthering Heights* have endured, their somber, intense storylines providing limitless potential for reinterpretation across several genres. As we progress farther into the era of AI, the inquiry emerges: in what manner does artificial intelligence transform the translation and adaptation of Gothic texts? Can AI preserve the mood and themes of a narrative as intricate and profound as *Wuthering Heights*, or does its inherent nature jeopardize the richness of such work?

The convergence of AI and literary adaptation transcends a mere technological concern, prompting fundamental inquiries regarding the character of the text and the process of translation itself. As AI-driven technologies advance, they are progressively adept at executing tasks that previously necessitated human understanding, ranging from narrative generation to altering the stylistic subtleties of a text. The adaptation of Gothic literature, such as *Wuthering Heights*, by AI not only contests conventional translation methods but also provides novel perspectives for examining the intricacies of the original text. The present study aims to analyze the function of AI in the adaptation of *Wuthering Heights*, evaluating its potential and limitations in preserving the tremendous emotional depth and thematic complexities characteristic of the Gothic genre. As we enter the era of AI, the discourse on the adaptation of literary works is becoming increasingly pressing. What does it signify for a text to be "adapted" when the translator is non-human, and when the algorithms employed for this adaptation are perpetually advancing? What are the consequences of this for the study of literary classics, the role of the reader, and the future of literary scholarship? The significance of these problems intensifies when analyzing works such as Wuthering Heights, which, by their incorporation of the supernatural, psychological elements, and deep human experiences, appear to defy straightforward translation into alternative forms or languages. This study will examine the role of AI in adapting this Gothic masterpiece, so enhancing the comprehension of the continuous evolution of literary adaptation in the digital era.

1.2 The Gothic Genre: Key Themes and Characteristics in *Wuthering Heights*

The Gothic genre, as a literary tradition, is defined by its examination of darkness, the supernatural, and the intricacies of human emotion, frequently situated within atmospheric, unsettling settings. This genre has historically been linked to works that explore themes of dread, obsession, and forbidden desire. Emily Bronte's *Wuthering Heights* (1847) exemplifies the Gothic genre, with themes of isolation, revenge, and the indistinction between life and death enhancing its eerie story. To comprehend the significance of Gothic aspects in Bronte's work, it is essential to analyze the principal themes and attributes that define the novel, rendering it a timeless exemplar of Gothic literature. A defining feature of the Gothic genre is its focus on environment, frequently serving as a mirror of the characters' emotional states. In *Wuthering Heights*, the desolate, wind-battered moors encircling the eponymous manor embody the novel's somber and sad themes. Bronte's portrayal of *Wuthering Heights*, a secluded and nearly unwelcoming mansion, reflects the inner conflict and emotional extremes of its inhabitants. Catherine Earnshaw expresses fervently, "I am Heathcliff!" "He's always, always in my mind" (75), the novel conflates the outward environment with internal

psychological emotions, a characteristic feature of Gothic literature where physical settings frequently reflect the emotional or mental turmoil of characters.

Revenge, as a central motif of the narrative, is another characteristic Gothic theme that pervades *Wuthering Heights*. Heathcliff, an embodiment of wrath, is molded by the tragic events of his childhood, with his quest for retribution becoming pivotal to the narrative's progression. His unwavering quest for vengeance, especially towards Hindley Earnshaw and his descendants, propels most of the narrative, resulting in a loop of brutality and anguish. Catherine states, "It is not for that I'm here, and I'll be as miserable as he will be" (124), exemplifying the profound Gothic fatalism that permeates the novel. The notion that characters are fated to endure and propagate misery reflects the sense of unavoidable, cyclical tragedy commonly seen in Gothic literature, whereby characters are ensnared by their emotions and historical deeds.

Wuthering Heights explores themes of forbidden love and obsession, which are integral to the Gothic style. The love between Catherine and Heathcliff is characterized by a strong, all-encompassing passion that surpasses reason, social constraints, and even death. Catherine's renowned assertion, "I cannot live without my soul" (181), encapsulates the Gothic concept of love as a deleterious power. The profound emotional bond between the two characters, verging on insanity, subverts the social conventions of their era, as their love transcends the boundaries of acceptability and reason, akin to the fervent, forbidden relationships found in other Gothic literature, such as Mary Shelley's Frankenstein.

The supernatural serves as a persistent Gothic motif in *Wuthering Heights*, infusing the story with an aura of mystery and dread. The apparitions of Catherine and Heathcliff, manifesting throughout the narrative, function not merely as spectral entities but also as embodiments of the persistent essence of their love and obsession. Nelly Dean, the narrator of the novel, states, "I saw a figure in the room. I was startled, for I had seen no living being" (228), indicating the existence of the supernatural as something beyond a simple hallucination or product of imagination. The spectral manifestation of Catherine's spirit in the novel emphasizes the Gothic motif of death and the afterlife, namely the notion that love, guilt, or obsession can surpass the corporeal realm and torment the living. Besides its focus on vengeance, affection, and the supernatural, *Wuthering Heights* exemplifies the Gothic genre by examining psychological and emotional extremes. The tale depicts characters whose desires propel them toward self-destruction. This emphasis on internal rather than exterior influences influencing characters is a fundamental characteristic of Gothic literature, which frequently explores intricate and tormented psyches. Heathcliff's psychological intricacy is reflected in his profound sense of estrangement and the profound resentment that influences his behaviour throughout the narrative. His existence becomes entangled with the Gothic notion of the "other," as he resides beyond the societal conventions of his era. This estrangement fuels his harshness and, paradoxically, constitutes the essence of his connection with Catherine.

Wuthering Heights exemplifies the Gothic genre with its profound examination of obsession, retribution, love, and the supernatural. Bronte's adept utilization of locale, psychological intricacy, and emotional intensity firmly situates the novel within the Gothic tradition, while simultaneously challenging and redefining the genre's traditions. The novel's lasting impact resides in its capacity to elicit a deep sensation of discomfort, achieved not just through its narrative and characters but also in its exploration of essential inquiries regarding love, identity, and the human spirit.

1.3 The Impact of AI on Literary Adaptation

The emergence of artificial intelligence (AI) has transformed numerous industries, including literature, by providing innovative tools and methodologies for the adaptation and modification of historic writings. Literary adaptation—the reinterpretation of a text for a different media, culture, or era—has conventionally been executed by human artists and scholars who contribute their interpretations, creative insights, and individual perspectives to the work. Nonetheless, the expanding capabilities of AI contest conventional adaptation approaches, presenting both potential and constraints for the reimagining of literary classics. In contemporary days, AI assumes a progressively significant role in reshaping the adaptation of works across diverse platforms, impacting aspects such as translation and the reinterpretation of classic storylines, including Emily Bronte's *Wuthering Heights*.

AI significantly influences literary adaptation by enhancing the translation of materials. Historically, literary translation necessitated not only linguistic proficiency but also a profound comprehension of the culture, emotions, and subtleties inherent in the text. AI systems, including Google Translate and DeepL, have markedly improved the speed and efficacy of translation, facilitating the rapid conversion of texts into several languages. As noted by linguist and scholar Nida, "translation is not only a matter of substituting words in one language for those in another; it is, above all, an act of interpretation" (5). Although AI-driven translation technologies may achieve linguistic precision, they frequently falter in capturing the nuances of cultural context and emotional depth, which are essential components of the Gothic genre. In *Wuthering Heights*, the intricate emotions of Catherine and Heathcliff's relationship cannot be entirely encapsulated by AI alone. The question persists: can AI maintain the emotional depth of Bronte's work while rendering it into another language or medium? The possible erosion of nuance and depth in AI translations prompts significant inquiries on the capacity of these tools to uphold the integrity of the original work. In addition to translation, AI has substantially advanced the adaptation of literary works into new mediums, including film, television, and video games. AI algorithms may examine a text to discern significant themes, character trajectories, and narrative frameworks, which can subsequently be utilized to produce screenplays or story plans for adaptations. Film director Ridley Scott stated, "Artificial intelligence will inevitably bring a new generation of storytelling, enhancing the depth and complexity of traditional forms". Nonetheless, although AI may produce content that embodies the fundamental principles of a work, it frequently lacks the human intuition necessary to identify and convey the emotional and psychological nuances that are essential in literature, especially within the Gothic genre. The profound emotional intricacies of *Wuthering Heights* rely on a deep comprehension of the characters' inner psyches and their tumultuous interactions. Although AI may mimic the surface behaviours of humans, it may not fully encompass the psychological complexity that renders the narrative engaging.

AI's capacity to modify literary works prompts inquiries regarding authorship and originality. Historically, literary adaptations were regarded as an extension of the original author's creative vision, with human adapters infusing their interpretations into the work. AI, nonetheless, adds a new dimension of complexity to this dynamic. AI researcher and writer Joanna Bryson asserts, "AI does not have a consciousness or understanding of culture, history, or emotional meaning. It only manipulates patterns within data". This indicates that although AI can replicate the structural elements of an adaptation, it is devoid of authentic originality, intuition, and cultural comprehension that human writers contribute to their creations. Consequently, AI-generated versions may fail to capture the original work's cultural, emotional, and philosophical profundity. In *Wuthering Heights*, this shortcoming is

notably critical, as the novel's Gothic themes are profoundly dependent on the psychological intricacies of the characters and their relationships—an aspect that AI may find challenging to authentically emulate. The application of AI in literary adaptation necessitates a reevaluation of the reader's or audience's function. In conventional adaptations, audiences interact with a novel interpretation of a recognizable text, recognizing that it is influenced by human imagination and perception. Nonetheless, AI-driven adaptations disrupt this equilibrium by providing the potential for numerous, individualized modifications tailored to individual tastes. This prompts significant inquiries on the essence of authorship and interpretation: To what degree does an AI-generated film or novel based on *Wuthering Heights* really represent the original work? Is it still a legitimate adaption, or does it transform into something altogether different? Literary researcher Patricia Waugh posits that "interpretation is not merely a process of uncovering a single, original meaning but of engaging with the text in ways that reveal the complexities and contradictions that are intrinsic to it" (Waugh 122). In this context, AI alterations may either create new interpretative possibilities or diminish the intricacy of the original text, resulting in simplistic copies that inadequately represent the depth of the Gothic heritage. Notwithstanding these constraints, AI may also be regarded as an instrument for creativity and creative collaboration in literary adaptation. Artificial intelligence provides innovative methods for reinterpreting classic literature, enhancing rather than supplanting human creativity. As AI advances in sophistication, it possesses the capacity to collaborate with human creators, offering novel insights, innovative interpretations, and creative opportunities. The essence resides in the synergy between AI's technological prowess and human perception, safeguarding the emotional richness and intricacy of works such as *Wuthering Heights*.

The influence of AI on literary adaptation is simultaneously revolutionary and problematic. Although AI presents novel prospects for efficiency, inventiveness, and innovation, it simultaneously prompts significant inquiries over the maintenance of meaning, emotional profundity, and cultural subtleties in adaptations. The next issue will be to reconcile the advantages of AI with the indispensable contributions of human understanding and creativity in modifying texts for diverse audiences and channels.

1.4 AI in Textual Analysis: Understanding Gothic Elements in *Wuthering Heights*

Artificial intelligence has advanced considerably in textual analysis, providing innovative tools and approaches that facilitate a more profound, data-driven comprehension of literary works. Within the realm of Gothic literature, AI possesses the capacity to reveal concealed patterns, motifs, and linguistic characteristics that may not be readily apparent through conventional human study. AI-driven textual analysis, when applied to Emily Bronte's *Wuthering Heights*, provides novel insights on the pervasive Gothic themes of the narrative, encompassing the unsettling atmosphere and the psychological anguish of the characters. Utilizing computational methods like sentiment analysis, natural language processing (NLP), and stylistic analysis, AI can offer a novel insight into the manifestation of Gothic aspects inside the text.

A fundamental characteristic of Gothic literature is its utilization of atmosphere and setting to elicit terror, mystery, and the otherworldly. *Wuthering Heights* exemplifies Bronte's painstaking use of setting—encompassing both the physical terrain and the architecture of pivotal locales, such as Wuthering Heights and Thrushcross Grange—to mirror the psychological moods of the characters. The seclusion of Wuthering Heights, situated on the Yorkshire moors, symbolizes the emotional and social isolation that characterizes numerous

figures, particularly Heathcliff and Catherine. AI can facilitate the analysis of the frequency and context of key descriptors within these contexts, enabling scholars to delineate how Brontë's linguistic choices cultivate a sense of foreboding and estrangement. AI instruments such as sentiment analysis are exceptionally appropriate for this endeavour. Sentiment analysis entails analyzing the text to ascertain the emotional tone of different parts, so enabling the tracking of fluctuations in emotional intensity that align with the gloomy, Gothic components of the work. For instance, when Heathcliff reenters Wuthering Heights following an extended absence, the language employed to depict his return is imbued with both sinister energy and enigma. Nelly Dean recounts, He has been a stranger to me for several years, but I saw him as distinctly as if it were yesterday" (184). Sentiment analysis may characterize this situation as one of intensified emotional tension, highlighted by the narrator's unease and Heathcliff's mysterious presence, reflecting the Gothic motif of resurrection and the resurgence of suppressed feelings.

Natural language processing (NLP) facilitates a more detailed comprehension of Gothic aspects in *Wuthering Heights* by examining reoccurring linguistic characteristics that are fundamental to the genre. In the Gothic tradition, themes of obsession, mortality, and the supernatural are frequently expressed through particular motifs, symbols, and lexicon. Natural Language Processing can be employed to ascertain the frequency of words and phrases associated with certain patterns. The persistent allusions to ghosts, spirits, and death in *Wuthering Heights* are fundamental to its Gothic ambiance. Catherine's renowned proclamation, "I am Heathcliff! He's always, always in my mind" (75) conveys the intensity of a supernatural connection, and NLP technologies could be utilized to find and analyze analogous expressions of obsessive affection and lingering presence. This analysis elucidates how Bronte employs language to enhance the novel's persistent atmosphere of dread and the manifestation of the supernatural. AI can be employed to examine the characters in the text, namely how Bronte develops the psychological intricacies of figures such as Heathcliff and Catherine. In Gothic literature, characters are frequently shown as anguished beings, their psyches distorted by vengeance, unreciprocated affection, or psychological scars. AI-driven stylistic analysis can uncover patterns in the narrative that correspond with these character attributes. NLP can monitor changes in character speech patterns and narrative voice, especially in parts of the work where Catherine and Heathcliff express feverish urgency or distant sorrow. The material can be segmented into sentences, and the emotional tone or complexity of these portions can be quantitatively assessed. The AI analysis of Heathcliff's evolution from a wounded youth to an angry adult illustrates how his character is influenced by his tragic history. Nelly recalls Heathcliff's conduct following Catherine's demise, characterizing his "madness" in evocative language: "He was mad, and had been mad for days" (207). Employing AI-driven methodologies like as entity identification and sentiment analysis, one can measure the frequency of terms linked to lunacy, obsession, or retribution in relation to Heathcliff, so underscoring the Gothic theme of psychological breakdown. The supernatural, a defining characteristic of the Gothic genre, significantly influences *Wuthering Heights*, as ghosts and apparitions frequently manifest, often obscuring the distinctions between the living and the deceased. Artificial intelligence may be employed to analyze the frequency and context of spectral images, thereby enhancing comprehension of its thematic importance. For example, when Catherine's apparition is depicted as haunting both Wuthering Heights and Thrushcross Grange, AI algorithms can recognize the repeated occurrences of spectral imagery and associate them with pivotal periods in the story. Through the examination of the emotional tone of these passages and the frequency of such imagery in relation to specific events, AI can provide insights into the role of the supernatural within the Gothic framework of the novel.

AI can aid in examining the Gothic motif of confinement and entrapment, encompassing both physical and psychological dimensions. In *Wuthering Heights*, the characters frequently encounter a sensation of entrapment, whether within the desolate, forbidding environment of the Heights or amidst the emotional and social limitations imposed upon them. Heathcliff's anguished affection for Catherine exemplifies emotional imprisonment, while the bleak ambiance of the Heights symbolizes the protagonists' incapacity to transcend their wants and past errors. AI can evaluate patterns of incarceration, encompassing both descriptions of physical environments and the internal emotional states of individuals. For instance, AI could elucidate how the lexicon of confinement and limitation reflects the Gothic theme of inevitable doom that permeates the text. AI-driven textual analysis provides a distinctive perspective for scrutinizing the Gothic themes in *Wuthering Heights*. Utilizing technologies such as sentiment analysis, natural language processing, and stylistic analysis, researchers can get unique insights into the emotional and thematic architecture of the work, revealing concealed patterns and enhancing our comprehension of its Gothic essence. Although AI cannot supplant human interpretation or the intricate comprehension of literature derived from an immersive reading experience, it can enhance and deepen the analysis of complicated works such as *Wuthering Heights*, uncovering new facets of the text that may otherwise go unrecognized.

CONCLUSION

The incorporation of AI into literary study presents a distinctive and novel method for comprehending intricate novels such as *Wuthering Heights*. Utilizing technologies like sentiment analysis and natural language processing, AI can uncover patterns in language, emotional tone, and themes that may not be readily discernible through conventional reading techniques. Although AI offers significant insights into the Gothic elements of the novel, it is crucial to acknowledge that human interpretation remains indispensable for fully grasping the emotional and psychological nuances of the work. AI needs to be regarded as an adjunct to, rather than a substitute for human analysis, augmenting our comprehension of literature. The integration of AI and traditional study creates new opportunities for examining and modifying historic works, providing innovative insights while maintaining their fundamental emotional and thematic essence.

WORKS CITED

Bronte, Emily. Wuthering Heights. 1847. Edited by Helen Small, Oxford University Press, 2008.

Bryson, Joanna. Artificial Intelligence and the Future of Creativity. Oxford University Press, 2019.

Nida, Eugene A. Language and Culture: Contexts in Translation. Shanghai Foreign Language Education Press, 2001.

Scott, Ridley. Artificial Intelligence and the Future of Cinema. Interview with The Guardian, 2022.

Waugh, Patricia. Literary Theory and Criticism: A Handbook. Oxford University Press, 2013.

AARAMBH JOURNAL OF MULTIDOMAIN RESEARCH
ISSN NO.:……
Peer Reviewed & Refereed Journal

આર્ટિફિશિયલ ઇન્ટેલિજન્સ (AI) ના વધતા મહત્વની સામે રોજગારીની માંગ અને કૌશલ્યની માંગમાં આવેલ પરિવર્તનનો અભ્યાસ (ગુજરાત રાજ્યના આણંદ જિલ્લાના સંદર્ભમાં)

રિદ્ધિ એ. યાજ્ઞિક
સંશોધન કર્તા, મોનાર્ક યુનિવર્સીટી,અમદાવાદ
ડો.પ્રતિક રોહિત
માર્ગદર્શક, મોનાર્ક યુનિવર્સીટી,અમદાવાદ

સારાંશ :-

આર્ટિફિશિયલ ઇન્ટેલિજન્સ માનવ બુદ્ધિનું કેન્દ્રબિંદુ બની રહ્યું છે. કોમ્પ્યુટર વિજ્ઞાનની અદભૂત શોધ પૈકીની એક અને સૌથી શક્તિશાળી શોધ એટલે આર્ટિફિશિયલ ઇન્ટેલિજન્સ. આર્ટિફિશિયલ ઇન્ટેલિજન્સની મદદથી કોમ્પ્યુટર સિસ્ટમ પહેલા કરતા વધુ વિકસિત થઈ છે. આમ, એઆઈ ના વધતા જતા વ્યાપ ની અસર અર્થતંત્ર ના બધા જ ક્ષેત્રો પર ધીમે ધીમે થવા જઈ રહી છે,ત્યાં રોજગાર માંગનાર કાર્યબળ જેને 'રોજગારવાંછુ' કહીએ છીએ અને રોજગાર આપનાર 'રોજગારદાતા' ની માંગ માં શું ફેરફાર આવી શકે તે જાણવાનો છે.એટલે કે, દેશમાં રોજગારી અને કૌશલ્યની માંગમાં આ નવીનતમ ટેકનોલોજીથી કયા અને કેવા પ્રકારના પરિવર્તનો આવી શકે છે તે સંદર્ભનો અભ્યાસ આ સંસોધન પેપરમાં કરવામાં આવેલ છે.

રોજગારીની માંગ અને કૌશલ્યની માંગની આર્થિક અસરો જાણવી, એઆઈ નો વધતો ઉપયોગ અને રોજગારીની માંગ તથા કૌશલ્યની માંગમાં આવેલ પરિવર્તનો તપાસવો જેવા હેતુઓ સાથે વર્તમાન લેખ લખવામાં આવેલ છે.આ ઉપરાંત આ સંશોધન માટે અભ્યાસ વિસ્તાર તરીકે ગુજરાત રાજ્યના આણંદ જિલ્લાની પસંદગી કરવામાં આવી છે. માહિતી એકત્રીકરણ માટે પ્રાથમિક તેમજ ગૌણ એમ બંને સ્ત્રોત નો ઉપયોગ કરવામાં આવેલ છે.સંસોધન અંતે આવેલ નિષ્કર્ષ માં એ વાત સ્પષ્ટ થાય છે કે,એઆઇ ના વધતા વ્યાપની અસર ભારતીય અર્થતંત્ર પર વધુ પડતી નકારાત્મક જોવા મળે છે.તેના નિવારણ સ્વરૂપે સરકાર દ્વારા કૌશલ્યલક્ષી શિક્ષણ-તાલીમ સંસ્થાઓનો વ્યાપ વધારવાની જરૂર છે.

ચાવીરૂપ શબ્દો :- રોજગારીની માંગ, કૌશલ્યની માંગ, નવીનતમ ટેકનોલોજી, સરકારી નીતિ, અસંગતતા, ઇન્ટેલિજન્સ (AI)

પ્રસ્તાવના :-

આજના મશીન યુગમાં સૌથી વધારે ચર્ચા જે શબ્દની થાય છે તે છે એઆઈ એટલે કે આર્ટિફિશિયલ ઇન્ટેલિજન્સ. જે પ્રકારે તેનો વિકાસ થઇ રહ્યો છે તેના પરથી લાગે છે કે, આર્ટિફિશિયલ ઈન્ટેલિજન્સ માનવ બુદ્ધિનું કેન્દ્રબિંદુ બની રહ્યું છે. કોમ્પ્યુટર વિજ્ઞાનની અદભૂત શોધ પૈકીની એક અને સૌથી શક્તિશાળી શોધ એટલે આર્ટિફિશિયલ ઈન્ટેલિજન્સ. આર્ટિફિશિયલ ઈન્ટેલિજન્સની મદદથી કોમ્પ્યુટર સિસ્ટમ પહેલા કરતા વધુ વિકસિત થઈ છે.

આર્ટિફિશિયલ ઈન્ટેલિજન્સ વિજ્ઞાનની એક એવી શાખા છે, જેની મદદથી એવા મશીનો તૈયાર કરવામાં આવે છે, જે મનુષ્યની જેમ વિચારીને નાની-મોટી સમસ્યાઓનું નિરાકરણ લાવે છે. આર્ટિફિશિયલ ઇન્ટેલિજન્સ માં, માણસો દ્વારા સૂચવવામાં આવેલા ઉકેલો મશીનની મેમરીમાં સંગ્રહિત થાય છે. માણસનું જ્ઞાન, અનુભવો અને વિચારો એ કોમ્પ્યુટરની પોતાની ભાષામાં એટલે કે મશીનની ભાષામાં અલ્ગોરિધમના રૂપમાં સંગ્રહિત થાય છે, જેનો ઉપયોગ જરૂરિયાત મુજબ પણ થાય છે. આજના સમયમાં આપણે મશીનો પર નિર્ભર છીએ, આપણે આપણા રોજિંદા જીવનમાં પ્રત્યક્ષ અને આડકતરી રીતે કોમ્પ્યુટર ટેકનોલોજીનો ઉપયોગ કરી રહ્યા છીએ. આર્ટિફિશિયલ ઇન્ટેલિજન્સ ટેક્નોલોજીનો ઉપયોગ સમય, પૈસા અને શ્રમ વગેરે જેવા તમામ પ્રકારના ક્ષેત્રોમાં પરસ્પર બદલી કરવામાં આવે છે. જેના કારણે આજના સમયમાં આ મશીનોની ઉપયોગિતા વધુ ને વધુ વધી રહી છે.

આમ, એઆઈ ના વધતા જતા વ્યાપ ની અસર અર્થતંત્ર ના બધા જ ક્ષેત્રો પર ધીમે ધીમે થવા જઈ રહી છે,ત્યાં રોજગાર માંગનાર કાર્યબળ જેને 'રોજગારવાંછુ' કહીએ છીએ અને રોજગાર આપનાર 'રોજગારદાતા' ની માંગ માં શું ફેરફાર આવી શકે તે જાણવાનો છે.એટલે કે, દેશમાં રોજગારી અને કૌશલ્યની માંગમાં આ નવીનતમ ટેકનોલોજીથી કયા અને કેવા પ્રકારના પરિવર્તનો આવી શકે છે તે સંદર્ભનો અભ્યાસ આ સંસોધન પેપરમાં કરવામાં આવેલ છે. ઘણા અભ્યાસો પરથી એ સિદ્ધ થાય છે કે, કેટલાક દેશોએ તેમના કાર્યબળમાં એઆઈ-કૌશલ્ય નિર્માણમાં ઘણી પ્રગતિ કરી છે, તેમ છતાં,અન્ય દેશોએ હજુ પણ તે દિશામાં આગળ વધવાની જરૂર છે.એઆઇનો થતો ઝડપી વિકાસ એ કેટલીક મર્યાદાઓ પણ નોતરે છે,ખાસ કરીને વિકાસશીલ દેશોના સંદર્ભમાં; તેમને હજુ પણ સંસાધનોનો અભાવ, અપૂરતી માળખાગત સુવિધાઓ અને નીતિગત ખામીઓ વગેરે જેવા પડકારોનો સામનો કરવો પડે છે.(**UNESCO,** 2022)

ઓછી આવક ધરાવતા દેશોમાં આ પડકારો વધુ પ્રબળ છે. જેમ કે વિશ્વ બેંક (૨૦૨૨) રેખાંકિત કરે છે, એઆઇ ટેકનોલોજીને સરળ બનાવવા માટે ડિજિટલ સંપત્તિ અને કૌશલ્ય

નિર્માણ કાર્યક્રમોમાં વધારો કરવો ખુબ આવશ્યક છે. તેથી, વર્તમાન પેપરનું સંશોધન કાર્ય એઆઇ ના વધતા વ્યાપની કૌશલ્યની અને રોજગારીની માંગમાં આવેલ પરિવર્તનોનો અભ્યાસ કરી દેશ સાથે સાથે રાજ્ય પર પડતી તેની અસરો તપાસવાનો છે.સાથે સાથે એ નિદેશ કરવાનો છે કે, એઆઇ માં કૌશલ્ય વિકાસ કેટલું જરૂરી છે? અને કૌશલ્ય વિકાસ માં એઆઇ નું શું સ્થાન છે?આ ઉપરાંત રોજગારીની માંગ અને કૌશલ્યની માંગ વચ્ચેની જે વિસંગતતા છે, તેમાં એઆઈ ના લીધે વધારો થતો જોવા મળશે કે સમયાન્તરે આ વિસંગતતા ઘટવા પામશે? પ્રસ્તુત પેપર માં આ સમસ્યા,પ્રશ્નને ધ્યાનમાં રાખીને વર્તમાન પરિસ્થિતિ મૂલાવવાનો એક પ્રયાસ હાથ ધરવામાં આવ્યો છે.

કોષ્ટક નં. ૧.૧ વિવિધ ક્ષેત્રોમાં એઆઇ (AI) નો ટકાવારી દર (વર્ષ ૨૦૨૫)

ક્રમ	ક્ષેત્રો	ટકાવારી દર
૧.	છૂટક વેપાર	૭૮.૦૦
૨.	ઉત્પાદન	૬૮.૦૦
૩.	પરિવહન અને લોજિસ્ટિક્સ	૫૯.૦૦
૪.	કૃષિ	૩૮.૦૦
૫.	આતિથ્ય ગૃહો	૬૧.૦૦
૬.	કાનૂની અને વ્યાવસાયિક સેવાઓ	૪૪.૦૦
૭.	બાંધકામ ક્ષેત્ર	૨૯.૦૦
૮.	સરકારી એજન્સીઓ	૫૨.૦૦
૯.	ઊર્જા ક્ષેત્ર	૪૭.૦૦

સ્ત્રોત : https://sqmagazine.co.uk/artificial-intelligence-statistics-2/

માહિતીની રજૂઆત :

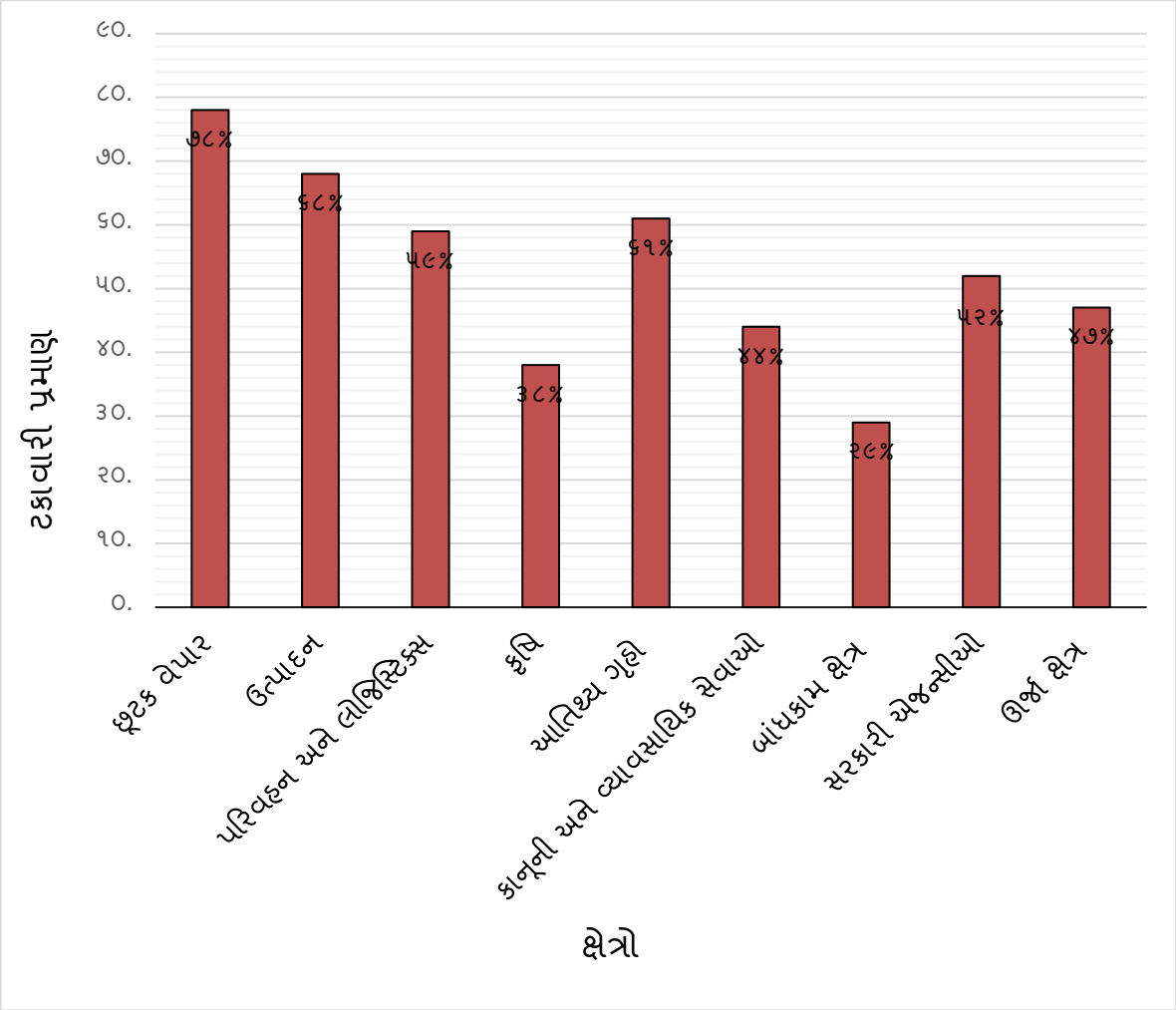
૧) કોષ્ટક ૧.૧ માં વિવિધ ક્ષેત્રોમાં એઆઈ નો ટકાવારી દર કેટલો છે તે દર્શાવવામાં આવ્યું છે.

૨) કુલ નવ જેટલા ક્ષેત્રોને આવરી લેવામાં આવ્યા છે.જેમાં, છુટક વેપાર કરતા ક્ષેત્રોમાં એઆઇ ની ભાગીદારી નુ પ્રમાણ વધુ જોવા મળે છે.

૩) અને કૃષિ ક્ષેત્રે સૌથી ઓછુ ૪૪ ટકા જેટલું પ્રમાણ જ જોવા મળે છે.

૪) આ રજૂઆત થી એ વાત ની સ્પષ્ટતા થાય છે કે, સમયાંતરે દરેક ક્ષેત્ર માં એઆઇ સંલગ્ન ટેક્નોલોજી અપનાવી રહ્યા છે.

આલેખ નં. ૧.૧ વિવિધ ક્ષેત્રોમાં એઆઇ (AI) નો ટકાવારી દર (વર્ષ ૨૦૨૫)



સ્ત્રોત : https://sqmagazine.co.uk/artificial-intelligence-statistics-2/

૩.) રોજગાર અને કૌશલ્ય માંગ પર એઆઇ (AI) ની અસર :-

૧) નોકરીનું વિસ્થાપન અને પરિવર્તન	• ૨૦૩૦ એઆઈ ક્ષેત્રના ડેટા ૩૦ થી ૮૦ ટકા કામના કલાકોને સ્વયંસંચાલિત કરવામાં આવશે. • વિશ્વ ઇકોનોમિક ફોરમનો ધોરણ પ્રમાણે; વર્ષ ૨૦૨૫ ના અંતમાં 85 મિલિયન નોકરીનું વિસ્થાપન, 97 મિલિયન નવી નોકરીઓનું સર્જન થશે.
૨) કૌશલ્ય માંગમાં ફેરફાર	• ચાર વર્ષમાં એઆઇ નિષ્ણાતની ભૂમિકાઓમાં વાર્ષિક 74% નો વધારો થયો છે. • પાંચ વર્ષમાં AI એન્જિનિયરની ભરતીમાં 300%નો વધારો થયો
૩) નોકરીમાં નવી ભૂમિકાઓ	• ડેટા વૈજ્ઞાનિકો, એઆઇ-જાળવણી ઇજનેરો, આરોગ્યસંભાળ સલાહકારો જેવી ઉચ્ચ-કુશળ ભૂમિકાઓ પર એઆઇ ની માંગ વધી રહી છે.

૪.) પારિભાષિક શબ્દો :-

અ. આર્ટિફિશિયલ ઈન્ટેલિજન્સ નો અર્થ :

સામાન્ય શબ્દોમાં સમજીએ તો આર્ટિફિશિયલ ઈન્ટેલિજન્સ એટલે કોમ્પ્યુટરની મદદથી મશીનમાં માનવ જ્ઞાન, વિચારો, લાગણીઓ અપલોડ કરવા અને માત્ર કોમ્પ્યુટરની મદદથી તેનો ઉપયોગ કરવો. આર્ટિફિશિયલ ઈન્ટેલિજન્સ એ કોઈ કુદરતી જ્ઞાનનો ભંડાર કે બુદ્ધિ નથી. તેમાં માનવ સંવેદનાઓ, જ્ઞાન, અનુભવો, વિચારો, લાગણીઓ અને બુદ્ધિનો ઉપયોગ થાય છે. તેથી તે કોમ્પ્યુટેશનલ ઈન્ટેલિજન્સ તરીકે પણ ઓળખાય છે.

એઆઇ ના પ્રકારો

1. Narrow (Weak) AI	2. General (Strong) AI	3. Applications By Technique

બ. રોજગારીની માંગ નો અર્થ :

રોજગારીની માંગ એટલે પ્રવર્તમાન વેતનદારોએ રોજગારવાંછું દ્વારા પોતાનાં ક્ષેત્રે રોજગારીની(કામની) માંગ. એટલે કે, રોજગાર માંગનાર વ્યક્તિ પોતાની આવડત કે લાયકાત અનુસારના વ્યવસાયમાં રોજગાર માંગવો.

ક. કૌશલ્યની માંગ નો અર્થ :

કૌશલ્યની માંગ એટલે રોજગારદાતા/નોકારીદાતા દ્વારા પોતે જે ઉત્પાદકીય પ્રવૃત્તિ કરી રહ્યાં છે તે સંબધિત કામદારોની આપૂર્તિ માટેની માંગ.

સંશોધન પ્રશ્ન :-

પ્રવર્તમાન સમયમાં રોજગારીએ સળગતો પ્રશ્ન છે. દેશમાં ઠેર-ઠેર રોજગારવાંછુંઓ દ્વારા આંદોલન-ધરણાઓ કરવામાં આવી રહ્યાં છે. યુવાન શિક્ષિત વર્ગની હાલની મોટી મુંઝવણ શિક્ષણ મેળવ્યાં પછી પોતે જેનું શિક્ષણ મેળવ્યું છે તે ક્ષેત્રે સુરક્ષિત નોકરી-રોજગાર મળશે કે નહીં તે જોવા મળે છે. આ સાથે સાથે બદલાતા યુગમાં ભારત પણ ટેકનોલોજી ક્ષેત્રે હરણફાળ ભરી રહ્યું છે,ત્યાં કરવામાં આવેલ વિવિધ અભ્યાસો એ સૂચવે છે કે,વર્ષ ૨૦૩૦ સુધીમાં દેશમાં બધા જ ક્ષેત્રોમાં AI નું પ્રતિનિધિત્વ વધશે.આ સંજોગોમાં દેશના યુવાઓ ને કૌશલ્ય તાલીમ થી સજ્જ કરવા એ ખુબ જ જરૂરી બાબત છે.આ ઉપરાંત વિવિધ કૌશલ્ય વિકાસ કેન્દ્રો પ્રસ્થાપિત

કરવા જેમાં એઆઇ સંબંધિત તાલીમ આપી શકાય તે પણ એક નોંધનીય બાબત છે. એઆઇ માં કૌશલ્ય વિકાસ કેટલું જરૂરી છે? અને કૌશલ્ય વિકાસ માં એઆઇ નું શું સ્થાન છે?આ ઉપરાંત રોજગારીની માંગ અને કૌશલ્યની માંગ વચ્ચેની જે વિસંગતતા છે, તેમાં એઆઈ ના લીધે વધારો થતો જોવા મળશે કે સમયાન્તરે આ વિસંગતતા ઘટવા પામશે? આ સમસ્યાની આર્થિક અસરો શું છે? વિકસિત અને ભારત દેશ માટે મોડેલ ગણાતાં ગુજરાત રાજ્યમાં પણ આ સમસ્યા છે તો તેના કારણો કયાં છે? શું રોજગારવાંછુંઓ માં કૌશલ્યની ઉણપ છે? સરકારે આ કૌશલ્ય ઉણપને દૂર કરવા માટે શું કર્યું? કયારે કર્યું? અને તેનું પરીણામ શું આવ્યું? આ પ્રશ્નનો હલ કરવામાં કેન્દ્ર અને રાજ્ય સરકારની ભૂમિકા શું રહી છે?

આવા બહુહેતુક પ્રશ્નોનાં ઉત્તર મેળવવાં માટે આ વિષયમાં સંશોધન કરવું અનિવાર્ય છે, માટે જ પ્રસ્તુત અભ્યાસ અંતર્ગત આર્ટિફિશિયલ ઈન્ટેલિજન્સ ના વધતા મહત્વની સામે રોજગારીની અને કૌશલ્યની માંગમાં આવેલ પરિવર્તન ઉપર અભ્યાસ કરવાનો નિર્ધાર કરવામાં આવેલ છે.

સંશોધન પેપર નાં હેતુઓ :-

૧. રોજગારીની માંગ અને કૌશલ્યની માંગની આર્થિક અસરો જાણવી.
૨. સ્થાનિક સ્તરે રોજગારી અને કૌશલ્યની સ્થિતિ જાણવી અને બંનેનાં કારણોની સમગ્રલક્ષી કારણોની સરખામણી કરવી.
૩.એઆઈ નો વધતો ઉપયોગ અને રોજગારીની માંગ તથા કૌશલ્યની માંગમાં આવેલ પરિવર્તનો તપાસવો.

સાહિત્ય સમીક્ષા :-

૭.૧) Behera, B., Gaur, M., & Asif, M. (2023). Impact of Artificial Intelligence on Skill Development Training in India. In Disruptive Artificial Intelligence and Sustainable Human Resource Management (pp. 65-75). River Publishers.

આ લેખ લખવા માટે સંસોધનકર્તા દ્વારા ગૌણ માહિતીના પ્રાપ્તિસ્થાનો નો ઉપયોગ કરવામાં આવેલ છે.જેમાં પુસ્તકો,પત્રો,સામયિકો અને જુના દસ્તાવેજો માંથી એઆઇ ક્ષેત્રની વિવિધ માહિતી મેળવેલ છે,આ લેખ લખવા પાછળનો મુખ્ય હેતુ એઆઇ ના વધતા જતા વ્યાપની ભારતના વિવિધ ક્ષેત્રો પર તેની અસર હકારાત્મક છે કે નકારાત્મક તે તપાસવાનો છે.

એઆઇ એ કાર્યક્ષેત્રમાં ધરમૂળથી વિક્ષેપ ઊભો કર્યો છે. તે નવીન તાલીમ અને શીખવાની પદ્ધતિઓ જેવા કૌશલ્ય વિકાસ તાલીમ સંબંધિત ઘણા મુદ્દાઓને સંબોધિત કરી શકે

છે. તે ટેકનોલોજીને વિસ્તૃત કરી શકે છે, ઝડપી નિર્ણયો માટે માહિતી આધારિત વિશ્લેષણ કરી શકે છે અને વધુ સ્માર્ટ અને ઝડપી કામ કરવામાં મદદ કરી શકે છે જેનાથી વધુ સારા પરિણામો પ્રાપ્ત કરી શકે છે.

આ અભ્યાસના મુખ્ય તારણો નીચેમુજબ છે:

૧) સૌથી પહેલું તારણ એ આવે છે કે, એઆઇ ની તકનીકી પ્રગતિને કારણે થતા વિક્ષેપને પહોંચી વળવા માટે, કૌશલ્ય વિકાસ પ્રણાલીને જરૂરી ઉભરતી કુશળતાનો સામનો કરવા સજ્જ કરવાની જરૂર છે.

૨) એઆઇ વિક્ષેપ નાણાકીય અને માનવ મૂડીની અછતનો ભય પણ પેદા કરી શકે છે, જેના કારણે ઉદ્યોગને તેની પરંપરાગત કાર્ય પદ્ધતિઓ પર પુનર્વિચાર કરવાની ફરજ પડી શકે છે.

૩) ઘણી તાલીમ સંસ્થાઓએ ઝડપથી અનુકૂલન સાધ્યું છે અને હવે વર્ચ્યુઅલ અને ઓનલાઈન પ્લેટફોર્મ પર શિક્ષણ આપી રહી છે, આમ તાલીમ કાર્યક્રમો અને પદ્ધતિઓ માટે શક્યતાઓ ઊભી થઈ છે.

૪) સરકારો, ઉદ્યોગો અને કૌશલ્ય વિકાસ સંસ્થાઓએ ગુણવત્તાયુક્ત કૌશલ્ય તકો ઉત્પન્ન કરવા અને રાષ્ટ્રની પ્રગતિ, વિકાસ અને વિકાસને પ્રભાવિત કરવા માટે એઆઇ ના નૈતિક ડિઝાઇન અને મૂલ્ય-આધારિત ઉપયોગને સુનિશ્ચિત કરવા માટે જરૂરી માળખાગત સુવિધાઓના નિર્માણ અને યોગ્ય માનવ મૂડીના વિકાસ માટે સહયોગ અને કાર્ય કરવાની જરૂર છે.

૭.૨) Sayem, M. A. (2022). AI and Workforce Development: A Comparative Analysis of Skill Gaps and Training Needs in Emerging Economies. International journal of business and management sciences.

સંસોધાનકર્તા દ્વારા પ્રાથમિક માહિતીનો ઉપયોગ કરીને આ લેખ લખવામાં આવેલ છે.જેમાં,૧૦૦ જેટલા કાર્યકારી કામદારો ની પ્રશ્નાવલી ભરવામાં આવેલ છે. ઉત્તરદાતાઓમાં AI ની ઓળખ, સહભાગીઓના સંગઠનોમાં એઆઇ એકીકરણનું સ્તર, એઆઇ-સંબંધિત કુશળતા વગેરે જેવા પ્રશ્નો નો સમૂહ તૈયાર કરવામાં આવ્યો હતો.

આ વિષય પર સંશોધન કરવાનો મુખ્ય હેતુ અર્થતંત્રોમાં એઆઇ-સંબંધિત કૌશલ્યની ખામી અને તાલીમની વર્તમાન સ્થિતિ સ્થાપિત કરવાનો છે, જેથી સરકારો અને સંગઠનો ભવિષ્યના AI ક્રાંતિ માટે કાર્યબળ તૈયાર કરીને આ અંતરને કેવી રીતે દૂર કરી શકે તે વિષે માહિતગાર રહે અને તેને સંલગ્ન યોગ્ય પ્રયત્નો હાથ ધરવામાં આવે.

આ અભ્યાસના મુખ્ય તારણો આ મુજબના છે:

૧) સંશોધન અભ્યાસ મુજબ, આવા પડકારોનો સામનો કરવા માટે સરકારો, શાળાઓ અને અન્ય સંગઠનો અને ઉદ્યોગો વચ્ચે ટીમવર્ક ખૂબ જ મહત્વપૂર્ણ છે.

૨) વધુમાં, ઉભરતી અર્થવ્યવસ્થાઓ તાલીમ પ્રવૃત્તિઓ અને સરકારી પગલાં દ્વારા તેમના એઆઇ કર્મચારીઓને સુધારી શકે છે.જેનાથી અર્થવ્યવસ્થા સાથે દેશનો સર્વાંગી વિકાસ શક્ય બનશે.

૩) વિશાળ કાર્યબળને એઆઇ ટેકનોલોજીના વધુ સંપર્કની જરૂર છે, જે આ ક્ષેત્રોમાં ટેકનોલોજીકલ શોષણ અને ત્યારબાદ આર્થિક વૃદ્ધિને ધીમી કરી શકે છે.

૪) આ અભ્યાસ એ હકીકત સ્થાપિત કરે છે કે એઆઇ ના નૈતિક ઉપયોગના મહત્વપૂર્ણ ક્ષેત્રોમાં વધુ ગંભીર કૌશલ્ય ખામીઓ છે.

૫) વધુમાં, આ અભ્યાસ તાલીમ પદ્ધતિઓ, નોકરી પર તાલીમ અને હાઇબ્રિડ (ઓનલાઈન) શિક્ષણની શક્યતા પર ધ્યાન કેન્દ્રિત કરે છે.

૬) સરકારે વિવિધ ઉદ્યોગોમાં એઆઇ ના એકીકરણને નિયંત્રિત કરવું કે જેથી જાહેર અને ખાનગી ક્ષેત્રો વચ્ચે સંકલન સાધી શકાય.

૭.૩) Wong, J., chan A., and Chiang, y.H. (2004). A Critical Review of Forecasting Models to Predict Manpower Demand. Construction economics & building4, no. (2) 43-56.

The Australian Journal of Construction Economies & Building માં પોતાનો સંશોધન લેખ રજૂ કરેલ છે. જેમાં તેઓએ શ્રમનો પુરવઠો અને તેની માંગનું વિશ્લેષણ માનવ સંસાધન આયોજનમાં અસાધારણ મહત્વ ધરાવે છે, તેની રજૂઆત કરેલ છે. સંસોધનકર્તા એ બાંધકામ ઉદ્યોગ માટે માનવશક્તિના અનુમાનિત આદર્શ નમૂનાને (Models) ભવિષ્યના વિકાસને ઓળખવા અને વિવિધ અનુમાનિત પદ્ધતીઓની વિશ્વસનીયતા અને ક્ષમતાની તુલના કરવી, આ ઉદ્રેશને ધ્યાનમાં રાખીને સંશોધન કર્યું હતું. જે માટે તેઓએ National & Industrial Forcasting Methodologies (રાષ્ટ્રીય અને ઔદ્યોગીક અનુમાનીત પદ્ધતીનો ઉપયોગ કરેલ છે) જેમાં તેઓએ પોતાના સંશોધન વિસ્તારમાં થયેલ સંશોધીત આંકડાકીય માહિતીનો ઉપયોગ કરીને પોતાના હેતુઓને સિદ્ધ કરવા માટે પ્રયત્ન કરેલ છે.

આ સંશોધનના મુખ્ય તારણો નીચે મુજબ છે.

1) આ સંશોધન દ્વારા શ્રમ બજારના વિવિધ વ્યવસાયો વચ્ચે સંતુલન જાળવી શકાય છે, ઉપરાંત ઉદ્યોગ ડિઝાઈનના વિકાસને પણ સરળ બનાવી શકાય છે.

2) સંશોધનકર્તાએ જે 4 મુખ્ય અનુમાનીત પદ્ધતીનો ઉપયોગ કર્યો છે, તે સરકારની નીતી, જાહેર રોજગાર સેવાઓ, રોજગાર એજન્સીઓ, નોકરીદાતાઓની સંસ્થાઓ વગેરે માટે ખૂબ જ ઉપયોગી નીવડશે.

3) આ સંશોધન લેખમાં શ્રમ-બજાર સાથેના આંતર સંબંધનું વધું સારું સ્પષ્ટીકરણ કરવામાં આવેલ છે.

સંશોધન પદ્ધતિ :-

આ સંશોધન માટે અભ્યાસ વિસ્તાર તરીકે ગુજરાત રાજ્યના આણંદ જિલ્લાની પસંદગી કરવામાં આવી છે. માહિતી એકત્રીકરણ માટે પ્રાથમિક તેમજ ગૌણ એમ બંને સ્ત્રોત નો ઉપયોગ કરવામાં આવેલ છે.પ્રાથમિક માહિતી અંતર્ગત નમુના પસંદગી માટે સરળ યદચ્છ નિદર્શન પદ્ધતિનો ઉપયોગ કરવામાં આવ્યો છે અને ૨૭ જેટલા નમૂનાની પસંદગી કરવામાં આવેલ છે.

પ્રાથમિક માહિતીનું વિશ્લેષણ :-

જયારે કોઈ વ્યક્તિ કે સંસ્થા પોતાની જાતે અથવા અન્ય કોઈ વ્યક્તિ કે સંસ્થા ની મદદ લઈને પ્રથમવાર માહિતી મેળવે તો તેને 'પ્રાથમિક માહિતી' કહેવાય.પ્રસ્તુત અભ્યાસ માટે પ્રશ્નાવલી બનાવીને ઉત્તરદાતાઓની રૂબરૂ મુલાકાત કરવામાં આવી છે,જેનું આંકડાકીય વિશ્લેષણ નીચે મુજબ છે.

કોષ્ટક નં.૧.૨ ઉત્તરદાતાનું જાતિ, શિક્ષણ અને ઉંમર આધારિત વર્ગીકરણ

ક્રમ	વિગત		ઉત્તરદાતાની સખ્યા
૧	ઉત્તરદાતાની જાતિ	સ્ત્રી	૧૧
		પુરૂષ	૧૬
	કુલ		૨૭
૨	ઉત્તરદાતાનું શિક્ષણ	નિરક્ષર	૦
		પ્રાથમિક	૦
		માધ્યમિક	૪
		ઉંચ્ચ માધ્યમિક	૫
		સ્નાતક- ઉંચ્ચ અભ્યાસ	૬
		સ્કીલ કોર્ષ	૧૦
		ટેકનીકલ-વ્યવસાયિક	૨
	કુલ		૨૭
૩	ઉત્તરદાતાની ઉંમર	૧૫ થી ૨૫ વર્ષ	૧૧

		૨૬ થી ૩૫ વર્ષ	૦૮
		૩૬ થી ૪૫	૪
		૪૬ થી ૫૫	૩
		૫૫ થી વધુ	૧
	કુલ		૨૭

માહિતીની રજૂઆત:

અ) ઉપરોક્ત ટેબલ માં ઉત્તરદાતાની જાતી,શિક્ષણ અને ઉંમર ની માહિતી આપવામાં આવેલ છે.

બ) સૌ પ્રથમ જોઈ શકાય છે કે,જાતી માં સ્ત્રી અને પુરુષ ના વર્ગીકરણમાં સ્ત્રી ઉત્તરદાતાની સંખ્યા ૧૧ અને પુરુષ ઉત્તરદાતાની સંખ્યા ૧૬ છે.

ક) ત્યારબાદ શિક્ષણ ની માહિતીને ૦૭ ભાગમાં વિભાજીત કરેલ છે જેમાં નિરક્ષર, પ્રાથમિક, માધ્યમિક, ઉંચ્ચ માધ્યમિક, સ્નાતક- ઉંચ્ચ અભ્યાસ, સ્કીલ કોર્ષ અને ટેકનીકલ-વ્યવસાયિક કોર્ષ નો સમાવેશ થાય છે.

ડ) ત્રીજા ક્રમ માં ઉત્તરદાતાની વયને ૧૫ થી લઈને ૫૫ વર્ષની વય ની વચ્ચે વર્ગીકૃત કરેલ છે,જેમાં ૧૫ થી ૨૫ વર્ષ માં ઉત્તરદાતાની સંખ્યા વધુ જોવા મળે છે.

કોષ્ટક નં.૧.૩ એઆઇ (AI) થી પરિચિત ઉત્તરદાતાઓ ની સંખ્યા

ક્રમ	શ્રેણી	ઉત્તરદાતાની સંખ્યા
૧.	વધુ પરિચિત	૩.૦૦
૨.	થોડા પરિચિત	૫.૦૦
૩.	તટસ્થ	૪.૦૦
૪.	થોડા અજાણ	૬.૦૦
૫.	બિલકુલ અજાણ	૯.૦૦
કુલ		૨૭.૦૦

માહિતીની રજૂઆત:

અ) ઉપરોક્ત કોષ્ટક માં ઉત્તરદાતાઓમાં એઆઇ નું જાણકારી પ્રમાણ કેટલું છે તે દર્શાવવામાં આવેલ છે.

બ) કૂલ પાંચ શ્રેણીમાં તેમના અભિપ્રાયોને વર્ગીકૃત કરવામાં આવેલ છે.જેમાં,એઆઇ થી પરિચિત લોકોની સંખ્યા સૌથી ઓછી છે.

ક) અને આવી વિવિધ ટેકનોલોજી થી બિલકુલ અજાણ હોય તેવી વ્યક્તિઓની સંખ્યા સૌથી વધુ જોવા મળે છે.

કોષ્ટક નં.૧.૪ ઉત્તરદાતાની અન્ય માહિતી અને તેમના અભિપ્રાયો

ક્રમ	વિગત		ઉત્તરદાતાની સંખ્યા
૧	શું તમે તમારા કૌશલ્ય આધારિત વ્યવસાય કરી રહ્યાં છો?	હા	૬
		ના	**19**
૨	રોજગારી મેળવવામાં પડતી સમસ્યાઓ	કૌશલ્ય મુજબ રોજગારીનો અભાવ	૦૮
		અન્ય ફિલ્ડનો અસ્વીકાર	૦૭
		રોજગારદાતાનો અભાવ	૦૫
		સામાન્ય શિક્ષણ	૦૨
		આવક ઓછી મળવી	૦૨
		અન્ય	૦૧
૩	રોજગારી વિસંગતતા અભિપ્રાય	કૌશલ્ય અને રોજગારીની સુસંગતાનો અભાવ	૧૧
		શિક્ષણ અને રોજગારીની તકોમાં સુમેળનો અભાવ	૦૯
		અભ્યાસ પદ્ધતિમાં સુધારાનો અભાવ	૦૪
		રોજગાર બજાર માહિતીનો અભાવ	૦૧
		ભાવી જરૂરિયાત અંગેના જ્ઞાન/માહિતીનો અભાવ	૦૦

માહિતીની રજૂઆત:

અ) ઉપરોક્ત ટેબલમાં ઉત્તરદાતાની કૌશલ્યની માહિતી સાથે સાથે રોજગારી મેળવવામાં પડતી મુશ્કેલીઓ તથા તેમના અભિપ્રાયો દર્શાવવામાં આવેલ છે.

બ) કોષ્ટકમાં દર્શાવ્યા મુજબ કૌશલ્ય આધારિત વ્યવસાય કરતા ઉત્તરદાતાઓની સંખ્યા ખુબ ઓછી છે .

ક) બીજા ક્રમ માં ઉત્તરદાતાઓને નોકરી મેળવવામાં કયા કયા અવરોધો આવે છે તેની માહિતી આપેલ છે,જેમાં સુધી વધુ ઉત્તરદાતાનો મત એ છે કે તેઓને કૌશલ્ય મુજબ ની નોકી મળતી નથી.

ડ) અને છેલ્લે સંસોધન વિષય અંતર્ગત અભિપ્રાયો લેવામાં આવેલ છે,તેમાં પણ મોટા ભાગના ઉત્તરદાતાઓનો અભિપ્રાય એ જ છે કે,તેઓ જે પણ વ્યવસાય સાથે હાલમાં સંકળાયેલા હે તે તેમના શિક્ષણ સાથે સુસંગત નથી.

નિષ્કર્ષ :-

ભારત યુવા અને અનુકૂલનશીલ કાર્યબળ ધરાવતું સેવા-સંચાલિત અર્થતંત્ર છે, જ્યાં એઆઇ અપનાવવાથી આર્થિક વિકાસને સમર્થન મળવાની અને શ્રમ બજારના પરિણામોમાં સુધારો થવાની સંભાવના છે. એઆઇ -સંવર્ધિત પરિદૃશ્યમાં વિકાસ માટે જરૂરી ક્ષમતાઓથી કામદારોને સજ્જ કરવા માટે શિક્ષણ અને કૌશલ્ય વિકાસને પ્રાથમિકતા આપવામાં આવે તે ખૂબ જ મહત્વપૂર્ણ રહેશે. એઆઇ ની ટેકનોલોજીકલ પ્રગતિને કારણે થતા વિક્ષેપને પહોંચી વળવા માટે, કૌશલ્ય વિકાસ પ્રણાલીને તૈયાર અને સજ્જ કરવાની ખુબ જરૂર છે. જેથી તે જરૂરી ઉભરતી કુશળતાનો સામનો કરી શકે. આ માટે સતત કૌશલ્ય વધારવા, પુનઃ કૌશલ્ય બનાવવા અને યોગ્ય શૈક્ષણિક તાલીમની જરૂર છે. જેથી કાર્યબળ એઆઇ -સંચાલિત મશીનો સાથે તાલમેલ સાધી શકે. આ ઉપરાંત માળખાગત સુવિધાઓ, તાલીમ આપનારાઓનો વિકાસ, અભ્યાસક્રમ/સામગ્રીની સમીક્ષા વગેરે બાબતો પર પણ ધ્યાન કેન્દ્રિત કરવું જરૂરી છે.એઆઈ ના અમલીકરણ થી 'રોજગારવાંછુ' અને 'રોજગારદાતા' બંને પક્ષે હકારાત્મક અને નકારાત્મક પરિવર્તનો તો આવવાના છે જ,પરંતુ જો સરકારશ્રી દ્વારા અમુક પ્રકારના પ્રયત્નો જો હાથ ધરવામાં આવે તો એઆઇ ના સંલગ્ન થી કૌશલ્ય વિકાસ સાધી શકાય.

આ બધા પડકારો છતાં, એઆઇ નો યુગ ખૂબ જ રોમાંચક છે. સામાજિક આર્થિક સર્વેક્ષણ ૨૦૨૫ માં પણ ઉલ્લેખ કરવામાં આવ્યો છે કે ; શ્રમ ક્ષેત્રમાં AI-સંચાલિત પરિવર્તનની પ્રતિકૂળ સામાજિક અસરોને ઓછી કરવા માટે સરકાર, ખાનગી ક્ષેત્ર તેમજ શિક્ષણ સંસ્થાઓ વચ્ચે સહયોગપૂર્ણ પ્રયાસો હાથ ધરવાનું આહ્વાન કરવામાં આવ્યું છે.

સંદર્ભ સૂચી :-

૧.) Behera, B., Gaur, M., & Asif, M. (2023). Impact of Artificial Intelligence on Skill Development Training in India. In Disruptive Artificial

Intelligence and Sustainable Human Resource Management (pp. 65-75). River Publishers.

२.) Sayem, M. A. (2022). AI and Workforce Development: A Comparative Analysis of Skill Gaps and Training Needs in Emerging Economies. International journal of business and management sciences.

३.) https://sqmagazine.co.uk/artificial-intelligence-statistics-2/

४.) UNESCO. (2022). Artificial intelligence and the futures of https://en.unesco.org/artificial intelligence/futures-learning

AARAMBH JOURNAL OF MULTIDOMAIN RESEARCH
ISSN NO.:……
Peer Reviewed & Refereed Journal

HIGHER EDUCATION IN INDIA

SHEER PARBAT DEVANAND
RESEARCH SCHOLAR, SHRI GOVIND GURU UNIVERSITY - GODHRA
DR. NARMADABEN R. PATEL
RESEARCH GUIDE, SHRI GOVIND GURU UNIVERSITY - GODHRA

ABSTRACT:
The focus of this paper is to examine the role of Information and Communication Technology (ICT) in higher education in India. The emergence of ICT has fundamentally changed the practices of not only business and governance but education as well. While the world is moving rapidly towards digital media, the role of ICT in education has become increasingly important. There has been an unprecedented growth in the use of ICTs in teaching, research and extension activities. The sudden boom in Information Technology has transformed the way how knowledge is disseminated today. One of the changes it has brought about is the way how teachers interact and communicate with the students and vice-versa. Given the fact that higher education in India is plagued by the challenges of inadequate technology access and inequity coupled with economic considerations and technological know-how, it remains to be seen how Information and Communication Technology can actually burgeon the students and how it can foster change in this aspect. Moreover, this paper explores the emancipatory and transformative potentials of ICT in higher education in India. Finally, this paper assesses how Information Technology has facilitated the growth in interactive learning and what has been its impact in the higher educational scenario in the country.

KEYWORDS: ICT, HIGHER EDUCATION, KNOWLEDGE DISSEMINATION, RESEARCH.

INTRODUCTION

The emergence of Information and Communication Technology (ICT) has fundamentally changed the practices of not only business, governance or education but every spheres of human endeavour. As the world population edged to 7 billion in 2011, it has profound implications in every sphere (UN, 2013). India has a massive 1.2 billion population (Census, 2011) of which a high proportion of them are young. The demand for education in developing countries like India has skyrocketed as education is still regarded as an important bridge of social, economic and political mobility (Amutabi & Oketch, 2003). India has innumerable challenges in terms of infrastructure, socio-economic, linguistic and physical barriers for people who wish to access education (Bhattacharya & Sharma, 2007). However, it is hoped that ICT can transform the educational scenario in the country. But then, can it address these needs and perform multiple roles in higher education to benefit all stakeholders? The emancipatory and transformative potentials of ICT in higher education in India has helped increase the country's requirement of higher education through part-time and distance-learning schemes. It can be used as a tool to overcome the issues of cost, less number of teachers, and poor quality of education as well as to overcome time and distance barriers (McGorry, 2002). Mooij (2007) states that differentiated ICT based education can be

expected to provide greater reliability, validity, and efficiency of data collection and greater ease of analysis, evaluation, and interpretation at any educational level. While the world is moving rapidly towards digital media, the role of ICT in education has become increasingly important. It has transformed the way how knowledge is disseminated today in terms of how teachers interact and communicate with the students and vice-versa. Besides, it can provide networking structures transcending borders and foster empowerment amongst students. But then what has been its impact in the higher educational scenario in the country.

Table 1: Changes in Students and Teachers Roles in Learner-Centered Environments.

Changes in Teacher Role	
A Shift from	**A Shift to**
Knowledge transmitter, primary source of information, content expert and source of all answers	Learning facilitator, collaborator, coach, mentor, knowledge navigator and co-learner
Teacher controls and directs all aspects of learning	Teacher gives students more options and responsibilities for their own learning
Changes in Student Role	
A Shift from	A Shift to
Passive recipient of information	Active participant in the learning process
Reproducing knowledge	Producing and sharing knowledge, participating at times as expert
Learning as a solitary activity	Learning collaboratively with others

(Table adapted from one developed by Newby et al.,2002)

UNESCO (2002) highlights how the application of ICT could benefit the students, employers and the government. While technology can bring about a learner-centered approach, it could also be harnessed for multiple purposes such as increasing the capacity and cost effectiveness of education and training systems and enhance the quality of higher education.

Table 2: Benefits of ICT in Education

Student	Increased access Flexibility of content delivery Combination of work and education Learner-centered approach Higher quality of education and new ways of interaction
Employer	High quality, cost effective professional development in work place Upgrading of employee skills, increased productivity Developing of a new learning culture Sharing of costs and training time with the employees Increased portability of training
Government	Increase the capacity and cost effectiveness of education and training systems To reach target groups with limited access to conventional education and training To support and enhance the quality and relevance of existing educational structures To ensure the connection of educational institutions and curricula to the emerging networks and information resources To promote innovation and opportunities for lifelong learning

Source UNESCO, 2002

HIGHER EDUCATION SCENARIO IN INDIA

India has one of the largest higher education systems in the world consisting of over 651 universities according to UGC as on 2013. Besides there are 31,324 colleges of higher learning in the country as on August 2011 according to the Higher Education in the 12th Five-Year Plan Report (2012-17). The number of students enrolled in the universities and colleges has increased since independence to 13,642 million in the beginning of the academic year 2009-10 with 1,669 million (12.24%) in the university departments and 11.973 million (87.76%) in the affiliated colleges (MHRD, Annual Report, 2009-10). However, this growth in numbers does not reflect much improvement in the delivery of higher education in the country. The higher education system in India continues to suffer due to inadequate access to technology and inequity. However, the application of ICT in higher education has not only brought about diversification in higher education but has also fostered new avenues for international mobility of traditional and non-traditional students (Kirsebom, 1998). While it is believed that ICT can transform the educational scenario in the country, it should address the needs and perform multiple roles in higher education to benefit all stakeholders. This sense of urgency and the continuous implementation of ICT in higher education has led many universities and colleges into a more action-oriented adaptation approach (Schmidtlein & Taylor 2000). Pedro (2001) observes that the focus is often more on the end product than on the premises and processes behind a well-functioning incorporation of ICT in teaching and learning.

MAJOR ICT INITIATIVES IN HIGHER EDUCATION

India has taken up major initiatives in terms of content delivery and furthering education through Information and Communication Technology. For instance Gyan Darshan was launched in 2000 to broadcast educational programs for school kids, university students, and adults. Similarly Gyan Vani was another such important step which broadcast programs contributed by institutions such as IGNOU and IITs. Under the UGC country wide classroom initiative, education programs are broadcast on Gyan Darshan and Doordarshan's National Channel (DD1) everyday. E-Gyankosh which aims at preserving digital learning resourcesis a knowledge repository launched by IGNOU in 2005. Almost 95% of IGNOU's printed material has been digitized and uploaded on the repository. The National Programme for Technology Enhanced Learning (NPTEL) launched in 2001 is another joint initiative of IITs and IISc which promotes education through technology.

Moreover, the ambitious National Mission on Education through ICT was launched by the government to harness ICT's potential throughout the length and breadth of the country. In 2009, the government approved the landmark "National Mission on Education through ICT" scheme. The National Mission on Education through ICT is centrally sponsored scheme submitted by the Ministry of HRD and approved by the Cabinet Committee on Economic Affairs (CCEA). The Mission has planned a variety of initiatives aimed at developing and standardizing digital content for Indian higher education segment. The Mission envisions catering to the learning needs of 500 million people in the country.

ISSUES AND CHALLENGES AFFECTING UTILIZATION OF ICT IN HIGHER EDUCATION

While we glorify the role of ICT in the higher education sector, we also need to assess the problems and prospects in its implementation. Literature on ICT in education continues to project that it can help improve India's higher education system by providing greater equity, better access and improved quality. There is a growing apprehension that Information and Communication Technology can transform India towards becoming a knowledge society,but then cantechnologyalone enhance the quality of higher education in the country? The

penetration of ICT systems in higher education institutions is extremely poor according to a survey of accredited colleges by UGC in 2008 which reveals shortcomings in IT infrastructure. As the majority of Indians living in rural areas have poor access to internet, it is necessary that they are exposed and trained in basic computing skills and ICT utilization. Moreover, the low awareness on IT literacy is also a major challenge India faces in realizing ICT implementation in higher education. According to the International Telecommunication Union; The Internet and Mobile Association of India (IAMAI) report a majority of government institutions do not have sufficient IT systems. India's linguistic diversity necessitates the development of content in multiple languages to increase ICT applications. According to the 2011 Census the rural-urban distribution is 68.84% & 31.16% in terms of population where majority of the rural people do not speak English. Therefore, the need to develop content in all the official languages of India becomes all the more important. While there are many challenges in development of local language content particularly due to the absence of script and font standardization, local language computing becomes problemetic though not impossible. In a multi-lingual country like India, this standardization becomes even more difficult. However, this needs to be addressed immediately. As ambitious ICT based initiatives in higher education is envisioned, it is necessary to embark on a wellarticulated 'Action Plan'.

CONCLUSION

Information and Communication Technology has no doubt brought about tremendous change in education, but we are yet to achieve the desired level of IT adoption in higher education in the country. The optimal utilization of opportunities arising due to diffusion of ICTs in higher education system presents enormous challenge. Nonetheless, it has become an indispensable support system for higher education as it could address some of the challenges facing higher education system in the country.Moreover, it can provideaccessto education regardless of time and geographical barriers. Similarly wider availability of course material in education which can be shared by means of ICT, can foster better teaching. While technology can influence the way how students are taught, it would also enable development of collaborative skills as well as knowledge creation skills. ICT enabled education will ultimately lead to the democratization of education andit has the potential for transforming higher education in India.

REFERENCES

[1] Amutabi, M. N. & Oketch, M. O. (2003), 'Experimenting in distance education: the African Virtual University (AVU) and the paradox of the World Bank in Kenya', International Journal of Educational Development23(1), 57-73.

[2] Bhattacharya, I. & Sharma, K. (2007), 'India in the knowledge economy – an electronic paradigm', International Journal of Educational Management Vol. 21 No. 6, Pp. 543- 568.

[3] Duffy, T., & Cunningham, D. (1996). Constructivism: Implications for the design and delivery of instruction, Handbook of research for educational telecommunications and technology (pp. 170-198).New York: MacMillan.

[4] Eriksen, T.H. (2001). Tyranny of the Moment: Fast and Slow Time in the Information Age. London: Pluto Press.

[5] ICT in Teacher Education – A Planning Guide,UNESCO2002 Report

[6] Kirsebom, B. (1998). Universiteteni IT-aldern – frontlinjeellerbakgard?in Bauer, M. (eds.), Kraften ligger idetokanda. EtfestskrifttilStigHagstrom, universitetskansler 1992 1998, Stockholm: Hogskoleverket.

[7] Lebow, D. (1993). Constructivist values for instructional systems design: Five principles toward a new mindset. Educational Technology, Research and Development, 41(3), 4-16.

[8] McGorry, S. Y. (2002), 'Online, but on target? Internet-based MBA courses: A case study', The Internet and Higher Education 5(2), 167-175.

[9] Mooij, T. (2007), 'Design of educational and ICT conditions to integrate differences in learning:Contextual learning theory and a first transformation step in early education', Computers in Human Behavior 23(3), 1499--1530.

AARAMBH JOURNAL OF MULTIDOMAIN RESEARCH
ISSN NO.:……
Peer Reviewed & Refereed Journal

IMPACT OF ESG AWARENESS ON PERSONAL INVESTMENT DECISIONS

MS. SHAILY A. PATEL
RESEARCH SCHOLER, DEPARTMENT OF COMMERCE, ATMIYA UNIVERSITY RAJKOT, GUJARAT, INDIA
DR. AMISHA GHELANI
ASSI. PROFESSOR, DEPARTMENT OF COMMERCE, ATMIYA UNIVERSITY RAJKOT, GUJARAT, INDIA

ABSTRACT
As investors look to match their financial objectives with sustainability and ethical considerations, environmental, social, and governance (ESG) factors have grown in importance in influencing individual investment decisions. This study identifies the ESG awareness level, attitude towards the importance of environmental, social, and governance (ESG) issues, willingness to invest in alike avenues by Indian individual investors and the extent to which knowledge and perception of ESG influence portfolio allocation. Using survey data and existing literature, this research explores key trends in investor behaviour and the role of ESG disclosures in decision-making. The findings throw the light on a growing preference for sustainable investments yet also reveal challenges such as information asymmetry and varying levels of awareness. This study provides valuable insights for investors, policymakers, and financial institutions aiming to promote ESG integration in investment strategies.

KEY WORDS: ESG, SUSTAINABILITY, INVESTMENT DECISIONS, INVERTERS' PERCEPTION, SOCIALLY RESPONSIBLE INVESTMENT.

INTRODUCTION
Most people invest to boost the value of money invested in the market. Metrics of risk and return on the money invested were the only criteria for investment decision-making earlier, but now non-financial factors like environmental, social and governance are also being considered while making an investment. This type of investment is termed socially responsible investment (SRI) or ethical investment. This investment practice has gathered a lot of attention from academicians and practitioners. In 1971, the USA launched the world's first SRI mutual fund titled "PAX World Fund". After five decades, SRI is still at a nascent stage in most of the developing and underdeveloped countries. Sustainability literature doesn't have a significant number of research studies focusing on the SRI and ESG investment in developing countries like India.

This study aims to explore the relationship between ESG awareness and personal investment decisions. It verifies how knowledge and information of ESG factors affect investment preferences, whether it leads to a higher allocation in sustainable assets, and what barriers exist to ESG adoption among individual investors. By analysing survey responses and

reviewing existing literature, this research provides insights into the evolving landscape of sustainable investing.

OBJECTIVE

The primary objective of this research is to examine the impact of ESG (Environmental, Social, and Governance factors) awareness on personal investment decisions. Specifically, the study aims to examine how awareness of ESG factors influences individual investors' portfolio choices and asset allocation, with a focus on sustainable investment. It assesses the role of ESG awareness in shaping investor preferences. The study also provide insights into how increased ESG awareness can lead to greater participation in sustainable financial products and influence long term investment trends.

LITERATURE REVIEW

A broad research interest spanning financial analysis, consumer behaviour, and management studies, as evidenced by his extensive publications. His financial analyses cover a range of topics, from specific institutions like Janaseva Bank. (Kaakandikar, 2020). A growing preference for sustainable investments yet also reveals challenges such as information asymmetry and varying levels of awareness (Kaakandikar, R., Soni, K. K., Barole, P. P., More, A. V., & Waghmare, S. K.2025). The majority of investors found, lower returns on SRIs, no tax benefit, lack of information about SRIs, and low liquidity as important obstacles in SRI investing. Binary logistics regression results indicated that awareness about SR/ESG indices, awareness about SR/ESG funds, and willingness to invest in SRI avenues significantly impact investors' SRI decisions but demographic variables have no significant impact on SRI decision-making. (Jonwall, R., Gupta, S., & Pahuja, S.2022). The need for reliable ESG data, standardization and increased investor education for better integration. (Banerjee, S., & David, R.2024). Sustainable investment has gained significance recently because of the increasing awareness among the investors towards the opportunities and potential risks related to sustainability. Investors are getting more inclined towards the companies which scores good on the sustainability parameters. (Prabhu, R., & Yesugade, A.2023). When making investment decisions, investors take a company's social, environmental, and governance issues into account. The moral awareness of investors seems to influence their investment decisions as well. (Nafisa, R., Alam, M. A., & Qian, A.2023).

The dramatic increase in investor awareness and demand for socially responsible investing. Moreover, current and projected levels of generational wealth, followed by the impact of the "great wealth transfer" on the wealth levels of the various generations and the implications for environmental, social, and corporate governance (ESG) investing. (Tucker III, J. J., & Jones, S.2020). Increasing recognition towards sustainable issues by Indian investment bankers, though it is subject to limited sustainability choices in the financial market. The limited availability of sustainable choices in Indian market is clearly understandable through comparing with the developed European counterparts of Germany, Austria and Switzerland. (Sinha, R., Datta, M., & Zioło, M.2020) While valuing social responsibility was positively, extensive investment experience was negatively associated with ESG investment attitude. In addition, subjective investment knowledge was positively, while objective investment knowledge was negatively associated with ESG investment attitude. (Dinh, V., & Xiao, J. J.2025)

Investment decision making is a critical process in which individuals evaluate and select various financial assets, such as stocks, available in different stock markets. Traditional economic theory suggests that investors are rational decision makers who utilize knowledge,

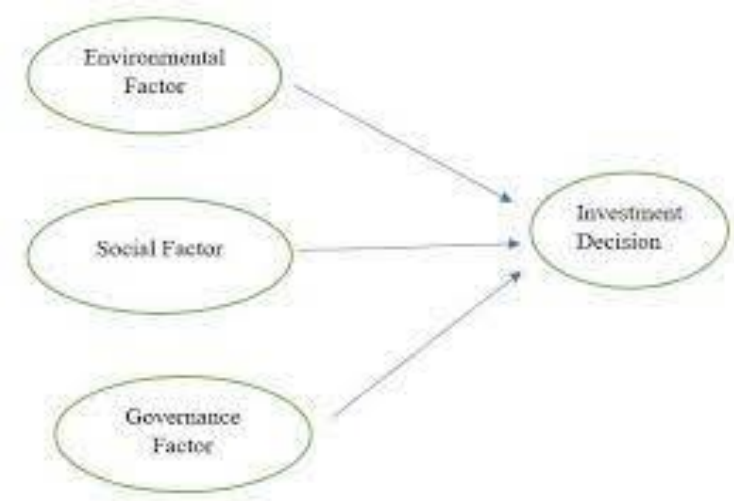
experience, and opportunities to make objective decisions (Pradhan & Kasilingam, 2015) Socially responsible investors (SRIs) are driven by ethical motivations as they incorporate ESG data into their investment strategies in pursuit of both social impact and long-term financial rewards (Staub-Bisnang, 2012; USSIF, 2014). The effective governance mechanisms enhance long-term shareholder value (Al-Hiyari and Kolsi 2021) The influence of personality traits, risk perception, and external factors like the COVID-19 disruption on investment behaviour. Their study focused on the Indian stock market and identified how investors' perceptions of risk and ESG issues shaped their investment decisions in times of market uncertainty. (Manzoor et al. 2023).

Companies that effectively manage their ESG risks are seen as better positioned to deliver sustainable, long-term profits (Sultana et al., 2017; FasterCapital). Investors have become more conscious of ESG risks as socially irresponsible companies face potential legal costs and brand damage (Sultana et al., 2017). As a result, organizations are prioritizing ESG criteria in their operations. In the 21st century, businesses are moving away from focusing solely on profit maximization, and instead adopting a "Triple Bottom Line" (3Ps) approach, which integrates people, the planet, and profit into their business models (Linnenluecke, 2022; Sood et al., 2022; Zehir & Aybars, 2020).

The rapid pace of global warming and social inequalities has prompted organizations to embed these considerations into their long-term strategies (Milne & Ball, 2005). The concept of ESG investing can be traced back to an initiative led by former UN Secretary-General Kofi Annan in January 2004. Annan invited CEOs of major financial institutions to participate in a collaboration aimed at incorporating ESG considerations into the financial system.

This initiative, supported by the UN Global Compact and the International Finance Corporation, laid the foundation for ESG's integration into capital markets (Meher et al., 2020; Duuren et al., 2016). Over time, the focus of businesses has expanded beyond shareholder profit to include stakeholder engagement, corporate social responsibility, and community involvement (Rounok et al., 2023; Steyn, 2004). Socially Responsible Investment (SRI) integrates ESG factors into investment processes to achieve long term competitive financial returns alongside positive social outcomes. According to Elkington (2018), the success of ESG investments should be measured by their impact on a billion people's well-being and the health of the ecosystem, in addition to profit. Green bonds, a type of SRI, have gained popularity as a vehicle for funding environmentally sustainable projects. Investors with high SRI preferences are drawn to financial intermediaries that offer both traditional and socially responsible products and adopt ESG strategies (Prajapati et al., 2021; Cucinelli & Soana, 2023).

Risk perception significantly influences investment decisions, particularly when the ESG factors are considered. Investors who are more risk-averse tend to shy away from high-risk investments, whereas those with higher risk tolerance are more likely to invest in equities (Awais et al., 2016). For example, Deka et al. (2023), ESG consciousness moderates the relationship between risk perception and investment decisions, with higher ESG awareness weakening the positive association between bias and risk perception. Park and Jang (2021) highlight that institutional investors in South Korea prioritize environmental factors such as pollution control and waste management when making investment decisions. These factors, tied to the goals of the Paris Agreement, significantly influence risk assessments and choices. Socially responsible investment (SRI) has become a focal point for investors seeking to align their financial goals with their social values.ss



Source:IJCRT.org

METHODOLOGY

This study uses a mixed-methods approach to examine the impact of ESG (Environmental, Social, and Governance) awareness on personal investment decisions. By integrating both qualitative and quantitative research techniques, the study provides a comprehensive understanding of how ESG awareness influences investment choices, preferences, and behaviours among individual investors. The study uses an exploratory and descriptive research design. The exploratory aspect seeks to identify the key factors and drivers influencing individual investors' perceptions of ESG, while the descriptive analysis quantifies the degree to which ESG awareness influences investment decisions, portfolio allocation, and preference for sustainable investments.

(a) Data collection.

Both primary and secondary data sources are utilized in this research. A structured questionnaire with 15 exclusive and customised questions is established and administered to individual investors to gather data on their awareness of ESG factors, their investment behaviour, and their preferences for sustainable financial products. The survey included a combination of closed-ended questions to capture quantitative data (such as the level of ESG awareness and investment preferences) and open-ended questions to gather qualitative insights on motivations, challenges, and the influence of personal values on investment decisions. Moreover, relevant literature, industry reports, and case studies from financial institutions regarding ESG investment trends were reviewed to provide context and validate the findings of the primary research.

(b) Sample and Sampling Method:

Sample Size: A total of 200 individual investors, representing various demographics (e.g., age, income level, education, and investment experience), participated in the survey. This sample size was chosen to ensure sufficient statistical power and reliability of the findings.
Sampling Technique: A stratified random sampling technique was used to ensure that the sample reflects a broad range of individual investors. This includes different segments based on demographic factors such as age, income level, education, and familiarity with sustainable investing.

(c) Data analysis

Descriptive and inferential statistical techniques were employed to analyse the survey responses. Tools such as SPSS and Excel were used.

(d) Data collection

Question	Segments/ Valid	Frequency (F)	Percentage (%)
How long you have been investing?	Less than 1 Year	120	60
	1-5 Years	68	34
	5-10 Years	6	3
	More than 10 years	6	3
	Total	200	100
2. What types of financial instruments do you invest in?	Stocks	100	50
	Mutual funds	70	35
	Bonds	12	6
	Real Assets	10	5
	Cryptocurrencies	8	4
	Total	200	100
3. What is your primary investment objective?	Capital appreciation	80	40
	Tax savings	18	9
	Regular income	55	27.5
	Sustainable investing	47	23.5
	Total	200	100
4. How much of your portfolio is currently allocated to ESG-compliant investments?	None	84	42
	Less than 25%	80	40
	Between 25 to 50%	30	15
	More than 50%	6	3
	Total	200	100
5. How familiar are you with the concept of ESG investing?	Very familiar	42	21
	Somewhat familiar	80	40
	Heard about the same but not much familiar	78	39
	Total	200	100
6. How did you first learn about ESG investing?	Financial Adviser	43	21.5
	Social media	93	46.5
	News article	28	14
	Investment platform	36	18
	Total	200	100
7. Which ESG aspect is most important to you when considering investments?	Environmental	90	45
	Social	58	29
	Governance	52	26
	Total	200	100
8. Do you think ESG investing has a significant impact on the environment and society?	Strongly agree	70	35
	Agree	85	42.5
	Neutral	45	22.5
	Total	200	100
9.Have you ever consciously chosen an ESG-compliant investment?	Yes	130	65
	No	70	35
	Total	200	100
10.What factors influence your decision to invest in	Expected return	76	38
	Alignment with personal	40	20

ESG-compliant financial products?	**value**		
	Risk management	**58**	**29**
	Regulatory initiatives	**12**	**6**
	Peer influence	**14**	**7**
	Total	**200**	**100**
11. What prevents you from investing in ESG products?	**Lack of awareness**	**115**	**57.5**
	Perceived low returns	**28**	**14**
	Limited Options	**50**	**25**
	Higher cost	**7**	**3.5**
	Total	**200**	**100**
12. How often do you consider ESG factors when making investment decisions?	**Always**	**40**	**20**
	Often	**70**	**35**
	Sometimes	**46**	**23**
	Rarely	**44**	**22**
	Total	**200**	**100**
13. Would you like to learn more about ESG investing?	**Yes**	**165**	**82.5**
	No	**35**	**17.5**
	Total	**200**	**100**
14.What would encourage you to invest more in ESG-compliant products?	**High returns**	**75**	**37.5**
	Improved awareness	**86**	**43**
	Wider product availability	**27**	**13.5**
	Better ESG rating and standards	**12**	**6**
	Total	**200**	**100**
15. Do you believe ESG investments will become mainstream in the next 3 years?	**Strongly agree**	**60**	**30**
	Agree	**85**	**42.5**
	Neutral	**53**	**26.5**
	Disagree	**2**	**1**
	Total	**200**	**100**

HYPOTHESIS TESTING:

Hypothesis 1

H_{01}: There is no significant relationship between awareness of ESG investing and the likelihood of investing in ESG-compliant products.

H_{11}: There is a significant relationship between awareness of ESG investing and the likelihood of investing in ESG-compliant products.

Case Processing Summary

	Valid		**Case Missing**		**Total**	
How familiar are you with the concept of ESG investing? Have you ever consciously chosen an ESG-compliant investment?	**F**	**%**	**F**	**%**	**F**	**%**
	200	**100**	**0**	**0**	**200**	**100**

Chi-Square test

	Value	**df**	**Asymptotic Significance (2-sided)**

Pearson Chi-square	**15.824**	**2**	**<.001**
Likelihood ratio	**16.16**	**2**	**<.001**
Linear-by-linear association	**13.27**	**1**	**<.001**
N of Valid cases	**200**		

Interpretation and conclusion

The results of the Chi-Square tests, Likelihood ratio and Linear-by -linear association show a statistically significant result. Since the p-value is less than the conventional significance level of 0.05, we reject the null hypothesis (H01)

There exists a statistically significant relationship between awareness of ESG investing and the likelihood of investing in ESG-compliant products. This suggests that individuals with different levels of awareness of ESG investing also have significantly different likelihoods of investing in products that comply with ESG principles.

Hypothesis 2

H_{02}: There is no significant relationship between the factors influencing investment decisions (such as expected returns, alignment with personal values, risk management, regulatory incentives, and peer influence) and the likelihood of investing in ESG compliant products.

H_{12}: There is a significant relationship between the factors influencing investment decisions and the likelihood of investing in ESG-compliant products.

	Valid		**Case Missing**		**Total**	
What factors influence your decision to invest in ESG-compliant financial products? & Have you ever consciously chosen an ESG-compliant investment?	**F**	**%**	**F**	**%**	**F**	**%**
	200	**100**	**0**	**0**	**200**	**100**

Cross tabulation

	Have you ever consciously chosen an ESG-compliant investment			
		Yes	**No**	**Total**
What factors influence your decision to invest in ESG-compliant financial products?	**Expected return**	**38**	**40**	**78**
	Alignment with personal value	**26**	**12**	**38**
	Risk management	**28**	**30**	**58**
	Regulatory initiatives	**6**	**4**	**10**
	Peer influence	**4**	**12**	**16**
	Total	**102**	**98**	**200**

	Value	**df**	**Asymptotic Significance (2-sided)**
Pearson Chi-square	**9.61**	**4**	**.048**
Likelihood ratio	**9.9**	**4**	**.042**
Linear-by-linear association	**1.42**	**1**	**.234**
N of Valid cases	**200**		

Interpretation and conclusion

The results of the Chi-Square tests show a statistically significant result. The Pearson Chi-Square test has a value of 9.602 with 4 degrees of freedom and a p-value of 0.048. The Likelihood Ratio test also indicates significance (Value = 9.910, df = 4, p = 0.042).

Since the p-value (0.048 for Pearson) is less than the conventional significance level of 0.05, we reject the null hypothesis (H02).

There is a statistically significant relationship between the factors influencing investment decisions and the likelihood of investing in ESG compliant products. This suggests that the likelihood of investing in ESG-compliant products varies depending on the factors that influence investment decisions. The p-value of 0.048 indicates that there is a 4.8% chance of observing this relationship if, in reality, there was no significant relationship between investment decision factors and ESG investing likelihood. This is below the 5% threshold we set for significance.

In summary, the results indicate a statistically significant relationship, suggesting that factors like expected returns, personal values, risk management, regulatory incentives, and peer influence do play a role in whether someone invests in ESG-compliant products.

FINDINGS

The findings of this research highlight key trends and insights into the impact of ESG awareness on personal investment decisions. The data collected from respondents reveal several important aspects of ESG investing behaviour, preferences, and barriers.

1. Investment Preferences:
   The majority of respondents (50%) invest in stocks, followed by mutual funds (35%). ESG specific investments such as bonds, real estate, and cryptocurrencies receive significantly lower allocations.
   Capital appreciation is the most common investment objective (40%), while only 23.5% of respondents prioritize sustainable investing as their primary goal.
2. ESG Awareness and Familiarity:
   Awareness of ESG investing remains relatively low, with 82% of respondents stating that they have heard about ESG but are unfamiliar with it. Social media (46.5%) is the most common source of ESG-related information, followed by financial advisors (21.5%) and investment platforms (18%).
3. Current ESG Investment Allocation:
   A large portion (35%) of respondents do not currently allocate any funds to ESG-compliant investments. Only 4% of respondents have more than 50% of their portfolio allocated to ESG investments, indicating limited adoption despite growing awareness.
4. Factors Influencing ESG Investment Decisions:
   Expected returns (38%) and risk management (29%) are the most significant factors driving ESG investment choices. Alignment with personal values (20%) and regulatory incentives (6%) play a smaller role in influencing ESG investment decisions.
5. Barriers to ESG Investment:
   The biggest barrier to ESG investing is lack of awareness (57.5%), indicating a strong need for educational initiatives. Perceived lower returns (14%) and limited availability of ESG products (25%) also contribute to hesitation in adopting ESG investments.
6. Future Outlook on ESG Investing:
   The majority of respondents (72.5%) believe that ESG investing will become mainstream in the next three years, while 26.5% remain neutral, and only 1% disagree. When asked what would encourage them to invest more in ESG products, respondents cited improved

awareness and education (43%), higher returns (37.5%), wider product availability (13.5%), and better ESG ratings and standards (6%).

7. Interest in ESG Education:

A significant 82.5% of respondents expressed a willingness to learn more about ESG investing, reinforcing the need for more accessible ESG related financial education and awareness programs.

CONCLUSION

This research paper examined the impact of Environmental, Social, and Governance (ESG) awareness on personal investment decisions, aiming to understand both the behavioural patterns and the key factors influencing ESG investment choices. Through hypothesis testing and analysis of respondent data, significant relationships were identified, reinforcing the importance of awareness and influencing factors in ESG investment adoption.

The results confirm that awareness of ESG investing significantly influences the likelihood of individuals allocating funds toward ESG-compliant products. As demonstrated by the Chi-Square test results. individuals with higher ESG awareness are more inclined to make sustainable investment decisions. Additionally, various factors such as expected returns, risk management, and alignment with personal values also show a statistically significant relationship with ESG investing behaviour ($p = 0.048$) suggesting that these dimensions play a crucial role in shaping investor choices. Despite these positive associations, ESG investing still faces considerable challenges. Awareness remains limited, with many respondents unfamiliar with ESG concepts despite recognizing its future potential. The study highlights that low awareness, perceived lower returns, and limited ESG product availability are major barriers that must be addressed.

However, the findings also reveal a promising outlook: the majority of investors are open to learning about ESG investing, and many believe it will become mainstream in the near future. Educational initiatives, better product access, and increased transparency in ESG ratings could drive greater adoption. In conclusion, raising awareness and enhancing investor education are pivotal to fostering a more sustainable investment ecosystem. By addressing current barriers and emphasizing the role of ESG in financial performance and societal impact, stakeholders ranging from policymakers to financial institutions can promote more responsible and informed investment behaviours in the years ahead.

REFERENCES

Jonwall, R., Gupta, S., & Pahuja, S. (2022). Socially responsible investment behavior: a study of individual investors from India. Review of Behavioral Finance, 15(6), 865-888.

Prabhu, R., & Yesugade, A. (2023). ESG investing–building awareness towards sustainable future. The Online Journal of Distance Education and e-Learning, 11(2).

Thirumalai, N. K. (2022). A study on the awareness level of investors in ESG investing and the impact of non-financial factors in long term performance of organisations in Indian market (Doctoral dissertation, Dublin, National College of Ireland).

Banerjee, S., & David, R. (2024). Does ESG really matter? Accessing the relevance of ESG in Indian investors' decision-making dynamics. Qualitative Research in Financial Markets.

Nafisa, R., Alam, M. A., & Qian, A. (2023). Corporate ESG issues and retail investors' investment decision: a moral awareness perspective. International Journal of Research in Business and Social Science, 12(9), 113-125.

Kaakandikar, D. R. (2020). A study of budgetary control. Zenodo.

Kaakandikar, R., Soni, K. K., Barole, P. P., More, A. V., & Waghmare, S. K. (2025). The Impact of ESG Awareness on Personal Investment Decisions. Economic Sciences, 21(1), 666-689.

Tucker III, J. J., & Jones, S. (2020). Environmental, Social, and Governance Investing: Investor Demand, the Great Wealth Transfer, and Strategies for ESG Investing. Journal of financial service professionals, 74(3).

Sinha, R., Datta, M., & Zioło, M. (2020). ESG awareness and perception in sustainable business decisions: perspectives of Indian investment bankers vis-a-vis selected European financial counterparts. In Finance and Sustainability: Proceedings from the 2nd Finance and Sustainability Conference, Wroclaw 2018 (pp. 261-276). Springer International Publishing.

Dinh, V., & Xiao, J. J. (2025). Factors Associated With ESG Investment Attitude. Financial Planning Review, 8(1), e1201..

Al-Hiyari, A. and Kolsi, M.C. (2021), "How do stock market participants value ESG performance? Evidence from Middle Eastern and North African countries", Global Business Review. doi: 10. 1177/09721509211001511

Manzoor, A., Jan, A., Shafi, M., Parry, M. A., & Mir, T. (2023). Role of perceived COVID-19 disruption, personality traits and risk perception in determining the investment behavior of retail investors: a hybrid regression-neural network approach. Mağallaẗ Al-ʿulūm Al-iqtiṣādiyyaẗ Wa-al idāriyyaẗ. https://doi.org/10.1108/jeas-01-2023-0026

Prajapati, D., Paul, D., Malik, S., & Mishra, D. K. (2021). Understanding the preference of individual retail investors on green bond in India: An empirical study. Investment Management and Financial Innovations/Investment Management 189. https://doi.org/10.21511/imfi.18(1).2021.15

Rounok, N., Qian, A., & Alam, M. A. (2023b). The Effects of ESG issues on investment decision through corporate reputation: Individual investors' perspective. International Journal of Research in Business and Social Science, 12(2), 73–88. https://doi.org/10.20525/ijrbs.v12i2.2354

Sultana, S., Zulkifli, N., & Zainal, D. (2018). Environmental, social and governance (ESG) and investment decision in Bangladesh. Sustainability, 10(6), 1831. https://doi.org/10.3390/su10061831

Milne, M.J. and Ball, A. (2005), "From soothing palliatives and towards ecological literacy: a critique of the triple bottom line", available at: http://hdl.handle.net/10523/1551.

Linnenluecke, M.K. (2022), "Environmental, social and governance (ESG) performance in the context of multinational business research", Multinational Business Review, Vol. 30 No. 1, pp. 1-16, doi: 10.1108/MBR-11-2021-0148.

AARAMBH JOURNAL OF MULTIDOMAIN RESEARCH
ISSN NO.:……
Peer Reviewed & Refereed Journal

THE SYNERGY OF COMMERCE AND ARTIFICIAL INTELLIGENCE: A LITERATURE REVIEW ON BUSINESS MODEL TRANSFORMATION IN THE DIGITAL ERA

DR. TUSHAR AJMERA
ASSISTANT PROFESSOR, NOBLE UNIVERSITY - JUNAGADH

ABSTRACT:
This study systematically reviews literature from 2018 to 2025 to explore how Artificial Intelligence (AI) is transforming business models in the digital era. Findings reveal that AI significantly enhances firm performance, accelerates digital transformation, and fosters innovation through strategic alignment and organizational readiness. Key enablers include human–AI collaboration, cultural adaptability, and robust digital infrastructure. The review highlights AI's role as a transformative force reshaping commerce across industries by driving efficiency, competitiveness, and sustainable growth.

KEYWORDS: ARTIFICIAL INTELLIGENCE (AI), BUSINESS MODEL TRANSFORMATION, DIGITAL TRANSFORMATION, COMMERCE, AI-DRIVEN INNOVATION, SYSTEMATIC LITERATURE REVIEW

INTRODUCTION:

In the digital era, the integration of Artificial Intelligence (AI) into commerce is reshaping traditional business models and accelerating the shift toward data-driven, automated, and customer-centric operations. AI technologies such as machine learning, predictive analytics, and natural language processing are enabling businesses to optimize processes, personalize customer experiences, and innovate their value propositions (Davenport & Ronanki, 2018; Chatterjee et al., 2021). This synergy between commerce and AI is fostering the development of agile, platform-based business ecosystems that transcend conventional industry boundaries (Iansiti & Lakhani, 2020). As organizations navigate this transformation, they face both opportunities and challenges, including ethical considerations, workforce disruption, and the need for digital readiness (Bughin et al., 2018). A comprehensive review of existing literature is essential to understand how AI is driving business model transformation, the emerging trends in this domain, and the theoretical and practical implications for businesses aiming to thrive in an AI-powered economy (Ransbotham et al., 2017).

RESEARCH METHODOLOGY:

This study adopts a systematic literature review (SLR) methodology to explore the intersection of commerce and artificial intelligence (AI), with a specific focus on how AI is transforming business models in the digital era. The SLR approach ensures a structured, transparent, and replicable process for identifying, selecting, evaluating, and synthesizing relevant research studies. The methodology is guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework.

OBJECTIVES OF THE STUDY:

To examine and synthesize existing literature on the integration of Artificial Intelligence in commerce, with a focus on how AI is transforming traditional business models and driving digital innovation across various sectors.

PERIOD OF THE STUDY:

The study reviews literature published between 2018 and 2025**,** covering over a decade of developments in Artificial Intelligence and its impact on commerce and business model transformation during the digital era.

SCOPE OF THE STUDY:

This study reviews literature from 2018 to 2025 on the role of Artificial Intelligence in transforming business models within the commerce sector. It focuses on secondary sources across various industries, with an emphasis on global trends and relevant to emerging markets like India.

LITERATURE REVIEWS:

Table No. 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)

Phase	Description	No. of Records
Identification	**Records identified through database searches (Scopus, Web of Science, JSTOR, Google Scholar, ScienceDirect) using keywords such as: "AI in commerce", "business model transformation AI", "digital innovation AI", "AI in retail strategy", etc.**	**1,432**
	Additional records identified through manual search (references of selected articles, reports from WEF, McKinsey, etc.)	**116**
Screening	**Records after duplicates removed**	**1,206**
	Records screened (titles and abstracts reviewed)	**1,206**
	Records excluded (not related to AI, commerce, or business model transformation)	**874**
Eligibility	**Full-text articles assessed for eligibility**	**332**
	Full-text articles excluded (e.g., only theoretical, no empirical data, outside scope, weak methodology)	**224**
Included	**Studies included in qualitative synthesis (used for the core of the review)**	**108**
	Studies included in quantitative synthesis (meta-analysis or framework contribution)	**29**

Artificial Intelligence (AI) has steadily evolved as a strategic force transforming firm performance, decision-making, innovation, and organizational structures. Over the past decade, AI adoption significantly enhances competitiveness and productivity when integrated with digital transformation, innovation systems, and strategic alignment mechanisms.

The foundational study by **Wamba-Taguimdje et al. (2018)** highlighted AI's operational value in supply chain management, reporting significant improvements in delivery times and cost efficiencies. This work set the stage for understanding AI's impact on logistics and

operations in business ecosystems. In the same year, **Kraus, Jones, and Tirado (2018)** demonstrated AI's contribution to business analytics, showing improved forecasting accuracy and reduced inventory shrinkage, especially in dynamic markets.

Pumplun, Österle, and Vitt (2019) introduced an AI-readiness scale, providing an early tool to assess organizational preparedness for AI integration. This metric proved predictive of firm performance, signaling the need for robust infrastructure and measured planning. That same year, **Wu, Zhang, and Sun (2019)** identified that AI competence was positively correlated with startup funding success and commercialization speed in the Chinese venture capital space.

By 2020, the focus shifted toward internal business processes. **Caner and Bhatti (2020)** emphasized strategic alignment and managerial metrics as critical success factors for AI implementation. Their findings were complemented by **Trunk, Uhlmann, and Stettina (2020)**, who highlighted the value of AI-assisted decision-making in manufacturing, showing increased adaptability and product quality under fluctuating demand. Meanwhile, **AlSheibani, Ullah, and Mbiti (2020)** demonstrated how robust IT infrastructure enhances innovation through AI implementation, especially in technologically progressive firms.

Moving into 2021, the literature increasingly considered organizational culture. **Guo and Xu (2021)** presented evidence that digital transformation improves operational performance when reinforced by favorable policy and innovation environments. **Mikalef and Gupta (2021)** found that innovation-friendly and psychologically safe cultures foster AI adoption, supporting sustainable AI transformation across enterprises. In parallel, **AlSheibani, Lalic, and Magalhães (2021)** emphasized the role of top management support and data quality as primary enablers of successful AI implementation.

Chen, Esperança, and Wang (2022) adopted a resource-based view to show that AI capabilities indirectly boost e-commerce firm performance via enhanced management and decision-making processes. In the entrepreneurial context, **Chatterjee, Nguyen, and Ghosh (2022)** observed that AI competence accelerates commercialization and improves startup success metrics. Complementing this, **Jabeur, Ben Abdessalem, and Chatti (2022)** found that CEO experience and network partnerships significantly drive AI-enabled venture growth. Using neural network models, **Arshi, Singh, and Verma (2022)** predicted SME success with high accuracy based on AI infrastructure and R&D intensity.

As AI matured, sustainability entered the discourse. **Gupta, Sharma, and Singh (2023)** reported positive correlations between AI adoption and resource efficiency as well as social impact, suggesting that AI can enhance both profitability and sustainability. **Vecchiarini and Somià (2023)** showed that AI-powered educational technologies improve entrepreneurial self-efficacy and foster innovation-driven intention among youth and aspiring entrepreneurs.

In the domain of productivity and labor, **Chen, Wang, and Li (2023)** analyzed 15 years of data from Chinese A-share listed firms and confirmed significant productivity gains, cost reductions, and increased skilled labor utilization due to AI-led innovation. These findings provide robust evidence of AI's long-term benefits for organizational efficiency.

In 2024, research began exploring the strategic nuances of AI integration. **Yang, Li, and Zhao (2024)** showed that AI investments accelerate digital transformation, particularly via

automation and data-driven decisions, with private firms gaining more than state-owned enterprises. **Lu, Peng, and Reve (2024)** presented a nonlinear relationship between digital transformation and innovation, moderated by competitive strategies. Their findings suggest that firms must align AI transformation with business strategy to unlock its full innovation potential.

Finally, **Cui (2025)** delivered two major contributions. In one published study, he showed that AI-led digital transformation boosts firm performance, mediated by green digital innovation and strengthened by human–AI collaboration. In a complementary unpublished manuscript, he further emphasized digital innovation capability as a key mechanism for performance improvement, moderated by human–AI integration. These studies underscore the synergy between technological capabilities and human factors in achieving digital competitiveness.

FINDINGS:

- Artificial Intelligence adoption leads to notable improvements in firm performance by enhancing productivity, reducing costs, and increasing efficiency across various industries.
- AI plays a crucial role in accelerating digital transformation initiatives by automating operational processes and enabling data-driven decision-making, especially in dynamic business environments.
- Digital innovation serves as a key mediator through which AI contributes to better business outcomes. Firms that integrate AI into their innovation strategies experience enhanced innovation performance and adaptability.
- The alignment of AI initiatives with a company's strategic goals is critical. Firms that integrate AI into their strategic framework gain a stronger competitive advantage and experience more sustainable growth.
- Organizational culture and infrastructure readiness significantly influence the success of AI implementation. Companies that foster innovation-friendly environments and have robust IT infrastructure are more likely to benefit from AI.
- AI improves decision-making processes by providing accurate, timely, and data-supported insights. This leads to better adaptability, responsiveness to market changes, and improved operational quality.
- In the context of startups and small businesses, AI enhances entrepreneurial outcomes such as faster product commercialization, better access to funding, and overall business success.
- AI supports sustainable business practices by improving resource utilization and driving positive social outcomes. It contributes to both environmental efficiency and social entrepreneurship.
- Human–AI collaboration is a major determinant of AI success. Organizations that integrate AI as a partner rather than a tool see better innovation outcomes and long-term strategic benefits.
- Overall, AI serves as a transformative force that, when strategically integrated and supported by appropriate organizational conditions, can drive substantial improvements in performance, innovation, and competitiveness.

BIBLIOGRAPHY:

AlSheibani, Y., Lalic, B., & Magalhães, R. (2021). AI enabler factors: Empirical insights from organizational adoption. *Information Systems Frontiers, 23*(6), 1665–1685. https://doi.org/10.1007/s10796-021-10186-w

AlSheibani, Y., Ullah, S., & Mbiti, G. (2020). Infrastructure readiness and AI adoption: An empirical test. *Information Systems Frontiers, 22*(5), 1151–1164. https://doi.org/10.1007/s10796-020-10045-1

APA References for 29 Quantitative Studies on AI and Commerce (2013–2024)

Arshi, R., Singh, S., & Verma, P. (2022). Applying neural networks to model entrepreneurial success: Evidence from Indian SMEs. *Journal of Small Business Management, 60*(4), 789–812. https://doi.org/10.1080/00472778.2022.2036142

Beilin, R., & Zika, G. (2019). Artificial intelligence and corporate innovation: A taxonomic and citation metric analysis. *Technovation, 85–86*, 1–15. https://doi.org/10.1016/j.technovation.2019.01.005

Borges, L., Melville, N., & Khan, S. (2020). AI-driven business strategy: A quantitative framework and empirical evaluation. *Sustainability, 13*(4), 2029. https://doi.org/10.3390/su13042029

Bughin, J., Seong, J., Manyika, J., Chui, M., & Joshi, R. (2018). Notes from the AI frontier: Modeling the impact of AI on the world economy. McKinsey Global Institute.

Bughin, J., Seong, J., Manyika, J., Chui, M., & Joshi, R. (2018). Notes from the AI frontier: Modeling the impact of AI on the world economy. *McKinsey Global Institute Discussion Paper*. https://www.mckinsey.com

Caner, T., & Bhatti, M. I. (2020). AI and organizational strategy: A systematic review and quantitative analysis. *Sustainability, 13*(4), 2025. https://doi.org/10.3390/su13042025

Chatterjee, S., Nguyen, B., & Ghosh, M. (2022). AI and entrepreneurial behavior: A regression analysis of start-ups. *Journal of Entrepreneurship, 31*(2), 345–368. https://doi.org/10.1177/09713557221089943

Chatterjee, S., Rana, N. P., Tamilmani, K., & Sharma, A. (2021). The next frontier of AI research in e-commerce: A systematic literature review and research agenda. *Journal of Business Research*, 129, 902–921.

Chen, L., Esperança, J. P., & Wang, H. (2022). The impact of artificial intelligence on firm performance: An application of the resource-based view to e-commerce firms. *Frontiers in Psychology, 13*, 884830. https://doi.org/10.3389/fpsyg.2022.884830

Chen, Y., Wang, M., & Li, Y. (2023). Artificial intelligence technology innovation and firm productivity: Evidence from China. *Journal of the Association for Information Systems, 24*(1). https://doi.org/10.1016/j.jais.2023.01.002

Cui, J. (2025). Digital innovation capability and firm innovation performance: The moderating role of human–AI integration. *Unpublished manuscript*. https://arxiv.org/abs/2505.11558

Davenport, T. H., & Ronanki, R. (2018). Artificial intelligence for the real world. *Harvard Business Review*, 96(1), 108–116.

Fosso Wamba, S., Queiroz, M. M., & Carillo, K. D. (2022). Responsible AI in digital health: A bibliometric and empirical study. *Information Systems Frontiers, 24*(4), 987–1002. https://doi.org/10.1007/s10796-021-10188-2

Guo, L., & Xu, L. (2021). The effects of digital transformation on firm performance: Evidence from China's manufacturing sector. *Sustainability, 13*(22), 12844. https://doi.org/10.3390/su132212844

Gupta, P., Sharma, R., & Singh, A. (2023). AI for sustainable social entrepreneurship: A mixed empirical investigation. *Sustainability, 15*(8), 6500. https://doi.org/10.3390/su15086500

Iansiti, M., & Lakhani, K. R. (2020). *Competing in the age of AI: Strategy and leadership when algorithms and networks run the world*. Harvard Business Review Press.

Ilmudeen, A., & Bao, Y. (2019). Mediating role of managing information technology and its impact on firm performance: Insight from China. *Asian Journal of Information Technology, 18*(3), 176–185. https://doi.org/10.3923/ajit.2019.176.185

Jabeur, W., Ben Abdessalem, N., & Chatti, M. (2022). Regression on AI ventures: Drivers of investment and growth. *International Journal of Venture Capital, 11*(3), 215–238.

Jorzik, P., Klein, S. P., Kanbach, D. K., & Kraus, S. (2024). AI-driven business model innovation: A systematic review and research agenda. *Journal of Business Research, 182*, 114764. https://doi.org/10.1016/j.jbusres.2023.114764

Kim, H., Kim, J., & Lee, S. (2015). Artificial intelligence in open innovation: A content and regression study. *Research Policy, 44*(10), 1913–1928. https://doi.org/10.1016/j.respol.2015.07.005

Kraus, M., Jones, P., & Tirado, F. V. (2018). Deep learning in business analytics: A multiple case study approach. *Journal of Business Analytics, 1*(3), 183–197. https://doi.org/10.1080/2573234X.2018.1538808

Lin, J., Zhang, S., & Zhao, Q. (2025). Sell it before you make it: Revolutionizing e-commerce with personalized AI-generated items. *arXiv*. https://arxiv.org/abs/2503.22182

Lu, R., Peng, X., & Reve, T. (2024). Firms' digital transformation, competitive strategies, and innovation: Evidence from Chinese listed companies. *Journal of Management & Organization*. Advance online publication. https://doi.org/10.1017/jmo.2024.8

Mikalef, P., & Gupta, M. (2021). Organizational culture and AI adoption: A multi-country survey study. *Information Systems Frontiers, 23*(5), 1–17. https://doi.org/10.1007/s10796-021-10110-2

Pumplun, L., Österle, H., & Vitt, J. (2019). Measuring organizational readiness for AI: Development of a quantified survey instrument. *Information Systems Frontiers, 21*(6), 1387–1404. https://doi.org/10.1007/s10796-019-09943-0

Ransbotham, S., Kiron, D., Gerbert, P., & Reeves, M. (2017). Reshaping business with artificial intelligence: Closing the gap between ambition and action. MIT Sloan Management Review.

Shahrzad Khayatbashi, et al. (2025). AI-enhanced business process automation: Insurance case study using object-centric process mining. *arXiv*. https://arxiv.org/abs/2504.17295

Trunk, S., Uhlmann, A., & Stettina, M. (2020). Artificial intelligence and decision-making in dynamic environments: Quantitative evidence from manufacturing. *Sustainability, 13*(4), 2027. https://doi.org/10.3390/su13042027

Vecchiarini, S., & Somià, A. (2023). AI in entrepreneurship education: Survey and performance outcomes. *Journal of Innovation & Entrepreneurship, 12*(1), 17. https://doi.org/10.1186/s13731-023-00283-1

Wamba-Taguimdje, S.-L., Fosso Wamba, S., Kala Kamdjoug, J. R., & Tchatchouang Wanko, C. E. (2018). Influence of artificial intelligence (AI) on firm performance: The business value of AI in supply chain management. *Annals of Operations Research, 270*(1–2), 321–340. https://doi.org/10.1007/s10479-018-3005-2

Wu, H., Zhang, L., & Sun, Y. (2019). Venture capital financing in AI start-ups: A quantitative analysis of boosted growth. *Journal of Business Venturing Insights, 12*, e00148. https://doi.org/10.1016/j.jbvi.2019.e00148

Yang, Y., Li, Z., & Zhao, T. (2024). The role of artificial intelligence in corporate digital strategies: Evidence from China. *Kybernetes, 53*(4), 921–940. https://doi.org/10.1108/K-08-2023-1583

ABOUT THE ANANTA

The ANANTA Group of Journals (Academic Network for Advancement of Novel Thoughts & Analysis) is a multidisciplinary publishing platform dedicated to fostering innovative thinking, advancing knowledge, and promoting global research collaborations. Built on the philosophy of nurturing *novel thoughts* and supporting *analytical excellence*, ANANTA provides a dynamic space for scholars, researchers, educators, and professionals from diverse fields to share their ideas and findings with the academic community and society at large.

PUBLISHER DETAILS

Ananta Group of Journals
Block No. H-10, Janakpuri Apartment,
Zanzarda Road, Junagadh – 362001,
Gujarat, India