Index

Volume 2

# Revolutionizing Survey Research with AI: The Power of SurveyMonkey AI

A. Kalishwari[1] and M. Archana[1]

[1]*The SFR College for Women, Sivakasi, Tamil Nadu*

## Abstract

*SurveyMonkey's integration of artificial intelligence (AI) is transforming the landscape of survey research. This abstract explores how SurveyMonkey AI enhances various stages of the survey process, from design to analysis. AI-powered features offer intelligent question suggestions, automate data analysis and visualization, personalize the respondent experience, and improve data quality and accuracy. These advancements contribute to faster, more efficient research, deeper insights, and better-informed decision-making. While challenges such as cost, data privacy concerns, and potential biases exist, the overall impact of SurveyMonkey AI promises to democratize advanced research capabilities, enhance data-driven practices, and potentially facilitate positive social change. This abstract highlights the key benefits and challenges of SurveyMonkey AI, emphasizing its transformative potential in the field of survey research.*

## Introduction

Surveys are a cornerstone of data collection in research, providing valuable insights across various fields, including business, academia, and public policy. Surveys are a fundamental tool for collecting data in research, allowing organizations, businesses, and academics to gather insights from a targeted audience. They provide **quantifiable data** that helps in decision-making, trend analysis, and evaluating public opinions. Surveys are widely used in **market research, customer satisfaction studies, employee engagement analysis, academic research, and public policy assessment**. However, traditional survey methods often involve challenges such as bias in question formulation, lengthy data analysis, and difficulties in identifying key patterns. **SurveyMonkey AI** is transforming survey-based research by leveraging artificial intelligence to optimize survey design, enhance data analysis, and generate actionable insights.

This article explores how **SurveyMonkey AI** is revolutionizing survey research, making it more efficient, accurate, and insightful.

## The Role of AI in Survey monkey

1. **clear survey design with AI**

One of the most impactful applications of AI in survey research is in the design phase.

SurveyMonkey AI offers intelligent question suggestions, helping users craft effective and unbiased questions. By analyzing the survey's purpose and target audience, the AI can recommend question types, wording, and even suggest relevant follow-up questions. This not only streamlines the design process but also improves the overall quality of the survey, leading to more accurate and reliable data. Furthermore, AI can identify potential biases or ambiguities in questions, ensuring clarity and minimizing respondent confusion.

**2. AI-Driven Data Analysis**

Traditionally, analyzing survey data has been a time-consuming and often complex process. SurveyMonkey AI automates this process, providing users with instant insights and visualizations. The AI can identify trends, patterns, and correlations within the data, highlighting key findings and allowing researchers to focus on the "why" behind the numbers. This automated analysis saves significant time and resources, allowing for quicker decision-making. Beyond simple descriptive statistics, AI can perform more sophisticated analysis, such as sentiment analysis of open-ended responses, providing a deeper understanding of respondent opinions and feelings.

3. **Personalized Respondent Experience:**

AI can personalize the survey experience for each respondent. By analyzing previous responses or demographic information, the AI can tailor the survey questions and flow, making the survey more engaging and relevant. This personalized approach can lead to higher completion rates and more accurate data. For example, the AI can skip questions that are not relevant to a particular respondent, or present questions in a format that is optimized for their device.

**4. Enhanced Data Quality and Accuracy:**

SurveyMonkey AI contributes to improved data quality and accuracy in several ways. By identifying potential inconsistencies or errors in responses, the AI can flag them for review, ensuring data integrity. Furthermore, AI can help identify and mitigate response bias, leading to more reliable results. By analyzing response patterns, the AI can detect respondents who may be providing inconsistent or random answers, allowing researchers to exclude these responses from the final analysis.

5. **The Future of Survey Research:**

SurveyMonkey's integration of AI is not just a trend; it's a fundamental shift in how survey research is conducted. As AI technology continues to evolve, we can expect even more sophisticated applications in the future. This could include predictive analysis, allowing researchers to anticipate future trends based on current data, and more advanced natural language processing, enabling more nuanced analysis of open-ended responses. The combination of human expertise and AI power will undoubtedly lead to more insightful and impactful survey research, driving better decision-making across various fields.

## Advantages

**Speed & Efficiency -** AI supercharges the entire survey process, from design to analysis, saving you tons of time and effort.

**Smarter Surveys -** AI helps you create better surveys with clear questions, leading to more accurate and valuable data.

**Deeper Insights -** AI digs deeper into your data to uncover hidden trends and patterns that you might otherwise miss.

**Personalized Experience -** AI makes surveys more engaging for respondents, leading to higher completion rates and better data.

**Data Quality -** AI helps catch errors and biases, ensuring your data is reliable and trustworthy.

## Impact

SurveyMonkey AI is poised to revolutionize the survey landscape, democratizing advanced research capabilities and accelerating the entire process. By automating tedious tasks, AI empowers smaller organizations and individuals to access sophisticated tools previously limited to large corporations, leading to faster, more efficient research cycles. This translates to improved data-driven decision-making across various sectors, as organizations gain access to deeper insights and more accurate information. Furthermore, AI enhances the respondent experience through personalized surveys, boosting engagement and data accuracy. The increased accessibility of insights, simplified data analysis, and advancements in survey methodology contribute to a wider adoption of data-driven practices. Ultimately, SurveyMonkey AI has the potential to not only transform how surveys are conducted but also to facilitate positive social impact by empowering broader research and a deeper understanding of critical issues. As AI technology continues to evolve, its transformative potential in the survey world will only expand.

## Challenges

**Cost Barrier:** AI-powered features often come at a premium, making them inaccessible to budget-conscious users. This creates a divide, where smaller organizations or individuals might miss out on these powerful tools.

**Data Privacy & Security:** With AI comes data. Users need assurance that their data is handled responsibly and ethically. Concerns about how SurveyMonkey uses and protects this data are paramount, especially with sensitive information.

**AI Bias & Lack of Transparency:** AI algorithms can inherit biases from the data they're trained on. This can lead to skewed results. Additionally, the "black box" nature of some AI makes it hard to understand *how* it arrived at a conclusion, making it difficult to validate.

**Over-Reliance & Misinterpretation:** It's tempting to blindly trust AI. However, human oversight is crucial. Over-reliance can lead to misinterpretations and flawed conclusions. Users need to understand the AI's output and apply critical thinking.

## Conclusion

SurveyMonkey's integration of artificial intelligence (AI) is transforming the landscape of survey research. This abstract explores how SurveyMonkey AI enhances various stages of the survey process, from design to analysis. AI-powered features offer intelligent question suggestions, automate data analysis and visualization, personalize the respondent experience, and improve data quality and accuracy. These advancements contribute to faster, more efficient research, deeper insights, and better-informed decision-making. While challenges such as cost, data privacy concerns, and potential biases exist, the overall impact of SurveyMonkey AI promises to democratize advanced research capabilities, enhance data-driven practices, and potentially facilitate positive social change. This abstract highlights the key benefits and challenges of SurveyMonkey AI, emphasizing its transformative potential in the field of survey research.

## References

1) *https://www.smartsurvey.com/blog/why-are-surveys-good-for-research*
2) *https://www.surveymonkey.com/product/features/surveymonkey-genius/*
3) *https://www.surveymonkey.com/curiosity/5-steps-to-create-ai-prompts-for-high-quality-surveys-and-forms/*

# Entrepreneurial Intention of Students towards Entrepreneurship

V. Akshyadevi[1] and R. Subha Ranjani[2]

[1]*II.M. Com, PG and Research Department of Commerce, G. Venkataswamy Naidu College (Autonomous), Kovilpatti, Tamil Nadu*

[2]*Assistant Professor, PG and Research Department of Commerce, G. Venkataswamy Naidu College (Autonomous), Kovilpatti, Tamil Nadu*

## Abstract

***"Lazy hands make for poverty, but diligent hands bring wealth."***

***- THE HOLY BIBLE [Proverbs 10:4 (NIV)]***

*In this contemporary business world, innovators/entrepreneurs are the sources of fresh ideas since they always seek to replace the status quo with cutting-edge creations. This makes the notion of entrepreneurship still to remain firmly in the spotlight. Traveling for self-employment, or starting one's own business, is one approach to the recent graduate joblessness problem. Learners are beginning to hold entrepreneurship in considerable emphasis as a topic of study and as a tool for achieving financial independence and personal fulfillment on a global scale. Entrepreneurship education immensely contributes to the socioeconomic development of a society by providing opportunities for individuals to be involved in employment and self-employment and thus, it can encourage an entrepreneurial spirit by supporting graduates' entrepreneurial intention. This study aims to determine the intention of students towards entrepreneurship as a career which helps to extend the young entrepreneurs, in order to promote and develop our country. The current research's goal is to examine how entrepreneurship education affects students' aspirations to launch their businesses by verifying an entrepreneurial intent. The study helps future generation who are interested or apprehensive make plans to help the country's youth, especially those who are contemplating to launch a business. Higher education helps these impressionable young minds to progress, develop and to establish relationships with those who are actively involved in the arena of entrepreneurship as well as those who have a more realistic mindset if higher education institutions are to serve as a platform for students to develop into entrepreneurs and make significant contributions to the economy.*

***Keywords:*** *Entrepreneurship, Students, Entrepreneurial Intention, Self-Employment, Business.*

## Introduction

An entrepreneur is one who has the competencies and drive necessary to launch, manage, and be successful in a start-up business, as well as the willingness to take risks necessary to do so to generate profits. An entrepreneur is a person who runs an organization to make a profit from a prospect rather than serving as an employee. They are able to develop fresh, marketable ideas and foresee both the present and future demands, which make them crucial to the expansion of every economy. They are frequently seen as innovators or sources of fresh concepts since they always seek to replace the status quo with cutting-edge creations. But, the notion of entrepreneurship remained firmly in the

spotlight. The aptitude and preparedness to launch, organize, and manage a business company with all of its risks and problems in order to turn a profit are defined as entrepreneurship. The launch of an innovative business undertaking is the best illustration of entrepreneurship. It can be categorized as tiny home-based entities to large international corporations. Entrepreneurship education immensely contributes to the socioeconomic development of a society by providing opportunities for individuals to be involved in employment and self-employment. Entrepreneurship education can encourage an entrepreneurial spirit by supporting graduates' entrepreneurial intention. The current study's goal is to examine how entrepreneurship education affects students' aspirations to launch their own businesses by verifying an entrepreneurial intent.

## Statement of the Problem

Student enthusiasm in starting and expanding ventures that foster and encourage the notion that entrepreneurship is a fantastic complement to wage livelihood has recently increased. There are several reasons for this curiosity. First of all, it is common for learned innovators to launch businesses that grow faster compared to those of their contemporaries. Scholars and members of the management community are both aware of how important learning plays in the achievement of contemporary endeavors. Due to the approach of organizational simplification brought on by growing global market competition, prior perks of wage employment in large, well-established organizations, such as employment security or award for commitment, are now less of a reality, which makes self-employment more appealing. The number of unemployed graduates has also increased. As a result, there is a chance of learners to start their own businesses. The goal of the study is to better understand how students' personal opinions toward entrepreneurship are impacted.

## Review of Literature

Haddad, G., Haddad, G., & Nagpal, G. (2021), outcomes demonstrate that through the mediating effects of individual views on entrepreneurial activity, subjective standards, as well as perceived control over behavior, students' favorable opinions of the respect their business schools demonstrate for diversity positively influence the development of their entrepreneurial intentions. The study adds to what is already known about how learning settings affect students' entrepreneurial inclinations. In real life, it educates academic institutions and practitioners about the necessity of utilizing diversity to foster student entrepreneurship and promote entrepreneurship.

Mythili D., Nithya R. & Jaiswal S., (2020) seeks to find out the way students' opinions toward entrepreneurship are changed by lectures.The results show that there is a significant relationship between students' intents, attitudes, and the effects of education.

Malyadri, G., Kumar, B. R., & Kusuma, G. D. V. (2018) aimed to determine whether proactive personality traits or behaviour tend to differ in entrepreneurs compared to those who are not.The results showed that 67.9% of the students had entrepreneurial potential. The findings showed that both the family's income and the individuals' jobs were crucial. Additionally, the study found a strong correlation between proactive behaviours and an entrepreneurial mindset.

## Research Objectives

- To determine the entrepreneurial intention towards entrepreneurship among students.
- To identify the influence of educational background on entrepreneurial intention among students.
- To identify the influence of family business on entrepreneurial intention among students.

## Research Hypotheses

- **H1:** There is a significant relationship between residence of the respondents and their willingness to become an entrepreneur.***(T-TEST)***
- **H2:** There is a significant relationship between field of study of the respondents and their interest to become an entrepreneur with CED guidance.***(ANOVA TEST)***
- **H3:** There is an association between father’s occupation of the respondents and their career choice.***(CHI-SQUARE)***

## Research Scope

Traveling for self-employment, or starting one's own business, is one approach to the recent graduate joblessness problem. Learners are beginning to hold entrepreneurship in considerable emphasis as a topic of study and as a tool for achieving financial independence and personal fulfilment on a global scale. This study aims to determine the intention of Lady Doak College students towards entrepreneurship as a career which helps to extend the young entrepreneurs, in order to promote and

develop our country. The study can help those who are interested or apprehensive make plans to help the country's youth, especially those who are contemplating launching a business.

The study is descriptive in nature and adopted survey strategy. The respondents for this research were Lady Doak College students; hence data were gathered through an online survey. A sample of 100 respondents was selected using Convenient Sampling. Data is collected through primary as well as secondary sources.

## Data Analysis & Interpretation

**Table No.: 1 - General Profile of the Respondents**

| Factors | Category | Respondents | Respondents (in %) |
|---|---|---|---|
| **Age** | 17 – 19 Years | 56 | 56 |
| | 20 – 22 Years | 43 | 43 |
| | 23 – 25 Years | 1 | 1 |
| **Degree Program** | Under Graduate | 72 | 72 |
| | Post Graduate | 27 | 27 |
| | Others (Diploma) | 1 | 1 |
| **Subject Discipline** | Arts | 44 | 44 |
| | Science | 43 | 43 |
| | Business | 8 | 8 |
| | Technology | 5 | 5 |
| **Father's Occupation** | Self employed | 55 | 55 |
| | Private sector employee | 23 | 23 |
| | Public sector employee | 12 | 12 |
| | Retired | 7 | 7 |
| | Unemployed | 3 | 3 |
| **Mother's Occupation** | Self employed | 6 | 6 |
| | Private sector employee | 6 | 6 |
| | Public sector employee | 19 | 19 |
| | Retired | 0 | 0 |
| | Home maker | 69 | 69 |
| **Residence** | Urban | 78 | 78 |
| | Rural | 22 | 22 |
| ***TOTAL*** | | ***100*** | ***100*** |

Source: Primary data

The above table indicates the general profile of the respondents. It is inferred that 56% of the respondents belong to the age group of 17-19 Years; Majority of the respondents are under Graduates

(72%); and are from Arts (44%). 55%of the respondent's fathers are Self-Employed and 69% of the respondent's mothers are Home Makers. Majority (78%) of the respondents are from urban area.

**Table No.:2 - Career choice of the respondents after studies**

| Particulars | No. of Respondents | Percentage |
|---|---|---|
| Employee | 37 | 37 |
| Entrepreneur | 20 | 20 |
| Successor | 19 | 19 |
| Others | 24 | 24 |
| ***Total*** | ***100*** | ***100*** |

Source: Primary data

From the table above, it is understood that 37% of respondents' career choice after studies is to be an employee, 20% as entrepreneur, 19% as successor and 24% chose others.

**Table No.: 3 -Entrepreneurial Factors influencing respondents**

| Factors | Particulars | No. of Respondents | Percentage |
|---|---|---|---|
| ***Entrepreneurial experience*** | Yes | 18 | 18 |
| | No | 82 | 82 |
| ***Family business*** | Yes | 28 | 28 |
| | No | 72 | 72 |
| ***Respondents' willingness to takeover family business*** | Yes | 11 | 11 |
| | No | 48 | 48 |
| | Maybe | 41 | 41 |
| ***Respondents' willingness to become an entrepreneur*** | Yes | 49 | 49 |
| | No | 14 | 14 |
| | Maybe | 37 | 37 |
| ***Respondents' awareness about Centre for Entrepreneurship Development (CED)*** | Yes | 76 | 76 |
| | No | 24 | 24 |
| ***Usefulness of Vocational Courses*** | Yes | 64 | 64 |
| | No | 5 | 5 |
| | Maybe | 31 | 31 |
| ***Respondents' interest to become an entrepreneur with CED guidance*** | Yes | 45 | 45 |
| | No | 11 | 11 |
| | Maybe | 44 | 44 |

| | | | |
|---|---|---|---|
| ***Respondent's awareness about government schemes*** | Yes | 33 | 33 |
| | No | 48 | 48 |
| | Maybe | 19 | 19 |
| ***Total*** | | ***100*** | ***100*** |

Source: Primary data

Most of the respondents don't have: entrepreneurial experience (82%) and family business (72%). Though 28 respondents have family business, only 11% are willing to take over family business. On the whole, 49% of student respondents are willing to become an entrepreneur in future. Majority (76%) of the respondents have awareness about Centre for Entrepreneurship Development (CED) at Lady Doak College.64% of the respondents think that vocational courses organized by Centre for Entrepreneurship Development (CED) of Lady Doak College are highly useful among which majority (45%) of respondents are also interested in becoming an entrepreneur with the guidance of CED and 33 respondents (33%) are aware of the Government schemes available for entrepreneurs.

**Table No.:4 -Source of Entrepreneurial Knowledge**

| Particulars | No. of Respondents | Percentage |
|---|---|---|
| Syllabus | 26 | 26 |
| Online | 30 | 30 |
| Family | 21 | 21 |
| Others | 23 | 23 |
| ***Total*** | ***100*** | ***100*** |

Source: Primary data

The table above shows that students gained entrepreneurial knowledge through syllabus (26%), online (30%), family (21%) and other sources (23%).

**Table No.: 5 - Main challenges faced by entrepreneur**

| Particulars | No. of Respondents | Percentage |
|---|---|---|
| Personal | 19 | 19 |
| Finance related | 42 | 42 |
| High risk | 13 | 13 |
| Market competition | 26 | 26 |
| ***Total*** | ***100*** | ***100*** |

Source: Primary data

There are various challenges faced by an entrepreneur during his course of business. But, here, four main classifications such as Personal, Financial, Marketing and Economy are considered. Majority (42%) of respondents have thought that source of finance and its related support as the main challenge faced by an entrepreneur; market competition (26%) as the next major challenge and high risk as the least challengeby13% of respondents.

**Table No.: 6 – Respondent's Level of Satisfaction towards initiatives by CED**

| Particulars | No. of Respondents | Percentage |
|---|---|---|
| Highly satisfied | 18 | 18 |
| Satisfied | 47 | 47 |
| Neutral | 33 | 33 |
| Dissatisfied | 2 | 2 |
| Highly dissatisfied | 0 | 0 |
| ***Total*** | ***100*** | ***100*** |

Source: Primary data

From the above table, we infer that majority (47%) of the respondents are satisfied with the initiatives taken by Centre for Entrepreneurship Development (CED) of Lady Doak College, next major 33% of respondents find it neutral and the least as high dissatisfaction stands zero.

**Table No.: 7 - Respondent's opinion about entrepreneur**

| Particulars | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree | Total | Weighted Mean Score | *Rank* |
|---|---|---|---|---|---|---|---|---|
| Being an entrepreneur implies more advantages than disadvantages to me | 19 | 43 | 33 | 3 | 2 | 100 | 3.74 | ***4*** |
| A career as entrepreneur is attractive for me | 26 | 40 | 28 | 6 | 0 | 100 | 3.86 | ***2*** |
| If I had the opportunity and resources, I would become an entrepreneur | 40 | 31 | 26 | 2 | 1 | 100 | 4.07 | ***1*** |
| Being an entrepreneur would entail great satisfaction for me | 27 | 31 | 37 | 4 | 1 | 100 | 3.79 | ***3*** |

Source: Primary data

If the respondents had an opportunity to become an entrepreneur, they will, with a mean score of 4.01 stands first. Entrepreneur as a career, is attractive for the respondents with a mean score of 3.86. Being an entrepreneur would entail great satisfaction for the respondents with a mean score of 3.79 and finally, becoming an entrepreneur gives more advantage than disadvantage to the respondents with a mean score of 3.74 stands as least opinion.

**Table No.: 8 - Factors influencing respondents' entrepreneurial decision**

| Particulars | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree | Total | Mean Score | *Rank* |
|---|---|---|---|---|---|---|---|---|
| My friends & family approve my decision to start a business | 19 | 35 | 35 | 9 | 2 | 100 | 3.60 | ***6*** |
| Creating jobs for others | 20 | 50 | 29 | 1 | 0 | 100 | 3.80 | ***3*** |
| Being creative and innovative | 34 | 45 | 19 | 1 | 1 | 100 | 4.10 | ***1*** |
| Having a high income | 20 | 42 | 32 | 5 | 1 | 100 | 3.75 | ***4*** |
| Taking calculated risk | 18 | 36 | 39 | 5 | 2 | 100 | 3.63 | ***5*** |
| Being my own boss (Independent) | 39 | 38 | 17 | 3 | 3 | 100 | 4.07 | ***2*** |

Source: Primary data

There are different factors that influence respondents to become an entrepreneur, like being creative and innovative with a mean score of 4.10 stands first in influencing, being independent: as my own boss with a mean score of 4.07; Creating jobs with 3.80, High income with 3.75, taking calculated risk with 3.63 and approving decision to start a business by family & friends with3.60 stands as least factor.

**Table No.: 9 - Entrepreneurial intention of the respondents**

| Particulars | Strongly Agree | Agree | Neutral | Dis agree | Strongly Disagree | Total | Mean Score | *Rank* |
|---|---|---|---|---|---|---|---|---|
| Huge amount of capital is required for starting a business. | 27 | 51 | 19 | 3 | 0 | 100 | 4.02 | ***4*** |
| It is easy to start a business with available resources. | 9 | 39 | 40 | 11 | 1 | 100 | 3.44 | ***5*** |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Entrepreneur should have the ability to create and grab the opportunity available to them. | 29 | 49 | 20 | 2 | 0 | 100 | 4.05 | ***3*** |
| Entrepreneur should have the ability to take risk. | 40 | 43 | 16 | 1 | 0 | 100 | 4.22 | ***1*** |
| Innovation is the basic feature of a successful entrepreneur. | 35 | 45 | 16 | 2 | 2 | 100 | 4.09 | ***2*** |

Source: Primary data

Majority of the respondents think that entrepreneur should have the ability to take risk and this is represented with a mean score of 4.22 that stands first; Innovation as the basic feature of a successful entrepreneur with 4.09, entrepreneur having ability to create and grab opportunities with 4.05, Huge requirement of capital for starting a business with4.02 and easy starting of business with available resources with 3.44 as mean score stands for least intention.

## Relationship between respondents' residence and Their willingness to become an entrepreneur*(T-TEST)*

**H1:** There is a significant relationship between residence of the respondents and their willingness to become an entrepreneur.

**Table No.:10 - Respondents' Residence and their willingness to become an entrepreneur**

| Group | N | Mean | Std. Deviation | F value | P Value |
|---|---|---|---|---|---|
| Urban | 78 | 3.269 | 1.135 | ***0.736*** | ***0.736*** |
| Rural | 22 | 3.182 | 0.795 | | |

Source: Primary data

***Interpretation***

Here sig. (p) value (0.736) is greater than 0.05, the null hypothesis is accepted (Ho) at 5% level of significance and alternative hypothesis is rejected (Ha). Hence, there is no significant relationship between residence of the respondents and their willingness to become an entrepreneur. But, their possibility to become an entrepreneur is high, as the responses show in other tables above.

**Relationship between respondents' field of study and their interest to be an entrepreneur with CED guidance *(ANOVA TEST)***

**H2:** There is a significant relationship between field of study of the respondents and their interest to become an entrepreneur with CED guidance.

**Table No.: 11 - Relationship between Respondents' Field of study and their interest to become an Entrepreneur with CED guidance**

| Field of study | N | Mean | Std. Deviation | F value | P Value |
|---|---|---|---|---|---|
| Arts | 44 | 1.955 | 0.939 | ***2.313*** | ***0.081*** |
| Science | 43 | 1.721 | 0.881 | | |
| Business | 8 | 1.750 | 1.035 | | |
| Technology | 5 | 2.800 | 0.447 | | |
| ***Total*** | ***100*** | ***1.880*** | ***0.924*** | | |

Source: Primary data

***Interpretation***

Here sig. (p) value (0.081) is greater than 0.05, the null hypothesis is accepted (Ho) at 5% level of significance and alternative hypothesis is rejected (Ha).Hence,there is no significant relationship between field of study of the respondents and their interest to become an entrepreneur with CED guidance.

**Association between father's occupation of the respondents and their career choice *(CHI-SQUARE)***

**H3:** There is an association between father's occupation of the respondents and their career choice.

**Table No.: 12 -Father's Occupation of the respondents and their Career Choice**

| Father's Occupation | Employee | Entrepreneur | Successor | Others | Total | Chi-Square | P Value |
|---|---|---|---|---|---|---|---|
| Self Employed | 16 | 14 | 11 | 14 | 55 | ***9.274*** | ***0.679*** |
| Private sector | 11 | 3 | 4 | 5 | 23 | | |
| Public sector | 5 | 0 | 3 | 4 | 12 | | |
| Retired | 3 | 2 | 1 | 1 | 7 | | |
| Unemployed | 2 | 1 | 0 | 0 | 3 | | |
| ***Total*** | ***37*** | ***20*** | ***19*** | ***24*** | ***100*** | | |

Source: Primary data

***Interpretation***

Here sig. (p) value (0.679) is greater than 0.05, the null hypothesis is accepted (Ho) at 5% level of significance and alternative hypothesis is rejected (Ha). Hence, there is no association between father's occupation of the respondents and career choice of the respondents.

## Discussions & Recommendations

- Higher education should include entrepreneurship courses to foster students' entrepreneurial aspirations.
- Students in other academic fields should also learn about entrepreneurship.
- To encourage entrepreneurial ambitions, the government should create support services in addition to entrepreneurship education.
- Government and educational institutions are suggested to create their curricula and educational initiatives that are successful, efficient, and respectful to the needs of learners of all backgrounds.
- Since interactions between various peer groups foster students' inventiveness and belief in oneself, which is a significant predictor of entrepreneurial intents, team diversity must be an essential part of academic activities.
- It may be advantageous for educational institutions to hire administrators, instructors, and students from a variety of backgrounds.
- Additionally, schools can benefit from diversity in the learning environment by participating in exchange programs with academic institutions in various nations and cultures.
- The theory of planned behaviour can be applied to research students' aspirations for starting their own business.
- Government programmes that offer financial aid to entrepreneurs should be made known to students.

## Conclusion

In a nutshell, any person can become an entrepreneur if they have the will and determination to start a new firm and are willing to embrace all of the risks involved.

***"Let us not become weary in doing good,***

***for at the proper time we will reap a harvest if we do not give up."***

***– THE HOLY BIBLE in Galatians 6:9 (NIV).***

It has been consistently recognized that entrepreneurship is crucial to the expansion and development of any economy. A multitude of benefits come with owning a business. The first phase of becoming an entrepreneur is referred to as entrepreneurial orientation. Future generations of a country must start trending in this direction. Higher education helps these impressionable young minds to progress and develop. It is crucial to establish relationships with those who are actively involved in the arena of entrepreneurship as well as those who have a more realistic mindset if higher education institutions are to serve as a platform for students to develop into entrepreneurs and make significant contributions to the economy.

The learners' desire to start a business is more influenced by psychological characteristics such as opinion, free, independent, sovereign, self-confidence, and possession than by demographic and social variables. However, each element that was identified—in this example, the diversified learning environment—brings us closer to comprehending this intricate yet natural process. Therefore, it is important to take into account the aforementioned aspects in order to develop entrepreneurial campuses and foster student entrepreneurship.

## References


1) *[1]The Holy Bible: New International Version. (1983). Hodder and Stoughton. (Original work published 1978). https://www.biblegateway.com/passage/?search=*
2) *Haddad, G., Haddad, G., & Nagpal, G. (2021). Can students' perception of the diverse learning environment affect their intentions toward entrepreneurship? Journal of Innovation & Knowledge, 6(3), 167-176. https://www.sciencedirect.com/ science/article/ pii/ S244456 9X2 1000214*
3) *[1]D, M., R, N., & Jaiswal, S. (2020, April 4). A study on Entrepreneurship Intention among Management Students with special reference to Coimbatore city. IJCRT. Retrieved July 17, 2023. https://ijcrt.org/papers/IJCRT2004143.pdf*

# Artificial Intelligence and E – Commerce

M. Amutha[1] and S. Mohana Priya[2]

[1]*Assistant Professor of Commerce, A. K. D. Dharma Raja Women's College, Rajapalaiam, Tamil Nadu*

[2]*II M. Com, A. K. D. Dharma Raja Women's College, Rajapalaiyam, Tamil Nadu*

**Corresponding Author e-mail id: amutham11884@gmail.com*

## Abstract

*The use of machine learning algorithms, natural language processing, and computer vision to enhance various aspects of the e-commerce experience is referred to as AI in E-commerce. This integration of artificial intelligence technologies into online commerce is referred to as AI in E-commerce. AI plays a crucial role in improving customer engagement, personalization, recommendation systems, fraud detection, inventory management, and supply chain optimization. Businesses can provide services that are more tailored and efficient by utilizing AI, which results in increased customer satisfaction and overall growth in the e-commerce sector. The benefits of e-commerce and artificial intelligence are the primary focus of this paper's explanation. Additionally, it aims to evaluate the significance of AI and its applications in the e-commerce domain."*

***Keywords:*** *Artificial intelligence, Machine learning, E-commerce.*

## E – Commerce and Artificial Intelligence

The modern information age brings new possibilities, software, and technological innovations that enhance marketing and shopping experiences. Businesses are forced to be more imaginative as a result of emerging technologies, which boosts productivity, quality, and profitability. Information and communication technologies (ICT), which have a significant impact on the business environment, drive most modern innovation. Investments in human capital and the appropriate integration of e-commerce solutions are two of the many factors that determine ICT's effectiveness. One sector where digital transformation and e-commerce play a crucial role is retail, where digital tools—such as websites—partially replace or complement physical stores.

## Role of Artificial Intelligence in E – Commerce

The e-commerce sector is undergoing a revolutionary transformation thanks to AI. It provides numerous benefits and enhances various aspects of online commerce. AI plays a key role in e-commerce in the following ways:

**1. Personalization and Customer Experience**

AI enhances customer experiences through personalized recommendations by analyzing customer preferences, behavior, and previous purchases. Additionally, real-time assistance from chatbots and virtual assistants boosts user engagement by providing instant support and guidance. Moreover, AI-driven dynamic pricing helps businesses optimize their pricing strategies by adjusting product prices based on customer behavior, market competition, and demand fluctuations.

**2. Fraud Detection and Security**

AI plays a crucial role in detecting suspicious activities, such as payment fraud and account takeovers. By leveraging machine learning models, AI analyzes transaction patterns to identify potential threats, ensuring enhanced security and fraud prevention.

**3. Inventory and Supply Chain Management**

AI predicts demand trends, enabling businesses to optimize stock levels and minimize issues like overstock or stock outs. Additionally, automated warehouse management systems enhance efficiency by streamlining logistics and delivery processes.

**4. Customer Support Automation**

AI chatbots efficiently handle common queries, significantly reducing response time and improving customer satisfaction. By leveraging Natural Language Processing (NLP), these chatbots enhance conversations, making interactions more human-like and engaging.

**5. Marketing and Advertising Optimization**

AI automates ad targeting and campaign optimization, ensuring that advertisements reach the intended audience effectively. Brands benefit from sentiment analysis, which helps them understand customer feedback and refine their marketing strategies for better engagement and impact.

**6. Pricing Optimization**

AI analyzes market trends, competitor pricing, and fluctuations in demand to set competitive prices. By adjusting prices in real time, businesses can maximize sales and profitability, ensuring they stay ahead in a dynamic market.

**7. Enhanced Customer Retention and Loyalty**

AI-driven loyalty programs offer personalized rewards and incentives, enhancing customer satisfaction and brand loyalty. By analyzing customer behavior, brands can improve engagement and retention strategies, creating more meaningful and long-lasting relationships with their customers.

AI plays a transformative role in e-commerce by improving customer experience, optimizing operations, enhancing security, and driving business growth. As AI continues to evolve, its impact on the e-commerce industry will only become more significant.

## Using Artificial Intelligence in E- Commerce Companies

**1. More targeted marketing and advertising**

Personalization is a top priority, according to retailers surveyed, only 15% claim to have fully implemented customization across all channels. With a more, you can stand out from the crowd. personal messages and individual conversations with customers Deep personalization has been made possible by AI and machine learning advancements. techniques to customize content by user. By looking at big data from the purchase histories and other customer interactions, you can zero in on what your customers really want and deliver the message that will most resonate.

**2. Increased customer retention**

Delivering targeted marketing and advertising messages personalized for customers can increase retention. According to McKinsey's research on omnichannel personalization, businesses can achieve a 10-15% increase in revenue and retention by implementing such strategies. The report states that 'building better data and insights on customers' is an essential component of personalization, as customer data is a valuable asset that adds value throughout the value chain.

**3. Smooth automation**

The objective of automation is to complete a task with as little effort as possible. Human involvement as much as possible. That can mean anything from scheduling emails in a CRM or marketing tool, using Zapier to automate tasks or leveraging advanced technology to make hiring easier. In the context of future ecommerce trends, however, Machine learning and robotics are two of the most talked-about topics currently. AI can play a big role in helping you automate the repetitive tasks that keep your online store functioning. You can automate things like product manufacturing with AI. Low-level support, discounts for loyal customers, and more

**4. Efficient sales process**

Using AI can help you create a more efficient sales process Automate abandoned cart follow-up by collecting customer data. Inquiries, and more. By having customers move through the funnel, you can them use chatbots to ask straightforward questions.

## AI Use Cases in E-commerce

Artificial intelligence (AI) is transforming the e-commerce landscape, enhancing customer experiences, optimizing pricing, and streamlining logistics. Many AI-driven solutions are already in use, even if consumers don't always realize they are powered by AI. Here are six of the most common AI applications in e-commerce:

**1. Personalized Product Recommendations**

- AI analyzes customer data, including past purchases and browsing behavior, to provide personalized product recommendations.
- Machine learning helps retailers capture and analyze data to optimize marketing campaigns, pricing strategies, and customer insights.
- Over time, AI systems will require less human intervention, making personalization more efficient and scalable.

**2. Pricing Optimization**

- AI-driven dynamic pricing adjusts product prices based on real-time supply and demand.
- Machine learning models predict when and what to discount, ensuring the minimum necessary discount to complete a sale while maximizing revenue.

**3. Enhanced Customer Service**

- AI-powered chatbots and virtual assistants provide 24/7 customer support for common queries, freeing human agents to handle more complex issues.
- These virtual agents enhance customer experience by providing instant responses and facilitating simple transactions.

**4. Customer Segmentation**

- AI processes vast amounts of customer data to identify behavioral trends and segment customers more effectively.

- AI-driven customer engagement systems continuously optimize their performance as they gather more data, improving precision in marketing strategies.

**5. Smart Logistics**

- AI enhances logistics and supply chain management by forecasting transit times, demand fluctuations, and potential shipment delays.
- Real-time data from sensors and RFID tags improve inventory management and demand prediction, leading to more efficient supply chain operations.

**6. Sales and Demand Forecasting**

- AI leverages real-time and historical data to predict consumer demand, helping businesses manage inventory more effectively.
- A McKinsey report highlights the importance of real-time customer analytics in adjusting prices and targeting marketing campaigns based on shifting demand patterns.

## Benefits of AI in the E-Commerce Industry

Artificial Intelligence (AI) is revolutionizing the e-commerce industry by enhancing customer experience, optimizing operations, and driving business growth. Here are some of the key benefits of AI in e-commerce:

**1. Personalized Customer Experience**

AI plays a crucial role in enhancing the shopping experience by analyzing customer behavior, preferences, and purchase history to provide personalized product recommendations. Additionally, dynamic pricing and personalized discounts ensure that customers receive the best deals tailored to their interests. AI-powered chatbots further improve customer engagement by offering immediate assistance and support, making shopping more convenient and efficient.

**2. Enhancement of Product Recommendations**

Machine learning algorithms play a vital role in suggesting relevant products based on user preferences, ensuring a more personalized shopping experience. Artificial intelligence-driven recommendation engines not only boost sales but also enhance customer satisfaction by providing tailored suggestions. Leading retailers like Netflix and Amazon leverage AI to refine their recommendations, ultimately increasing conversions and improving user engagement.

**3. Fraud Detection and Enhanced Security**

AI plays a crucial role in enhancing security by detecting fraudulent transactions and identifying unusual customer behavior patterns. Machine learning models help prevent payment fraud and account takeovers, ensuring a safer digital experience for users. Additionally, AI-based cyber security measures protect customer data, reinforcing trust and security in online transactions.

**4. Automated Customer Support**

AI-powered chatbots enhance customer service by responding to inquiries round-the-clock, significantly reducing response times. Virtual assistants provide instantaneous and accurate information, ensuring a seamless customer experience. By handling routine tasks, AI allows human support teams to focus on more complex issues, ultimately improving overall efficiency and service quality.

**5. Better Marketing and Ad Targeting**

AI enhances marketing strategies by automating and optimizing campaigns for higher engagement. Businesses leverage sentiment analysis to better understand customer preferences and feedback, allowing them to refine their offerings. Additionally, AI-driven ad targeting ensures that businesses reach the right audience with personalized advertisements, maximizing impact and conversion rates.

**6. Visual and Voice Search Capabilities**

AI-powered visual search enables customers to find products effortlessly by using images instead of text, enhancing the shopping experience with greater accuracy and convenience. Voice commerce, driven by AI assistants like Alexa and Google Assistant, allows users to make purchases through voice commands, making the process more seamless and efficient. To further improve discoverability, e-commerce platforms are optimizing for voice search, ensuring that customers can easily find and purchase products using natural language queries. These advancements in AI-driven technology are transforming the way consumers interact with online shopping platforms, offering a more intuitive and personalized experience.

**7. Advanced Sales and Demand Forecasting**

AI utilizes real-time and historical data to predict sales trends and customer demand, helping businesses stay ahead of market fluctuations. Predictive analytics play a crucial role in optimizing inventory management, pricing strategies, and marketing efforts for maximum efficiency. With AI-

driven insights, businesses can make proactive decisions, leading to improved performance and long-term success.

## Conclusion

Artificial intelligence in e-commerce is playing a leading role in driving innovative solutions and enhancing customer experiences. Some of the key use cases of AI in e-commerce include personalized shopping, product recommendations, and inventory management.

## References

1) *https://www.Oracle.Com/In/Artificial-Intelligence/*
2) *https://www.jetir.org/papers/JETIR2309413.pdf*
3) *https://www.ijcrt.org/papers/IJCRT21X0134.pdf*
4) *https://jusst.org/wp-content/uploads/2022/08/IMPACT-OF-ARTIFICIALINTELLIGENCE-IN-E-COMMERCE.pdf*

# A Study on Usage of AI in Banking Sector with Special Reference to Indian Banks

R. Andy

*Assistant Professor, Department of commerce [SF], N. M. S. S. Vellaichamy Nadar College, Madurai, Tamil Nadu*

## Abstract

*Artificial intelligence is rapidly expanding across the globe, with banks being among the early adopters of this technology. This analysis explores the various applications of AI within the banking sector, particularly highlighting the challenges encountered at the SBI Cantonment Branch. The focus is on the role of AI in banking operations, which encompasses areas such as cyber security, fraud detection, and customer service. Additionally, AI influences financing, credit assessments, and automation processes. Statistical methods were employed for the analysis, revealing both the utilization and the obstacles of AI in the banking industry.*

***Keywords:*** *Customer service, Fraud and cyber security, Chabot, Artificial Intelligence.*

## Introduction of AI

**A**rtificial **I**ntelligence (AI) refers to the development of machines that can think and behave like humans. These AI systems are designed to replicate human behaviors and can also be characterized by their ability to learn and solve problems independently. The primary objective of AI is to determine the most effective actions to achieve specific goals. A subset of AI, known as machine learning, enables computers to improve their performance by learning from new data without requiring human intervention. Deep learning, another aspect of AI, involves processing large volumes of data, such as text, images, or videos, to facilitate automatic learning.

According to Accenture, AI in the banking sector is represented by a computer system that perceives, comprehends, acts, and learns. This system is capable of observing its environment and analyzing data, subsequently taking actions and enhancing its capabilities through learning. As a result, machines can engage with their surroundings, individuals, and data in a more intuitive manner, thereby broadening the collaborative potential between humans and machines.

The influence of artificial intelligence on the banking industry is significant. This document examines the application of AI within Indian banks, providing a review of existing research. The emphasis is placed on the effects of AI in the banking sector.

## Elements of AI

Artificial Intelligence is built upon several essential components that collaborate to form intelligent systems.

1) Programming serves as a fundamental aspect.
2) Data structures facilitate the organization of information.
3) Algorithms consist of defined procedures for addressing problems.
4) Pattern recognition enables AI to identify trends.
5) Machine learning allows AI to enhance its capabilities over time.
6) Physics contributes to a practical understanding of the world.
7) Numerical methods support computational processes.
8) Psychology provides valuable perspectives on human cognition.

## Influence of AI on the Banking Sector

1) AI enables financial institutions to process vast quantities of data efficiently.
2) This capability allows banks to derive significant insights.
3) AI algorithms can identify money laundering activities within seconds.
4) By leveraging data, AI enhances fraud prevention and regulatory compliance.
5) AI-driven catboats and digital payment solutions enhance customer service.
6) Biometric fraud detection further strengthens security measures.

These technological advancements contribute to increased revenue and reduced expenses, ultimately resulting in higher profitability for banks.

## AI Technology Applications in the Banking Sector

AI enhances numerous functions within the banking industry. This encompasses the use of robotics and computer vision technologies. Additionally, AI employs natural language processing. Other notable examples include virtual agents and machine learning applications. These innovations significantly elevate the quality of banking services.

## Factors Driving the Integration of AI in the Banking Sector

1) AI is revolutionizing the banking industry.
2) Automation through robotics streamlines various tasks.
3) Computer vision technology enhances security measures.
4) AI's language comprehension capabilities improve service quality.

5) Virtual assistants provide tailored support to customers.

6) Machine learning techniques enhance the detection of fraudulent activities.

7) These AI solutions significantly increase operational efficiency.

8) They also contribute to an improved customer experience.

## AI Applications in Banking

1) The implementation of Artificial Intelligence in banking is transforming various critical
2) functions.
3) AI plays a vital role in identifying fraudulent activities and bolstering cyber security
4) measures.
5) Customer support is significantly enhanced through AI-driven solutions.
6) AI aids in ensuring adherence to regulatory requirements.
7) It optimizes financing and loan procedures by facilitating more accurate credit assessments.
8) AI contributes to the efficiency of business process management.
9) Marketing strategies are also refined with the help of AI technologies.

### Indian Banks Using AI

Numerous banks in India have adopted artificial intelligence technologies. Among these are the State Bank of India, Canara Bank, and HDFC Bank. Additionally, ICICI Bank, Axis Bank, and Bank of Baroda are also utilizing AI. Other institutions employing AI include Andhra Bank and Kotak Mahindra Bank.

### *(a) State Bank of India*

SBI stands as the largest public sector bank in India. The bank leverages artificial intelligence to enhance its banking services. Their AI-driven assistant, SIA, efficiently addresses customer inquiries. SIA assists with routine banking activities. The AI platform Payjo is responsible for the development of SIA. It has the capability to process nearly 10,000 questions every second, amounting to approximately 864 million questions daily. Reports indicate that this figure represents 25% of the total daily queries handled by Google.

***(b) Canara Bank***

Canara Bank has implemented a robot called Mitra, developed by Inventio Robotics in Bengaluru. Mitra is designed to assist customers in navigating the bank's facilities. Additionally, there is a smaller robot named Candi, which provides support to the bank's staff.

***(c) HDFC***

HDFC is another Indian financial institution leveraging artificial intelligence. Their chatbot, Eva, is integrated with Google Assistant, providing assistance to Android users with their inquiries. Additionally, HDFC introduced another AI chatbot, On Chat, which was launched on Facebook Messenger in 2016.

***(d) ICICI***

ICICI Bank stands as a prominent private banking institution in India. The bank employs software robots across more than 200 operational tasks. Notably, ICICI was the pioneer in India to implement artificial intelligence extensively.

***(e) Axis Bank***

AXIS Bank has introduced an AI chatbot named AXAA, allowing customers to address banking inquiries at any time. This service was launched in July 2020.

***(f) Bank of Baroda***

Bank of Baroda leverages artificial intelligence to enhance customer service and reduce expenses. They have developed an AI robot called Baroda Brainy, along with a chatbot named ADI.

***(g) Andhra Bank***

Andhra Bank merged with Union Bank in April 2020. They utilize an AI assistant called ABHi, which efficiently assists numerous customers.

***(h) Kotak Mahindra Bank***

Kotak Mahindra Bank features an AI chatbot named Keya, which is available to respond to inquiries around the clock. Keya operates as a voice bot integrated with the bank's telephone system.

**Applications**

AI serves a variety of functions across different sectors.

They are:

1) Customer support can be enhanced through the use of chatbots.
2) It plays a crucial role in identifying fraudulent activities and bolstering cyber security.
3) AI contributes to the evaluation of loan and credit applications.
4) The automation of various tasks is another significant advantage.
5) Companies can analyze market trends more effectively with the help of AI.

**Chatbots**

Chatbots leverage artificial intelligence to assist customers effectively. These applications simulate human interaction and deliver automated support. They enhance convenience and provide rapid responses. Financial institutions utilize chatbots to enhance their service offerings, enabling customers to handle requests more efficiently. Additionally, chatbots allow banks to gain insights into customer behavior, facilitating the development of tailored offers and services.

**Fraud Detection and Cyber Security**

Fraud detection is essential for preventing unauthorized access to financial resources or assets. Financial institutions encounter fraud through counterfeit checks and stolen credit cards. Various methodologies are employed to identify fraudulent activities. Data mining analyzes large datasets to uncover patterns indicative of fraud in transactions. Neural networks are utilized to recognize and flag potentially suspicious behaviors. Machine learning algorithms help identifies characteristics that are frequently associated with fraudulent cases. Pattern recognition techniques are employed to detect atypical activities.

Artificial intelligence enhances cyber security by identifying emerging malware threats. The system effectively highlights significant risks and automatically resolves issues. This safeguards sensitive client information. AI leverages advanced technologies and methodologies to thwart cyber-attacks, mitigating damage from viruses and hacking attempts. It plays a crucial role in preventing data breaches and restricting unauthorized access.

***(a) Loan and Credit Decision***

Artificial intelligence is transforming the landscape of loan decision-making. Financial institutions are now leveraging innovative data sources to assess credit risk more effectively. By analyzing patterns in mobile phone usage and social media activity, banks gain a more comprehensive understanding of borrowers' likelihood to repay loans. The application of machine learning algorithms enhances the accuracy of predicting loan defaults, surpassing traditional methods. This advancement ultimately leads to reduced financial losses for lenders.

***(b) Process Automation***

Process automation is facilitated through the use of **R**obotic **P**rocess **A**utomation (RPA). This technology enables bank personnel to concentrate on critical customer requirements by streamlining various processes. RPA efficiently extracts data from **K**now **Y**our **C**ustomer (KYC) documents, utilizing **O**ptical **C**haracter **R**ecognition (OCR) technology to enhance accuracy and efficiency.

***(c) Tracking Market Trends***

Artificial intelligence plays a pivotal role in market monitoring. It systematically analyzes data to forecast trends, fluctuations in currency, and stock market values. Additionally, robotic advisors provide support to traders by assisting with account setups and offering guidance on financial strategies.

## Challenges Encountered by Banks in Implementing Artificial Intelligence

1) Financial institutions face obstacles in the integration of artificial intelligence.
2) A significant number are hesitant to embrace innovative AI techniques.
3) There is often a lack of dedication to staff training in AI applications.
4) Access to data is essential for implementing operational improvements.
5) There is a disconnect between customer expectations and bank responses.
6) Existing personnel require training in AI technologies.
7) Customers generally have limited awareness of AI capabilities.
8) There is a deficiency of skilled professionals proficient in AI tools.
9) AI systems occasionally struggle to comprehend customer language effectively.

## Conclusion

Banks are increasingly adopting Artificial Intelligence to enhance their customer service offerings. They are exploring various applications of AI to create a more efficient banking experience. The outlook for AI in the banking sector is optimistic, as it enables customers to conduct transactions at their convenience, eliminating the need for lengthy queues. AI aims to provide personalized and high-quality service to each customer, while also streamlining processes and simplifying banking tasks.

## References


1) *Akalya, A. (2020). "The Effects and Challenges of Artificial Intelligence in the Banking Sector." Journal of Information and Computational Science, 10(2).*
2) *Amer Awad Alzaidi (2018) conducted a study titled "Impact of Artificial Intelligence on the Performance of the Banking Industry in the Middle East," published in the IJCSNS International Journal of Computer Science and Network Security, Volume 18, Issue 10.*
3) *Erol Pala (2021) conducted a systematic literature review on the role of artificial intelligence in customer-facing financial services, presenting an agenda for future research in the International Journal of Bank Marketing.*
4) *Geetha, A. (2021). "An Examination of Artificial Intelligence (AI) in Banking and Financial Services." International Journal of Creative Research Thoughts (IJCRT), Volume 9, Issue 9.*
5) *Kishore Meghani (2020) conducted a study titled "The Application of Artificial Intelligence and Blockchain in the Banking Sector: An Analysis of Scheduled Commercial Banks in India," published in the INDIAN JOURNAL OF APPLIED RESEARCH, Volume 10, Issue 8.*
6) *Laraibe Siddiqu (2020) explores the impact of artificial intelligence on the banking sector in the article titled "The Influence of Artificial Intelligence on the Banking Industry & How AI is Transforming Contemporary Banks," published in the International Journal of Management (IJM), Volume 11, Issue 6.*
7) *www.analyticsinsight.net*
8) *https://www.investopedia.com*
9) *https://towardsdatascience.com/enabling-data-ai-in-retail-banking-part-1-customer-analytics-journey-54a7ce7d2a81.*
10) *https://www.techtarget.com/searchsecurity/definition/fraud-detection.*

# A Study on E – Service Quality of Tourism with Special Reference to Thoothukudi District

P. Jayalakshmi[1] and R. Subha Ranjani[2]

[1]*II.M. Com, PG and Research Department of Commerce, G. Venkataswamy Naidu College (Autonomous), Kovilpatti, Tamil Nadu*

[2]*Assistant Professor, PG and Research Department of Commerce, G. Venkataswamy Naidu College (Autonomous), Kovilpatti, Tamil Nadu*

## Abstract

*Service quality in online environment has become recognized as an important factor it determining the success or failure of electronic commerce. E-Service quality is important for two reasons. Firstly it greatly influences customer's satisfaction and intention to online, secondly it is critical in attracting potential customers E-Service quality has been found to be an important input to customer's satisfaction online environment. The tourism industry faces a great challenge in the age of the information technology development. The traditional tourism distribution channel faces a threat of the emerging IT environment. Throughout years the tourism industry was development on the intermediaries who enabled the interaction between the supplier and the customer. Now a days, however, the supplier can reach the customer directly via internet having the geographical distance barriers and costs associated to them disappeared. The internet age changed the complexity of the tourism distribution, enabling the entry of the new virtual intermediaries characterized by strong competitive advantage towards other players of the sectors. Hence, the topic entitled, "A Study on E-Service Quality of Tourism with special reference to Thoothukudi District" has been chosen for the present study.*

***Keywords:*** *Tourism, Service Quality, Customer's Satisfaction.*

## Introduction

Service quality in online environment has become recognized as an important factor it determining the success or failure of electronic commerce. E-Service quality is important for two reasons. Firstly, it greatly influences customer's satisfaction and intention to online, secondly it is critical in attracting potential customers E-Service quality has been found to be an important input to customer's satisfaction online environment.

The success of tourism organizations will increasingly depend on sensing and responding to rapidly changing customer needs, using Information and Communication Technologies (ICTs) for delivering the right product, at the right time, at the right price, for the right customer. Customer satisfaction is regarded as an essential factor which influences long term relationship between and consumers in both the traditional and e-commerce business environments. Measuring Electronic

Satisfaction as a concept gained an increased importance in the marketing literature in recent times. Today travelers have more choices and are better information. They have easy was asked to conduct an attitude and usage survey on travel habits.

Electronic Service Quality is a new developing area of research, which has strategic importance for businesses striving to address consumers in the electronic market space. It is known that consumer behaviour in an online environment may differ substantially from the one displayed in the physical world. Therefore, it is important for practitioners to understand customer needs that are amenable to fulfillment in an online environment and strive to meet them website e service quality defined as "the extent to which a website facilitates efficient and effective shopping, purchasing and delivery of products and services. E – service quality is what differentiates a good quality website from a customer point of view and facilitates the process of bringing customer and company together. The present study addresses e-service quality in the tourism context. The area of e-service quality in tourism appears to have been understudied and there in clearly a need for further research.

## Statement of the Problem

The tourism industry faces a great challenge in the age of the information technology development. The traditional tourism distribution channel faces a threat of the emerging IT environment. Throughout years the tourism industry was development on the intermediaries who enabled the interaction between the supplier and the customer.

Now a days, however, the supplier can reach the customer directly via internet having the geographical distance barriers and costs associated to them disappeared. The internet age changed the complexity of the tourism distribution, enabling the entry of the new virtual intermediaries characterized by strong competitive advantage towards other players of the sectors. Hence, the topic entitled, "A Study on E-Service Quality of Tourism with special reference to Thoothukudi District" has been chosen for the present study.

## Objectives of the Study

The main objectives of the study are,

1) To study the personal profile of the respondents
2) To know the factors influencing E-Service quality of tourism.
3) To analyse the level of E-service quality of tourism.

4) To find out the relationship between personal profile of the respondents and their level of satisfaction towards E – service quality of tourism
5) To analyse the problem faced by the respondents
6) To offer suitable suggestions for the present study.

## Methodology and Tools

The study is based on both primary and secondary data. The primary data are collected from the respondents with the help of Interview schedule. The secondary data are collected from books, journals and websites. 120 respondents were selected by convenience sampling method. Statistical tools like Garrett ranking and 'F' test, Gap model are used to analyse the data.

## Analysis and Interpretation of Data

The data collected with the help of Interview schedule are analysed in six parts. They are,

A. Personal profile of the respondents
B. To know the amount spent on the tour
C. To find out the factors influencing tour
D. Problems faced by the respondents
E. Relationship between personal profile of the respondents and their level of satisfaction towards
F. E – service quality of tourism
G. E – Service quality of Tourism

## Personal Profile of the Respondents

The major findings of the study are

- 58 percent of the respondents are female.
- 25 percent of the respondents belong to the age group of 20 – 30 years and 30 – 40 years.
- 62 percent of the respondents are married.
- 52 percent of the respondents were completed post graduates.
- 25 percent of the respondents were businessman.
- 32 percent of the respondents having the monthly income of above Rs.25,000.

## Amount Spent on Tour

People spent amount to get any service. Generally, in the visit for tour, tourists spent amount for food, accommodation and to purchase famous goods in the spot. Hence the amount spent per annum by the respondents is given in Table -1

**Table - 1, Amount Spent on Tour**

| S. No | Amount Spent | No. of Respondents | Percentage |
|---|---|---|---|
| 1. | Below Rs.10,000 | 20 | 17 |
| 2. | Rs.10,000 – Rs.30,000 | 60 | 50 |
| 3. | Rs.30,000 – Rs.50,000 | 34 | 28 |
| 4. | Above Rs.50,000 | 6 | 5 |
| | Total | 120 | 100 |

Source: Primary data

It is observed from the Table -1 that, out of 120 respondents, 50 percent of the respondents have spent Rs.10,000 – Rs.30,000, 28 percent of the respondents have spent Rs.30,000 – Rs.50,000, 17 percent of the respondents have spent below Rs.10,000 and 5 percent of the respondents have spent above Rs.50,000 for tour.

## Factors Influencing Tour

The factors influence the tours of the respondents are given in Table -2.

**Table - 2, Factors Influencing Tour**

| S. No | Factors Influencing your tour | No. of Respondents | Percentage |
|---|---|---|---|
| 1. | Vocation | 20 | 17 |
| 2. | Season | 34 | 28 |
| 3. | Climate | 40 | 33 |
| 4. | Events | 20 | 17 |
| 5. | Others | 6 | 5 |
| | Total | 120 | 100 |

Source: Primary data

It was observed from the Table -2 that, out of 120 respondents, 33 percent of the respondents are influenced by climate, 28 percent of the respondents are influenced by season, 17 percent of the respondents are influenced by vocation and events and 5 percent of the respondents are influenced by others.

## Problem faced By the Respondents

Normally we faced many problems while availing the services the researcher enquired about the problem faced in E-Service Quality of tourism by the respondents and it is given in Table -3

**Table - 3, Problems Faced by the Respondents**

| S. No | Problems | Ranks | | | | | | | | | Garrett's Rank | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | I | II | III | IV | V | VI | VII | VIII | IX | Mean Score | Rank |
| 1. | Charging high amount | 7 | 14 | 8 | 5 | 4 | 2 | 5 | 8 | 7 | 52.9 | III |
| 2. | No promptness in service | 1 | 5 | 8 | 11 | 8 | 8 | 4 | 8 | 7 | 47 | V |
| 3. | Transport facility provide is inadequate | 8 | 8 | 9 | 8 | 8 | 4 | 7 | 6 | 2 | 54.5 | II |
| 4. | Languages problem | 15 | 8 | 3 | 7 | 4 | 8 | 7 | 3 | 5 | 55.9 | I |
| 5. | Insufficient room facility | 8 | 6 | 10 | 5 | 7 | 7 | 10 | 4 | 3 | 52.9 | III |
| 6. | Food are not suitable to our taste | 8 | 5 | 8 | 8 | 12 | 10 | 1 | 2 | 6 | 46.5 | VI |
| 7. | No consideration of personal difficulties | 1 | 6 | 4 | 8 | 10 | 6 | 7 | 10 | 8 | 44.75 | VII |
| 8. | No privacy & security | 5 | 6 | 5 | 5 | 3 | 5 | 7 | 12 | 12 | 44.1 | IX |
| 9. | Less guidelines of tourist | 7 | 2 | 5 | 3 | 4 | 10 | 12 | 7 | 10 | 44.7 | VIII |

From the above Table -3 it was clear that 'Language problem' is the foremost problem faced by the respondents. The second, third, fourth, fifth, sixth, seventh, eighth and nineth ranks were given to the problem of 'Transport facility provide in inadequate', 'Insufficient room facility' and 'Charging high amount', 'No promptness in service', 'Food are not suitable to our taste', 'No consideration of personal difficulties', 'Less guidelines of tourist' and 'No privacy & security' respectively.

## Relationship between Personal Profile of the Respondents and Their Level of Satisfaction Towards E – Service Quality of Tourism

The null hypothesis framed is "There exists no significant relationship between personal variable of the respondents namely gender, age, educational qualification, Occupation, monthly income and their level of satisfaction towards towards e – service quality of tourism.

**Table - 4, Consolidated Results of F – Test**

| S. No | Factors | Degrees of freedom | Calculated value | Table at 5% | Association |
|---|---|---|---|---|---|
| 1. | Gender | c = 2 | 0.336 | 4.303 | NS |
| | | r = 1 | 0.673 | 12.706 | NS |
| 2. | Age | c = 2 | 0.358 | 4.303 | NS |
| | | r = 4 | 0.371 | 2.776 | NS |
| 3. | Educational qualification | c = 2 | 1.474 | 4.303 | NS |
| | | r = 4 | 3.974 | 2.776 | S |
| 4. | Occupation | c = 2 | 0.16 | 4.303 | NS |
| | | r = 4 | 0.28 | 2.776 | NS |
| 5. | Monthly income | c = 2 | 0.50 | 4.303 | NS |
| | | r = 4 | 0.58 | 2.776 | NS |

NS = Not significant; S = Significant

From the above analysis, it is evident that there is not relationship between the level of satisfaction towards E-service quality of tourism and the personal profiles of the respondents like gender, age, educational qualification, occupation and monthly income.

## E – Service Quality of Tourism

According to the gap model, the difference between the expectations and perception are known as gap. Hence, expected, perceived and gap score of the service quality of factors are given in Table- 5.

**Table - 5, Consolidated Results of GAP Score**

| Service Quality Factors | Expected Score | Perceived Score | Gap Score |
|---|---|---|---|
| Tangibility | **7.9** | **7.19** | **0.71** |
| Reliability | 11.55 | 9.29 | 2.26 |
| Responsiveness | 11.46 | 9.53 | 1.93 |
| Assurance | 12.56 | 9.16 | 3.4 |
| Empathy | 12.1 | 9.66 | 2.44 |
| User friendliness | 8.19 | 6.8 | 1.39 |

Shows the gap score for the service quality of E-Service quality of tourism, the dimensions like Tangibility was low that indicating the high fulfillment of the expectations of the respondents as compared to other service quality factors like user friendliness, responsiveness, reliability, empathy and assurance.

## Suggestions

The following are the suggestions to improve the e-service quality of tourism.

- The E-Service Quality of tourism providers have a good website to attain the target online tourists successfully on the website.
- The E-service quality of tourism provider keep the website up to date and interesting and update the contents regularly.
- The website has a good quality photos and video, good and attractive design and have informative complete and attractive content.
- The service provider builds and maintain a relationship with the customer after the trip asking the feedback and using it to improve the tourism product.
- Online marketing strategies are evolving and changing rapidly. Online tourism service provider and these staff up to date with relevant marketing information.

## Conclusion

Marketing destinations online has become the major focus area all over tourism in today's world is no more a luxury. This has been possible by technological developments in transportation and information technology. It is an for both the tourist for planning finishing a successful satisfactory tour, as well as for the tourism companies for attracting more and more tourists there by generating more tourism business well designed sites with useful and relevant information can surely help realize a significant level of tourist business by satisfying tourist in effective manner.

## References

1) *International Journal of Business and Society, Vol.18, Issue.No.2, 2016.*
2) *International Journal of Business Science and Applied Management, Vol.1, Issue No.1, 2006.*
3) *International Journal of Economics and Management Engineering, Vol.7, Issue No.8, 2013.*
4) *International Journal of Hospitality & Tourism System, Vol.9, Issue No.1, 2016.*
5) *International Journal of Research and Analytical Review, Vol.6, Issue No.2, 2019.*
6) *www.ajhtl.com*
7) *www.ijrar.org*
8) *www.srjis.com*

# AI Chatbots in Digital Banking: Diagnosing Operational Shortcomings and Future Improvements in PSBs

Anju Tiwari[1]* and Ruby Mittal[2]

[1]*Assistant Professor- MVN university, Palwal*

[1]*Research Scholar- St John's College Agra*

[2]*Assistant Professor, MVN University, Palwal*

**Corresponding Author e-mail id: anju.tiwari@mvn.edu.in*

## Abstract

*As digital banking has evolved so quickly, chatbots have proven essential for transforming the customer experience through offering prompt, readily available and efficiently delivered answers. This study inspects how well automated chatbots exhibit throughout all Indian public sector banks (PSBs), putting an additional focus on how well they are able to deal with consumer solicitations on various real ground queries for which they might looking before dealing virtually. All 12 public sector banks has been taken for the study to find out the overall scenario of public sector for the virtual assistance. The findings show significant variation in chatbots execution, for a say i.e. a few banks providing live chat along with extensive, multilingual assistance whereas other ones offer little to no assistance. The analysis serves as an significant insight regarding how to best optimize chatbot platforms for upgraded user interaction, greater efficiency, and enhanced engagement with customers in the rapidly evolving environment of digital banking by outlining significant advantages and shortcomings. With the help of this study, we are able to have a precise overview about the functioning of these chat bot services. In an attempt to enhance customer satisfaction, this research underlines the requirements of precise replies, linguistic capabilities, and ease of interaction aligning with human agents.*

***Keywords:*** *Chatbots, Customer Service, User Experience, Virtual Assistance, Banking Automation, Digital Banking,*

## Introduction

AI-mediated financial operations have been developed predominantly because of the growing need for explosively sensitive banking sector and there is an urgent need for enhanced banking guidelines, and around the globe isomorphic behaviour (Tuzovic et al., 2021). The worldwide market size is expected to surpass USD 3.37 billion in 2024, hitting a projected total value of approximately USD 31.5 billion by 2031, with a compound annual growth rate (CAGR) of 37.62% from 2024 to 2031. The insertion of AI arbitration throughout current financial institutions has been unusual, as it has drastically decreased regular operating expenses with a molplier effect of 1.6 times of effectiveness. AI-mediated innovations are vital and advantageous, especially since the foreseeable future is contingent upon customised services, financial services additionally align with this trend (Hajro et al 2021) by way of adopting new technologies (S Chauhan &NP Singh, 2024).

Contemporary Nielsen quarterly investigations by Payne and Rucker (2022) claimed that approximately 80 percent of banking services are digitally stored. Furthermore, regular customers anticipate critical digital upgrades in the future years. AI mediated banking and finance utilises machine learning as well as blockchain technology, therefore addressing service congestion (Korezionswki, 2017). Integration of artificial intelligence enables banks to get rid of service combinations and unjust client requests. In comparison to the earlier banking paradigm wherby the users are confined only to specific banking hours, the emergence of AI facilitates an uninterrupted and interactive banking environment (Abdulquadri et al., 2021). In view of intense rivalry and a proliferation of digital-native generations, banks have to reinvent themselves and convey personalised offerings to meet the expanding expectations of their patrons (AL-Dosari et al, 2024). In the prevailing setting, the simultaneous development of Robotic Process Automation (RPA) and Artificial Intelligence (AI) serves as unique opportunities to tremendously modernise their rendering of services. The presented research evaluates the likelihood of AI-powered RPA, or robotic process automation, for tailoring financial services supply, thus boosting the wider pleasure of individuals (Alnaser et al 2023). Chatbots are a product of artificial intelligence, specifically those employing intricate techniques that incorporate Natural Language Processing (NLP) alongside Machine Learning (ML). AI backed Chatbots are using AI technology to deduce and reach out to user supplies in ways that are conversational

The application of AI in Indian banks was acknowledged in the Reserve Bank of India's (RBI) primary yearly release, "Report on Trend and Progress of Banking in India 2023-24." The RBI undertook a literary study of the Indian financial institutions' periodicals spanning last financial year. The review concluded that adoption of AI related concepts in Indian banks has grown sizeably, specifically in Private Sector Banks (PVBs). In the public sector banks (PSBs), penetration have been pacified but have experienced nevertheless ascended broadly 2.5 times through the recently cited research timeframe. The survey had also mentioned the fact that one of the main practices of AI throughout the service sectors is Chatbots which might speak, either through text or via voice, with individuals in natural dialects. Additionally, the analysis asserted that as a consequence of the conclusion of December 2024, 9 among the 12 PSBs and amjority of PVBs operated a certain type of Chatbot through leveraging AI and ML technologies and in the majority of instances, the Chatbots can be accessed by visiting banks' websites.

## What is banking chatbots?

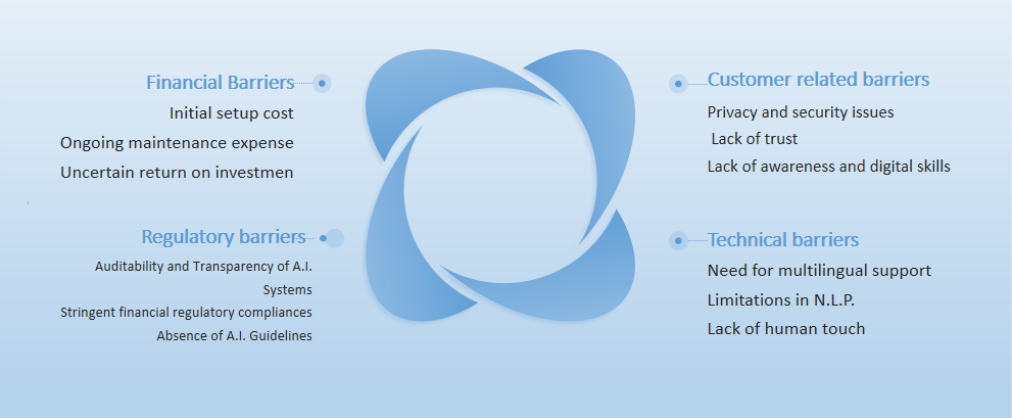
Virtual assistants termed as banking chatbots have been developed to communicate therewith individuals throughout various platforms, which include webpages or mobile devices. Bots can be assigned multiple tasks and utilise artificial intelligence to figure out what customers want and make them to have the capacity to accommodate them.

Certain chatbots provide basic offerings that involve addressing FAQs, however recently, they happen to be growing more complicated. Owing to AI, chatbots may be utilised as our own personal assistant. They've been typically interpersonal associates readily accessible 24/7 and in real-time. Chatbots may substitute aid for individuals beyond working hours as well as may perform simply as a supportive source throughout critical circumstances.

## Barriers and sub-barriers to AI banking chatbot adoption in India

Regardless of a technological and consumer perspective, A number of barriers exist in broad way adoption of these banking chatbots. Customer-related considerations typically include issues related to security and privacy, given that consumers are anxious concerning the safety of their confidential information as well as the hazards of illicit usage or theft of information (Cardona et al., 2021; Kim et al., 2023). Furthermore, the dearth of confidence in the technology behind chat bots originates from consumers' concern about mistakes, deception, or abuse of data, triggering trepidation in adopting chatbots for banking and finance (Lappeman et al., 2023; Nordheim et al., 2019). Additionally, many consumers are lacking the requisite grasping and expertise to effectively employ technological devices and networks, especially chatbots, therefore further restricts their widespread use (Abdulquadri et al., 2021; Alt et al., 2021).

Coming to the technological front, banking chatbots come across issues regarding offering multidisciplinary assistance, which has become vital for resolving to the distinct language inclinations and ethnicities of consumers (Rustamov et al., 2021; Mogaji et al., 2021). likewise shortcomings in the use of natural language processing (NLP), technological advances offer significant challenges, as chatbots attempt to fully comprehend sophisticated human speech, comprising intricacies settings and various intents (Tanveer et al., 2023; Janssen et al., 2021). Such constraints impede the efficacy and extensive acceptance of financial chatbots, emphasising the significance for advancements with regard to customer outreach and technological skills as well.




(Source-Author)

## Need of the Study

India is a fast-developing economy forcing the banking industry to incorporate AI technology to enhance operations. According to S Chauhan & NP Singh, (2024), top 3 factors impacting perpicacity of consumer satisfaction of banking sector are- Ease of Use, speed & web design And content. Adopting AI chatbots still encounters hurdles in the Indian financial industry (Gupta & Sharma, 2019; Rani et al., 2023; Hari et al., 2022). Although a few studies have explored attitudinal, psychological, and motivational factors shaping consumers' probability to accept emerging technology innovations, fewer studies have looked into the problems involved with integrating them (Dwivedi et al., 2021).

Table 1- Major financial data as on 31.03.2024 of PSB banks

| Name of the Bank | Total Business | Total Assets | Total Income Net Profit after tax | Chatbot operated Yes/No | Name & Year of establishment |
|---|---|---|---|---|---|
| Public Sector Banks | | | | | |
| Bank of Maharashtra | 470986 | 307137 | 4055 | Y | BoMY-2022 |
| Bank of Baroda | 2392738 | 1585797 | 17788 | Y | ADI- 2024 |
| Bank of India | 1301064 | 912597 | 6317 | Y | BOI SEVA- 2019 |
| Canara Bank | 2243978 | 1491540 | 14554 | Y | AURA-2024 |
| Central Bank of India | 628417 | 446672 | 2549 | N | NA |
| Indian Bank | 1202889 | 792619 | 8062 | Y | ADYA-2021 |
| Indian Overseas Bank | 499223 | 352033 | 2655 | N | NA |
| Punjab & Sind Bank | 202145 | 147656 | 595 | N | NA |
| Punjab National Bank | 2304142 | 1561835 | 8244 | N | PIHU-2019 |
| State Bank of India | 8620046 | 6179693 | 61076 | Y | SIA- 2017 |
| UCO Bank | 445150 | 323691 | 1653 | Y | UDAY-2024 |
| Union Bank of India | 2092304 | 1391957 | 13648 | Y | UVA-2017 |

*(Source-Ramana Rao* B V &*Savitha*Kulkarni, 2024)

| Sl. No. | Name of the Bank | Website link |
|---|---|---|
| 1 | Bank of Baroda | https://www.bankofbaroda.in/ |
| 2 | Bank of India | https://www.bankofindia.co.in/ |
| 3 | Bank of Maharashtra | https://bankofmaharashtra.in/ |
| 4 | Canara Bank | https://canarabank.com/ |
| 5 | Central Bank of India | https://www.centralbankofindia.co.in/en |
| 6 | Indian Bank | https://www.indianbank.in/ |
| 7 | Indian Overseas Bank | https://www.iob.in/ |
| 8 | Punjab National Bank | https://www.pnbindia.in/Home.aspx |
| 9 | Punjab & Sind Bank | https://punjabandsindbank.co.in/ |
| 10 | State Bank of India | https://www.sbi.co.in/ |
| 11 | Union Bank of India | https://www.unionbankofindia.co.in/english/home.aspx |
| 12 | UCO Bank | https://www.ucobank.com/Hindi/homehindi.aspx |

*(Source-Ramana Rao* B V &*Savitha*Kulkarni, 2024)

**Table -2**

| | **Name of the Bank** | **How can I open an account?** | **What is the minimum balance required in bank?** |
|---|---|---|---|
| 1 | Bank of India | Relevant | Relevant |
| 2 | Bank of Maharashtra | Relevant but No Typing available | Limited Relevant (Says No to typing) |
| 3 | Bank of Baroda | Relevant (with Wide Information) | Relevant (with Wide Information) |
| 4 | Canara Bank | More Relevant | More Relevant |
| 5 | Indian Bank | Not Working t(not opening properly) | Not Responding properly (not opening) |
| 6 | Indian Overseas Bank | NA | NA |
| 7 | Punjab & Sind Bank | NA | NA |
| 8 | Punjab National Bank | (Limited) only options | (Limited) only optional information available |
| 9 | State Bank of India | All relevant | (Limited), only optional information available but very detailed information is available. |
| 10 | UCO Bank | Relevant(Limited) only options | Relevant(Limited) only options |
| 11 | Union Bank of India | Relevant(Limited) | Not direct (Limited) |
| 12 | Central Bank of India | NA | NA |

*(Source-Author)*

**Table -3**

| | Name of the Bank | Why you were launched and when? | Can I open a zero balance account in bank? |
|---|---|---|---|
| 1 | Bank of India | Irrelevant | Relevant merely |
| 2 | Bank of Maharashtra | Limited Relevant(Typing No) | Limited Relevant(Typing No) |
| 3 | Bank of Baroda | Not Satisfactory & Irrelevant | Relevant<br>Yes, anybody can open a Bank of Baroda zero balance account. Then further asking how then it answer in detail. |
| 4 | Canara Bank | Irrelevant | More Relevant (Excellent)<br>Yes, you can open a zero-balance account with Canara Bank. Feel free to visit your nearest branch for more information and assistance on opening a zero-balance account.<br>Click here for More Details |
| 5 | Indian Bank | Not opening | Not opening |
| 6 | Indian Overseas Bank | NA | NA |
| 7 | Punjab & Sind Bank | NA | NA |
| 8 | Punjab National Bank | No Answer | Limited response with options |
| 9 | State Bank of India | Not Satisfactory & Irrelevant | Relevant |
| 10 | UCO Bank | We regret to inform you that we are unable to provide an answer to your query at this time. For immediate support, kindly call our Helpline Number at 1800 103 0123. Thank you for your understanding and cooperation. | Indirect but relevant (Limited) only options |
| 11 | Union Bank of India | Irrelevant | Not direct (Limited) |
| 12 | Central Bank of India | NA | NA |

*(Source-Author)*

**Table -4**

| | **Name of the Bank** | **I am happy with your response** | **I am disappointed with your responses.** |
|---|---|---|---|
| 1 | Bank of India | Totally Irrelevant | Says No URL found…So Not Relevant |
| 2 | Bank of Maharashtra | (Typing No) | Limited Relevant(Typing No) |
| 3 | Bank of Baroda | Relevant<br>Thank you, how may I assist you further? | We apologize for any inconvenience caused. If you have a complaint about our banking services, please approach the concerned Branch Manager first. If you are not satisfied with the response, you can escalate the matter through the established levels: Regional Manager, Zonal Manager, and finally to our Principal Nodal Officer, Shri Debabrata Das. |
| 4 | Canara Bank | Relevant<br>I'm glad to hear that you are satisfied with the response. If you have any more questions or need further assistance regarding Canara Bank, feel free to ask!<br>Click here for More Details | Relevant<br>I'm sorry to hear that you're disappointed. If you have any specific feedback or further questions, please feel free to share them. I'm here to assist you with any banking-related queries. |
| 5 | Indian Bank | Not Working | Not Working |
| 6 | Indian Overseas Bank | NA | NA |
| 7 | Punjab & Sind Bank | NA | NA |
| 8 | Punjab National Bank | Irrelevant - No Option availaible | No Option |
| 9 | State Bank of India | Not Relevant , only optional answers are available | Not Relevant because of entertaining only option-based information availability |

| | | | |
|---|---|---|---|
| 10 | UCO Bank | Relevant<br>Thank you! We're glad to hear that you're happy with the response. If you have any more questions or need further assistance, feel free to ask! | Relevant<br>I'm sorry to hear that you're disappointed with the responses. Typically, feedback does not receive a direct response unless it addresses critical issues. If there are specific concerns you'd like to discuss, please consider articulating those for more targeted assistance. |
| 11 | Union Bank of India | Not Relevant | Not Relevant |
| 12 | Central Bank of India | NA | NA |

*(Source-Author)*

Unsatisfactory information and inadequate client segmentation constitute some of the primary challenges that Indian banks have to contend with. The development of settlement tech companies like as Airtel Payments Bank as well as Paytm Payments Bank, the advent of neo banks along with neo banking avenues, and the proliferation of NBFCs has rendered it impractical for banks to remain viable in the present framework. In the current time frame, banks have adopted new technology to continue to expand their operations and enhance their offerings to clients. Artificial intelligence is assisting banks to upgrade their whole organization, spanning insurance to sales, contracts to cyber-security. Banks embrace data mining, blockchain, anlytics and machine learning to secure the future of their goods and services. Artificial intelligence in banking and finance enhances the operational effectiveness and viability of banks and financial organizations as well. A few of the key domains of application of artificial intelligence in the banking sector includes artificial intelligence-based chatbot services. AI chatbots in banks may assist consumers and furnish correct responses concerning their enquiries. These chat-bots deliver consumers with a tailored interaction. Consequently, AI chat-bots for the banking industry enables banks acquire clients, enhance the quality of service, and also grow their brand’s impact upon the company.

## Research Objectives

Measuring the broader efficacy and effectiveness of banking chatbots in context of replying to end-user enquiries conveys the relevant details taking as the core objective of this study. The study

seeks to determine the precision, consciousness, and attentiveness of chatbot engagements across many banks considering their capacity of dealing with a variety of consumer enquiries. The study further examines whether or not chatbots construct smooth user-encounters by grading replies as insignificant, extremely relevant, or moderately relevant. Strengths and weaknesses of chatbots have been observed with help of the study, especially when it comes to manage intricate enquiries and reducing client annoyance. likewise the research will look into how well chatbots can respond to client comments, escalate unsolved issues, and enhance financial communication in general. Work on chatbot implementation in the field of digital banking will shed light upon how these tools could improve client engagement, eliminate the need for human interaction, and boost delivery of services likewise. Given below are possible research questions of this study-

- What is the status of current chatbots in the Indian banking sector?
- How pertinent and precise are chatbot asserts with regard to resolving consumer queries?
- In context of responsiveness and utility, what the consumer perceive about chatbot engagement
- In contrast to automatic or generic feedback, to what degree do chatbots offer accurate and in-depth answers?

## Research Methodology

The current research adopts an initial information for all public sector banks (PSBs) gathered by interacting with chatbots accessible through the official websites of 10 chosen banks. Being a possible client, enquiries regarding to account creation procedures, minimum balance specifications, and zero-balance accounts possession were put forward as an assessment of the validity, accuracy, and receptivity of chatbot confrontations. Furthermore, the drop-down choices offered with the chatbot interface have been investigated to gauge the usefulness for leading visitors to pertinent information. Further analysis was to figure out the performance of chat-bot answers. With the help of study, potential to respond complicated queries, and their contribution in strengthening customer loyalty and contentment has also been highlighted.

## Data Analysis

A Brief Overview of Chatbot Responses across all nationalized banks.

- Bank of India: The chatbot delivers adequate replies concerning account opening along with required balance requests. Yet the response to zero-balance accounts remains restricted. It

struggles to provide significant details about it being launched yet successfully handles customer feedback.

- Bank of Maharashtra: The chatbot generates restricted replies, leaving the texting option missing. It conveys certain details on opening an account and requisite balance. Conversely, questions concerning its debut elicit inappropriate replies, and the software fails to handle consumer feedback properly.

- Bank of Baroda: The chatbot provides appropriate responses for the majority of requests, notably account opening plus zero-balance account availability. It drives customers toward live chat or video contact options for further assistance. inevitably lacks to deal with queries on its release but offers sorted replies to customer input.

- Canara Bank: The virtual assistant is extremely effective in transmitting great solutions to inquiry on setting up an account, minimum balance, and zero-balance accounts. It enables consumers to obtain additional information and gives a possibility for human support. The chatbot efficiently recognises both positive and adverse feedback.

- Indian Bank: The digital assistant fails to respond to requests concerning opening an account, a minimum balance, or zero-balance accounts. It doesn't work for pertinent enquiries, rendering it worthless for consumer interactions.

- Indian Overseas Bank: The chatbot is not accessible to be explored and fails to offer any responses to queries.

- Punjab & Sind Bank: None of the chatbot offering is accessible on the bank’s website.

- Punjab National Bank: The conversational interface conveys only specific options for customer enquiries, alleviating consumer engagement. The outcomes to launch-related queries and feedback from users are likewise constrained because of having limited assistance.Chat bot fails to offer direct solutions to queries pertaining to account opening, minimum balance, or zero-balance accounts.

- State Bank of India: The chatbot is accessible only once you have login your credentials on websites. Chatbot is not freely accessible on website for reviewing and to respond to the queries providing limitations on consumer engagements.

- UCO Bank: The chatbot conveys constrained replies to account opening and balance-related questions. Although it acknowledges customer feedback it inevitably leads consumers to a hotline for extra assistance.

- Union Bank of India: The chatbot does not specifically deal with minimum balance or zero-balance account questions yet it offers controlled pertinent details on accounts-related inquiries. Answers to launch-related queries remain insignificant, and the chatbot is lacking in well-organized responses for dealing with customer feedback.

- Central Bank of India: Not any type of chatbot service is accessible on the bank's homepage.

In a nutshell, throughout the 12 selected institutions the chatbot effectiveness exhibits substantial inclusiveness. Certain banks including Canara Bank and Bank of Baroda, enabling extensive, pertinent, and user-friendly conversations, promptly responding to client inquiries while offering assistance options like live chat and video conversations. Certain others, such as Indian Bank and Central Bank of India, on the contrary, have neither any chatbot services at all nor have confined capability. Feedback and queries associated with account services generated a range of replies, with several chatbots lagging short in their response i..e. Punjab & Sind bank has its chatbot only for the cyber fraud related awareness purpose, for having virtual assistance with PNB chatbot approaches towards an external link of whatsapp whereas Union Bank of India is having multiple chatbots for covering variety of queries like UVA,ABHI etc.

## Finding & Conclusion

AI has numerous weaknesses regardless its persuasive and compelling personality (Battisti et al., 2021). In accordance with recent studies, incorporating AI exerts an immense impact with prone users in emerging economies. As an outcome, consumers are sceptical about both the legitimacy of AI and its reliability in the banking sector (Mazzarolo and Mainardes, 2021). fortunately, some research has revealed that AI and banking have overlaps (Dingz et al., 2022). despite the fact current issues fail to receive ample consideration, executives are anticipated to endorse AI-mediated banking

services, as mentioned by Mogaji and Nguyen (2022). The primary objective of our paper is to bridge the knowledge vacuum and enhance current expertise. It rigorously emphasizes academic excellence. Afterwards of an in-depth review of the data, the study recommends that banks emphasise on strengthening answer accuracy, broadening multilingual assistance, by providing more detailed information on account-related enquiries in an effort to boost chatbot effectiveness.

As stated above, Indian Bank and Central Bank of India purely don't have chatbots functional and in few cases if some other banks having chatbot service offering alternatively provide with a restricted degree of engagement, resulting in cut down of consumer satisfaction. Certain chatbots' insufficient assistance for multilingual offerings and inability to deal with intricate enquiries as well additionally decrease their usefulness. We may summarise as-

- A smooth and thorough user interaction has been offered by few banks using sophisticated chatbot platforms and those who are lacking in need to make themselves sophisticated in this chatbot era.
- for enhancing inclusivity and customer engagement, multilingual compatibility and a variety of virtual assistance as well are mandatory.
- In specific banks, the broader effectiveness of virtual assistants is negatively impacted by an absence of real-time chat or personal service options.

Based to the study, it may be concluded that banks must optimize chatbot potential with a concentration on strengthening timeliness. which further may enable greater assistance for sophisticated enquiries, and boosting interaction with customer service professionals.

## References

1) *Hajro, N., Hjartar, K., Jenkins, P., & Vieira, B. (2021). What's next for digital consumers. McKinsey & Company. Retrieved July, 12, 2021.*
2) *Sheth, J. N., Jain, V., Roy, G., & Chakraborty, A. (2022). AI-driven banking services: the next frontier for a personalised experience in the emerging market. International Journal of Bank Marketing, 40(6), 1248-1271.*
3) *Abdulquadri, A., Mogaji, E., Kieu, T. A., & Nguyen, N. P. (2021). Digital transformation in financial services provision: A Nigerian perspective to the adoption of chatbot. Journal of Enterprising Communities: People and Places in the Global Economy, 15(2), 258-281.*

4) *AL-Dosari, K., Fetais, N., &Kucukvar, M. (2024). Artificial intelligence and cyber defense system for banking industry: A qualitative study of AI applications and challenges. Cybernetics and systems, 55(2), 302-330.*
5) *Alnaser, A. A., Hassan Ali, A., Elmousalami, H. H., Elyamany, A., & Gouda Mohamed, A. (2024). Assessment framework for BIM-digital twin readiness in the construction industry. Buildings, 14(1), 268.*
6) *Dlamini, S., &Lappeman, J. Inter-industry linkages: A pilot study on digital engagement.*
7) *Lee, H., Calvin, K., Dasgupta, D., Krinner, G., Mukherji, A., Thorne, P., ... & Park, Y. (2023). IPCC, 2023: Climate Change 2023: Synthesis Report, Summary for Policymakers. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland.*
8) *Dwivedi, Y. K., Hughes, L., Ismagilova, E., Aarts, G., Coombs, C., Crick, T., ... & Williams, M. D. (2021). Artificial Intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. International journal of information management, 57, 101994.*
9) *Chauhan, S., & Singh, N. P. (2024). Post Covid Era and Online Payment Systems in India. Industrija, 52(2), 41-76.*
10) *Chauhan, S., & Singh, N. P. (2024). Southeast Asian Business Review.*
11) *https://rbi.org.in/Scripts/AnnualPublications.aspx?head=Trend%20and%20Progress%20of%20Banking%20in%20India*
12) *https://www.verifiedmarketresearch.com/product/chatbot-for-banking-market/*
13) *https://www.rbi.org.in/*
14) *https://www.onlinesbi.sbi/*
15) *https://punjabandsindbank.co.in/*
16) *https://bankofmaharashtra.in/*
17) *https://adi.bankofbaroda.in/*
18) *https://www.iob.in/*
19) *https://www.unionbankofindia.co.in/en/home*
20) *https://www.ucobank.com/en/*
21) *https://punjabandsindbank.co.in/*
22) *https://www.indianbank.in/*
23) *https://canarabank.com/*
24) *https://www.bankofbaroda.in/*

# A Study on Consumer Perception towards the Impact of AI-Driven Advertisements on Buying Behaviour

Anushree P[1] and Emile Mishba V[1]

[1]*I M. Com, Department of Commerce, Lady Doak College, Madurai, Tamil Nadu*

## Abstract

*Artificial Intelligence (AI) is revolutionizing digital advertising by enabling hyper-personalized marketing strategies that influence consumer behaviour. This study examines consumer perceptions of AI-driven advertisements and their influence on buying behaviour. As AI technologies such as predictive analytics, machine learning, and recommendation systems become integral to digital marketing, it is essential to understand how consumers respond to these advancements. Therefore, the present study utilizes a survey-based approach to assess consumer awareness, trust, and satisfaction with AI-driven advertisements. It explores key factors such as ad relevance, perceived intrusiveness, data privacy concerns, and the effectiveness of AI-powered recommendations in influencing purchasing decisions. It is proposed to collect primary data from 200 respondents using Purposive sampling method using Google form. The collected data will be analysed using Microsoft Excel, SPSS, Percentage Analysis, and Garret Ranking. Additionally, the study analyses the varying impact of AI-powered advertisements on different consumer segments, including age groups, online shopping habits, and digital literacy levels. Ultimately, the research contributes to understanding how AI-driven advertisements shape consumer behaviour and offers recommendations for responsible AI adoption in digital marketing.*

***Keywords:*** *Artificial Intelligence, AI – Driven Advertisements, Buying Behaviour, Consumer Perception.*

## Introduction

In the digital age, Artificial Intelligence (AI) has transformed the way businesses engage with consumers, particularly in the realm of advertising. AI-driven advertisements use data, machine learning, and automation to show personalized ads to consumers. These ads are designed to attract buyers by understanding their preferences and behaviours. Many companies use AI to improve marketing strategies and increase sales. Consumers see AI-driven advertisements in social media, search engines, and online shopping platforms. These ads suggest products based on past searches, interests, and online activity. While some consumers find these ads helpful, others may feel concerned about data privacy and manipulation. AI can make advertisements more relevant, but it can also create doubts about how personal data is used. This study focuses on consumer perception of AI-driven advertisements and their impact on buying behaviour. It explores whether AI-powered ads build trust or lead to skepticism. The research also examines if personalized ads encourage consumers to make purchases or if they find them intrusive.

## Statement of the Problem

The rise of AI-driven advertisements has transformed consumer purchasing behaviour by enabling personalized and data-driven marketing strategies. While these ads enhance brand discovery and shopping convenience, concerns about privacy, transparency, and manipulation persist. Consumer perceptions toward AI-driven advertisements vary, influencing trust, engagement, and buying decisions, including impulse purchases. However, limited research exists on how these perceptions shape consumer behaviour. This study examines consumer attitudes, satisfaction levels, and key factors affecting acceptance of AI-driven ads. Moreover, the study aims to provide insights for marketers to optimize AI strategies while addressing consumer concerns effectively by analysing their impact on purchasing behaviour.

## Scope of the Study

This study focuses on understanding consumer perception of AI-driven advertisements and their impact on buying behaviour. It examines how AI-powered ads influence purchasing decisions and whether consumers trust or doubt these advertisements. The study also explores key factors such as personalization, relevance, data privacy, and consumer engagement in digital marketing. The research covers various online platforms, including social media, search engines, e-commerce websites, and mobile applications, where AI-driven advertisements are commonly displayed. It considers different consumer demographics, such as age, gender, and online shopping habits, to analyse how perceptions may vary among different groups. Additionally, it investigates both the benefits, such as enhanced user experience, and challenges, like privacy risks and ad skepticism.

## Objectives

- To analyse consumer attitudes toward AI-driven advertisement.
- To evaluate the effectiveness of AI - driven advertisements across different platforms.
- To examine the impact of AI-driven advertisements on purchasing behaviour of different demographics.
- To measure the satisfaction level of consumers with AI-driven advertisements.
- To identify key challenges that the consumers encounter with AI-driven advertisements.

## Review of Literature

1. Ernst & Young (EY) (2024) "The Influence of AI on Indian Consumer Buying Behaviour" This study surveyed 1,200 Indian consumers to examine how AI-driven advertisements

impact purchasing decisions. Findings revealed that 62% of consumers made purchases based on AI-driven recommendations, significantly higher than the 30% global average. However, the report also highlighted privacy concerns, with 77% of respondents worried about potential data breaches and misuse of personal information.

2. Adobe (2024) "Consumer Preferences for AI-Enabled Interactions in India" Examining data from 1,000 Indian consumers, this study found that 57% of respondents preferred AI-powered interactions over human-based customer service, exceeding the 39% global average. The research also showed that 84% of Indian consumers made purchases influenced by AI-driven recommendations or influencer marketing, indicating a high acceptance of AI in digital advertising.

3. Luo, X., Tong, S., Fang, Z., & Xu, Y. (2023) "AI-Powered Advertising: Opportunities and Challenges" This study examined a dataset of 1,500 digital consumers by analysing the benefits and risks of AI-driven ads. While AI improves ad efficiency and precision, it also raises ethical concerns about consumer manipulation. The research suggests that brands should implement transparency measures to maintain consumer trust.

4. Huang, M.-H., & Rust, R. T. (2021) "Engaged to a Robot? The Role of AI in Service Interactions" This research investigates how AI-powered ads impact consumer decision-making by examining responses from 800 consumers. Findings suggest that hyper-personalization increases engagement, but over-reliance on automation may reduce emotional connection with brands, making some consumers skeptical about AI's influence.

5. Kim, J., & Han, H. (2021) "The Impact of AI-Generated Ads on Emotional Engagement" By analysing responses from 600 participants across different demographics, this study finds that AI-generated ads enhance consumer engagement and brand recall when they use personalized messaging. However, excessive AI automation may negatively affect brand authenticity, leading to consumer resistance.

6. Beke, F., Eggers, F., Verhoef, P. C., & Wiesel, T. (2021) "The Impact of Personalized AI Recommendations on Privacy Concerns" Conducted with 750 participants, there search investigates how personalized AI recommendations affect consumer trust. Findings indicate

that while personalization enhances conversion rates, privacy concerns lead to reduced consumer acceptance of AI-driven advertisements.

7. Arora, N., Dreze, X., Ghose, A., Hess, J. D., Iyengar, R., Jing, B., & Joshi, Y. V. (2020) "Consumer Behaviour in Digital Marketing" This study, based on a survey of 1,100 consumers, explores how AI-driven advertising influences consumer decision-making. It concludes that AI significantly improves ad relevance and purchase likelihood but notes that generational differences affect consumer acceptance, with younger audiences being more receptive.

8. Grewal, D., Hulland, J., Kopalle, P. K., & Karahanna, E. (2020) "The Future of Technology and Marketing" This study explores the role of AI in digital marketing and consumer behaviour by analysing data from 1,200 consumers across multiple industries. It highlights how AI-driven advertisements use predictive analytics and personalized targeting to influence purchase intent. However, concerns about consumer trust and data privacy remain significant barriers to widespread acceptance.

9. Paschen, J., Wilson, M., & Ferreira, J. J. (2019) "The Role of Artificial Intelligence in Digital Marketing Strategy" This study, conducted with 950 participants, discusses how AI enables brands to deliver real-time, data-driven advertising. While AI-powered ads enhance targeting accuracy, the research identifies potential issues such as the "uncanny valley" effect, where consumers find AI-generated ads unsettling, reducing trust in brands.

10. Tussyadiah, I., & Miller, G. (2019) "Consumer Resistance to AI-Powered Advertising "Based on a survey of 700 online shoppers, the study highlights that while AI-driven advertisements improve relevance and convenience, they also raise concerns about privacy and data security. Many consumers feel that AI-driven ads are intrusive, leading to ad avoidance behaviours.

## Research Methodology

The research is descriptive cum analytical and adopted a survey strategy. The research is conducted among the online consumers in Madurai, Tamil Nadu, India using Purposive Sampling method. The final sample included 200respondents belonging to the different age groups. Data is

collected through both primary and secondary sources. Through primary sources, a structured questionnaire is used to collect the data with the details about the demographic profile of the respondents and questions related to satisfaction and challenges with regard to AI-driven advertisements in influencing the buying decisions of online shoppers. Secondary data from Journals, books, and websites is used.

## Limitations of the Study

- The study is limited within the areas of Madurai city.
- The study involves a limited number of consumers, which may affect how applicable it is to a larger population.
- The study focuses on current perceptions without measuring long-term behavioural changes.

## Analysis And Interpretations

### 1. Percentage Analysis

### 1.1 Age of the Respondents:

**Table 1.1 – Age of the Respondents**

| S.NO | AGE | NUMBER OF RESPONDENTS | PERCENTAGE |
|---|---|---|---|
| 1. | 18 - 25 | 116 | 58 |
| 2. | 26 - 35 | 40 | 20 |
| 3. | 36 - 45 | 21 | 10.5 |
| 4. | Above 45 | 23 | 11.5 |
| | **TOTAL** | **200** | **100** |

**Source:** Primary Data

**Figure 1.1 – Age of the Respondents**

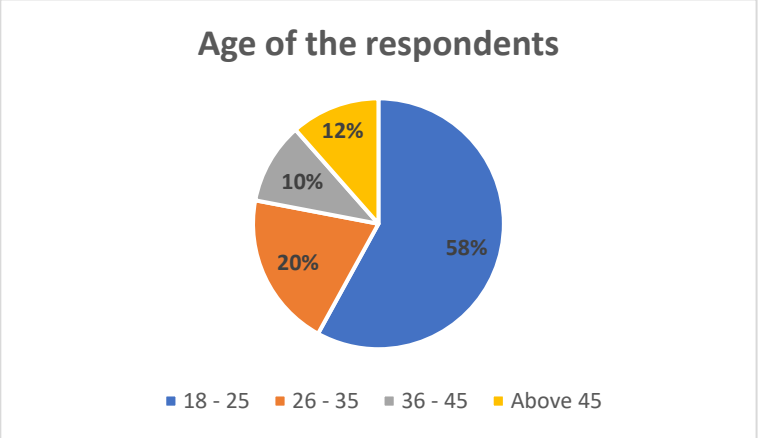


Table 1.1 shows the age distribution of the respondents. It is found that the survey is dominated by younger respondents, with 78% aged 18-35, including 58% from the 18-25 group alone. Participation decreases with age, as 36-45 accounts for 10.5% and above 45 for 11.5%. This suggests that the findings will be heavily influenced by younger perspectives, with minimal representation from older age groups.

### 1.2 Major Platforms for AI-Driven Advertisements

**Table 1.2 – Platforms for AI-Driven Advertisements**

| S.NO | AGE | NUMBER OF RESPONDENTS | PERCENTAGE |
|---|---|---|---|
| 1. | Social media platforms | 108 | 54 |
| 2. | Search engines | 14 | 7 |
| 3. | E-commerce | 41 | 20.5 |
| 4. | Mobile Applications | 13 | 6.5 |
| 5. | Video streaming platforms | 24 | 12 |
| | **TOTAL** | **200** | **100** |

**Source:** Primary Data

**Figure 1. 2 – Platforms for AI-Driven Advertisements**

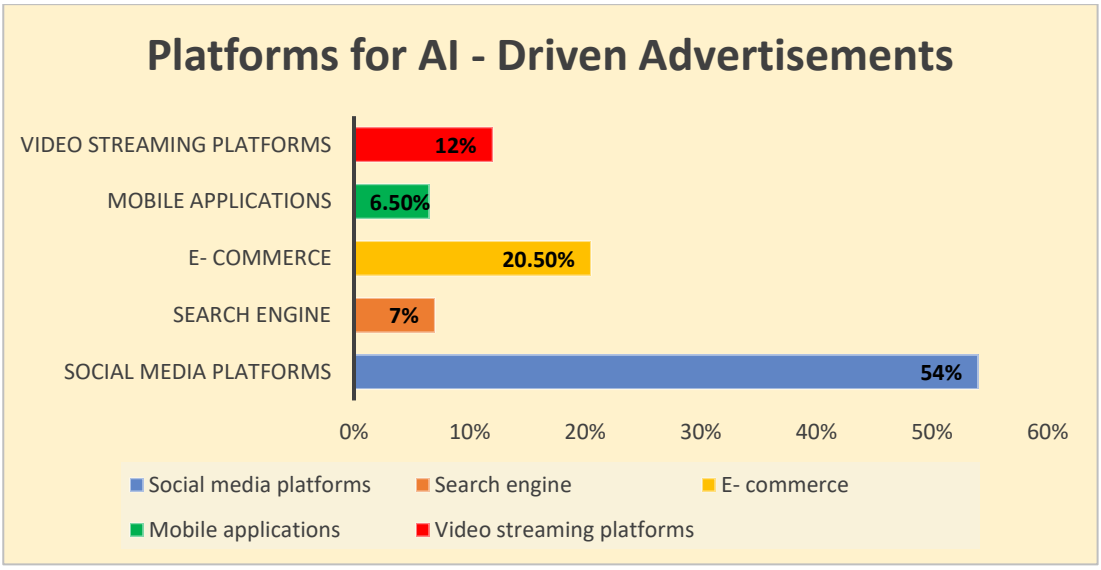



Table 1.2 shows that social media platforms are the most popular for AI-driven advertisements, accounting for 54% (108 respondents). E-commerce platforms follow with 20.5%

(41 respondents), indicating significant engagement. Video streaming platforms represent 12% (24 respondents), while search engines (7%) and mobile applications (6.5%) have comparatively lower usage. This indicates that social media is the primary channel for AI-driven ads, followed by e-commerce and video streaming.

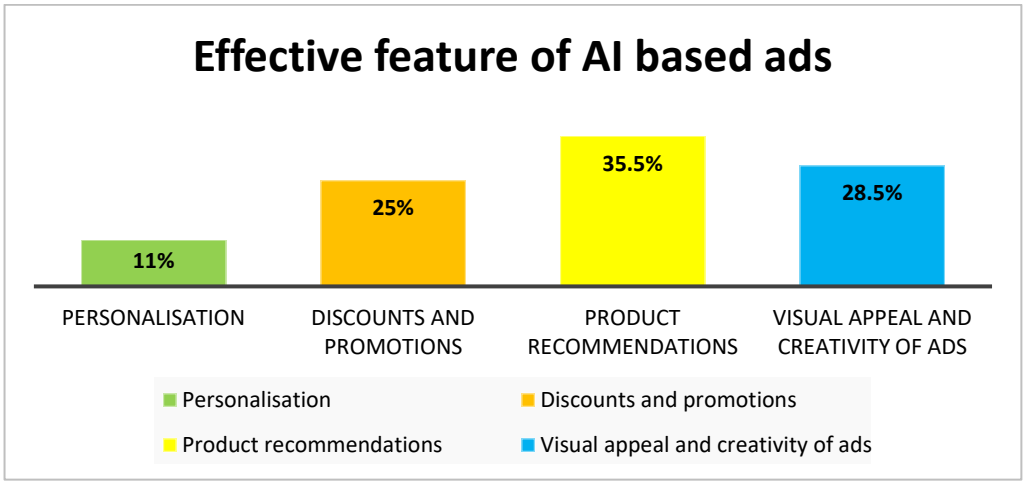
### 1.3 Effective Feature of AI-Based Ads

**Table 1.3 – Effective Feature of AI-Based Ads**

| S.NO | FEATURE | NUMBER OF RESPONDENTS | PERCENTAGE |
|---|---|---|---|
| 1. | Personalisation | 22 | 11 |
| 2. | Discounts and promotions | 50 | 25 |
| 3. | Product recommendations | 71 | 35.5 |
| 4. | Visual appeal and creativity | 57 | 28.5 |
| | **TOTAL** | **200** | **100** |

**Source:** Primary Data

**Figure 1.3 - Effective Feature of AI-Based Ads**




The data shows that product recommendations (35.5%) are the most effective AI-driven ad feature, followed by visual appeal (28.5%) and discounts & promotions (25%). Personalization (11%) is the least preferred, indicating that users value relevant suggestions and engaging visuals more than tailored content alone.

### 1.4 Suggested Enhancements for AI-Driven Ads

**Table 1.4 - Suggested Enhancements for AI-Driven Ads**

| S.NO | FEATURE | NUMBER OF RESPONDENTS | PERCENTAGE |
|---|---|---|---|
| 1. | Enhanced privacy control | 53 | 26.5 |
| 2. | Ad personalisation settings | 48 | 24 |
| 3. | Ad frequency control | 37 | 18.5 |
| 4. | Interactive & Gamified ads | 62 | 31 |
| | **TOTAL** | **200** | **100** |

**Source:** Primary Data

**Figure 1.4 - Suggested Enhancements for AI-Driven Ads**

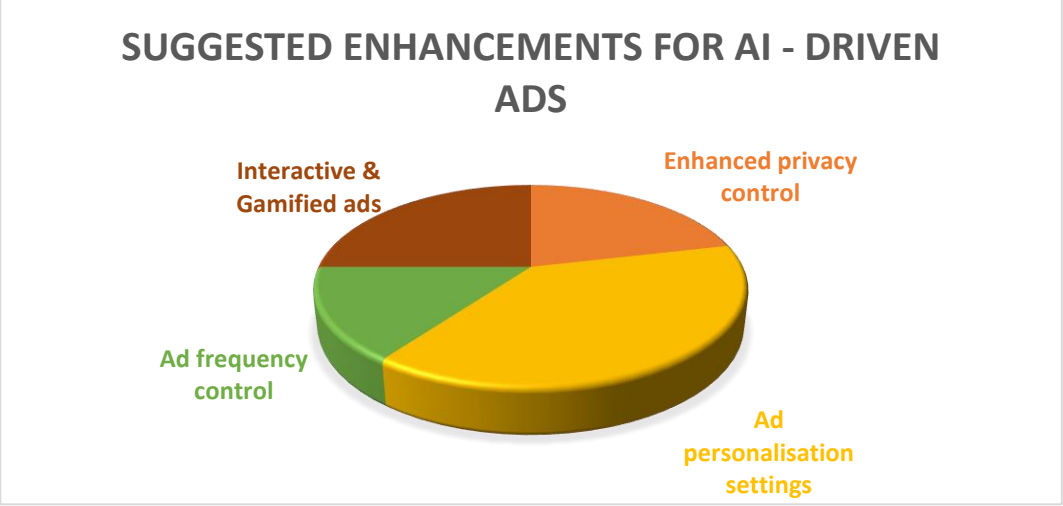



Table 1.4 indicates the additional feature that the respondents would like to see in AI-driven advertisements. The majority (31%) prefer Interactive & Gamified Ads, highlighting a demand for engaging ad experiences. Enhanced Privacy Control (26.5%) is also a key concern, showing the need for better data security. Ad Personalization Settings (24%) indicate consumer interest in customized ads, while Ad Frequency Control (18.5%) is the least preferred, suggesting ad repetition is a lower priority.

## 2. Garrett Ranking

**Table 2.1 – Challenges of AI-Driven Advertisements**

| S.NO | CHALLENGES | TOTAL | AVERAGE SCORE | RANK |
|---|---|---|---|---|
| 1. | Privacy concerns | 13220 | 66.10 | I |
| 2. | Lack of transparency in data usage | 10700 | 53.50 | III |

| | | | | |
|---|---|---|---|---|
| 3. | Limited control over personalization | 8576 | 42.88 | VIII |
| 4. | Security risks | 9574 | 47.87 | V |
| 5. | Inaccuracy of recommendations | 9335 | 46.68 | VI |
| 6. | Irrelevant or Repetitive Ads | 11726 | 58.63 | II |
| 7. | Over targeting or feeling manipulated | 10680 | 53.40 | IV |
| 8. | Intrusiveness of Ads | 9128 | 45.64 | VII |
| 9. | Bias in Ad recommendations | 8122 | 40.61 | IX |
| 10. | Ad fatigue | 7882 | 39.41 | X |

**Source**: Primary Data

**Figure 2.1 – Challenges of AI- Driven Advertisements**

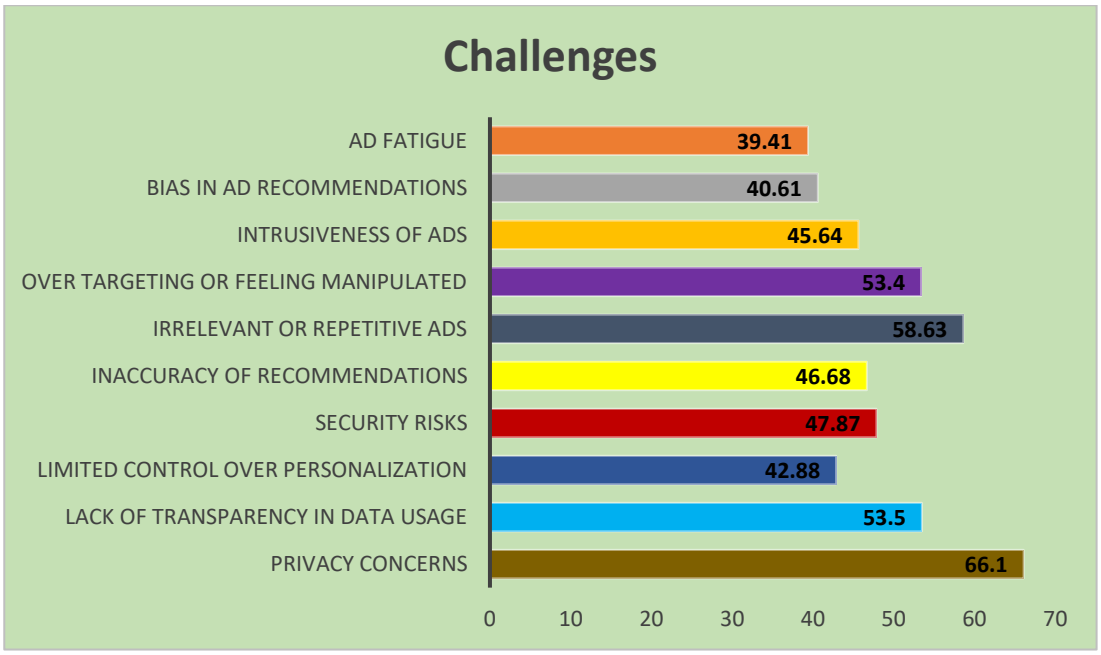



Table 2.1 highlights the challenges that the consumers encountered in AI – driven advertisements. The biggest challenges in AI-driven advertising stem from privacy concerns, lack of transparency, and irrelevant or repetitive ads with the average score of 66.10, 58.63 and 53.50 respectively. Users worry about how their data is collected and used, often feeling a lack of control over personalization. Additionally, repetitive or irrelevant ads create frustration, reducing engagement and trust in AI-powered marketing.

## 3. Weighted Average Mean

**Table 3.1 – Benefits of AI-Driven Advertisements**

| S.NO | BENEFITS | MEAN SCORE | RANK |
|---|---|---|---|
| 1. | Discovering new brands and products | 1.95 | V |
| 2. | Getting relevant discounts and offers | 2.91 | III |
| 3. | Saving time in decision-making | 3.25 | IV |
| 4. | Receiving personalized recommendations | 3.61 | I |
| 5. | Enhancing overall shopping convenience | 3.30 | II |

**Source:** Primary Data

**Figure 3.1 – Benefits of AI-Driven Advertisements**

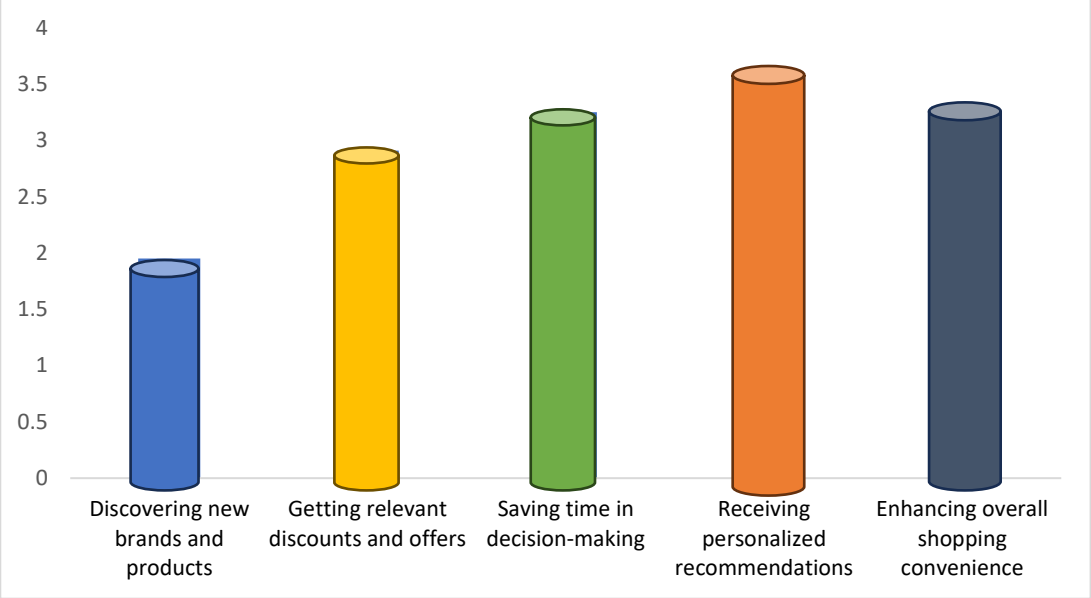



Table 3.1 shows that the AI-driven advertisements enhance the shopping experience by providing personalized recommendations, improving convenience, and offering relevant discounts. Consumers appreciate ads that suggest products tailored to their preferences, making shopping more efficient. Additionally, AI simplifies the process by reducing search efforts and enhancing accessibility while also helping users save money through targeted promotions.

## 4. One way ANOVA

**Table 4.1 – Difference Between Age with Regard to Theimpact of AI-Driven Advertisements**

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 279.008 | 4 | 93.003 | 4.642 | .004 |
| Within Groups | 3926.947 | 196 | 20.035 | | |
| **Total** | **4205.955** | **200** | | | |

**Source**: Primary Data

**H0** – There is no significant difference between age with regard to the impact of AI-driven advertisements on buying decisions.

**H1** – There is a significant difference between age with regard to the impact of AI-driven advertisements on buying decisions.

The ANOVA test was conducted to examine whether there is a significant difference between age with regard to the impact of AI-driven advertisements on buying decisions. The results indicate that there is statistically a significant difference between age and impact of AI ads ($p < 0.05$). Hence, null hypothesis is rejected and alternate hypothesis is accepted. This suggests that age influences consumer responses, likely due to differences in technology adoption and digital literacy, with younger consumers being more receptive to AI-driven ads than older ones.

## Chi Square Test

**Table 5.1 – Association Between Gender and Level of Satisfaction**

| | | SATISFACTION LEVEL | | | TOTAL |
|---|---|---|---|---|---|
| | | LOW | MEDIUM | HIGH | |
| GENDER | MALE | 13 | 31 | 34 | 78 |
| | FEMALE | 37 | 61 | 24 | 122 |
| TOTAL | | 50 | 92 | 58 | **200** |

**Source:** Primary Data

**Table 5.2 – Chi Square Tests**

| | Value | df | Asymp Sig. (2-sided) |
|---|---|---|---|
| Pearson Chi-Square | 14.026 | 2 | .001 |
| Likelihood Ratio | 13.946 | 2 | .001 |
| Linear-by-Linear Association | 12.417 | 1 | .000 |
| N of Valid cases | **200** | | |

**Source:** Primary Data

**H0** – There is no association between gender and the satisfaction level of the respondents with AI – driven advertisements.

**H1** - There is an association between gender and the satisfaction level of the respondents with AI – driven advertisements.

From the table 5.2, since the p value is 0.001 which is less than the significant level 0.05, the null hypothesis is rejected and alternate hypothesis is accepted. Hence there is an association between gender and the satisfaction level of the respondents with AI – driven advertisements. Men and women may have different preferences and trust levels toward AI-driven advertisements due to variations in shopping behaviour, personalized content perception, and engagement with digital platforms.

## Findings

- 57.9% of the respondents belong to the age group of 18 -25 years.
- 61.4% of respondents are female, while 38.6% are male.
- The highest level of educational qualification among the respondents is postgraduate.
- 56 % of the respondents prefer to make their purchases on a monthly basis.
- Social media platforms serve as the primary medium for 54% of respondents to encounter AI-driven advertisements.
- 37.1% of respondents believe that AI-driven advertisements influence their purchase decisions.
- 35.6% of respondents consider product recommendations based on search history as a key feature of AI-driven advertisements.

- 38.5% of the consumers find AI – Driven advertisements more engaging than traditional advertisements.
- 35% of the respondents strongly agreed that the AI – driven advertisements help them to compare prices and products before buying.
- 58.5% of the respondents says that the AI – Driven advertisements increase their trust in brands that frequently appear in their feed.
- 50% of the respondents agrees that the AI based ads are visually appealing and well-designed.
- 31% of them would like to see interactive and gamified ads as an additional feature in AI – driven advertisements.
- Garrett Ranking reveals that the biggest challenges in AI-driven advertising stem from privacy concerns, lack of transparency, and irrelevant or repetitive ads.
- It is found out that the consumers would appreciate ads that suggest products tailored to their preferences, making shopping more efficient
- One-way Anova reveals that there is a significant difference between age with regard to the impact of AI-driven advertisements on buying decisions.
- Chi square test shows that there is an association between gender and the satisfaction level of the respondents with AI – driven advertisements.

## Recommendations

- AI-driven ads should strike a balance between personalization and consumer comfort. Limiting repetitive ads and ensuring diversity in content can reduce ad fatigue and increase engagement.
- Marketers should continuously refine AI algorithms to ensure ads remain relevant and aligned with consumer interests. AI should adapt based on feedback and user interactions to avoid irrelevant recommendations.
- Giving consumers the ability to customize their ad preferences, such as adjusting ad frequency or selecting preferred categories, can enhance user satisfaction and engagement.
- AI-powered ads can be made more interactive through gamification, chatbots, or augmented reality experiences to increase engagement and create a positive perception.

## Conclusion

This study highlights the growing influence of AI-driven advertisements on consumer behaviour, revealing both positive and negative perceptions. AI technologies enable highly personalized and targeted advertising, enhancing user experience by offering relevant product recommendations. The study indicates that while AI-powered ads can drive purchasing decisions, their effectiveness largely depends on the balance between personalization and consumer comfort with data usage. Furthermore, different demographic groups exhibit varying levels of trust and engagement with AI-driven ads, making it crucial for businesses to understand their target audiences better. As AI technologies continue to evolve, advertisers must adapt to changing consumer expectations while ensuring transparency and security in their marketing strategies. This research provides valuable insights for businesses seeking to refine their AI-driven advertising strategies, build trust, and enhance consumer relationships in an increasingly digital marketplace**.**

## References


1) *Ashraf, A., Muneer, S., & Hassan, H. U. (2024). The impact of AI-generated advertising content on consumer buying behaviour and consumer engagement. Bulletin of Business and Economics, 13(2).*
2) *Chowdhury, S., Basu, S., Ashoka, N., & Singh, P. K. (2024). Influence of AI-driven digital marketing on consumer purchase intention: An empirical study. Journal of Informatics Education and Research, 4(2), 575.*
3) *Liu, Q. (2024). Impact of artificial intelligence on consumer buying behaviours: Study about the online retail purchase. Journal of Infrastructure, Policy and Development, 8(9), 7700.*
4) *Churchill, V., Li, H. A., & Xiu, D. (2024). Unravelling consumer purchase journey using neural network models.*
5) *Luo, X., Tong, S., Fang, Z., & Xu, Y. (2023). AI-powered advertising: Opportunities and challenges. Journal of Interactive Marketing, 53, 1–15.*
6) *Wu, L., & Wen, T. J. (2021). Understanding AI advertising from the consumer perspective: What factors determine consumer appreciation of AI-created advertisements? Journal of Advertising Research, 61(2).*
7) *Huang, M.-H., & Rust, R. T. (2021). Engaged to a robot? The role of AI in service interactions. Journal of Service Research, 24(1), 30–41.*
8) *Kim, J., & Han, H. (2021). The impact of AI-generated ads on emotional engagement. Journal of Advertising, 50(1), 57–72*
9) *Grewal, D., Hulland, J., Kopalle, P. K., &Karahanna, E. (2020). The future of technology and marketing. Journal of the Academy of Marketing Science, 48(1), 1–8.*
10) *Paschen, J., Wilson, M., & Ferreira, J. J. (2020). The role of artificial intelligence in marketing. Journal of Business Research, 117, 274–281.*
11) *Tussyadiah, I., & Miller, G. (2019). Consumer resistance to AI-powered advertising. Journal of Marketing Management, 35(7–8), 577–601.*

# An Analytical Study on Online Buying Behaviour among Youth in Thoothukudi District

R. Kamatchi[1] and S. Palanikumar[2]

[1]*II.M. Com, PG and Research Department of Commerce, G. Venkataswamy Naidu College (Autonomous), Kovilpatti, Tamil Nadu*

[2]*Head and Assistant Professor, PG and Research Department of Commerce, G. Venkataswamy Naidu College (Autonomous), Kovilpatti, Tamil Nadu*

## Abstract

*Online shopping has become a rising trend in all corners of the earth, and this is due to the vast growth of technology and use of smart phones which has created a fast-moving lifestyle among young consumers. Online shopping is a technology-based activity, where the consumers are connected with smart phones or laptops to buy products online. The present study has been initiated with the intention of examining the online buying behaviour of youth in Thoothukudi district. The study was based on primary data collected from 379 young online consumers between the age group of 18-29 years by using Stratified Random Sampling Method and studying the result statistically. The researcher used the statistical tools such as percentage, cross tabulation and one way ANOVA test to analyze the data.*

***Keywords:*** *Young Consumers, Online shopping, Buying Behaviour*

## Introduction

The rapid changing situation of the world is linked with connectivity of people through internet. Young people use internet for various purposes like chatting with friends, sending an e-mail, placing an order, buying products through online, booking tickets, watching videos, playing games, collecting study materials and so on. Through social media people exchange their ideas, feelings, personal information, videos, and pictures. The internet has entered into everyone's life and has made the lifestyles digitally connected. A good number of people are frequently using the internet for online shopping because many of the young consumers want to buy things from the place where they stay. The internet helps such consumers to search for products at cheaper prices and this leads consumers to take a buying decision. Thus, online shopping is a term that unites groups in this techno-modern world.

## Review of Literature

Meher Neger and Burhan Uddin (2020) investigated the factors which affect the online consumers buying behavior during the Covid-19 pandemic situation in Bangladesh. The study

measured the influence of different factors like product, price, time saving, payment, security, administrative and psychological factor on online consumers buying behaviour during Covid-19 pandemic situation.

Jukariya, T. and Singhvi, R. (2018) has studied the internet shopping which has emerged with new idea. It has developed endless opportunities for all. This is mostly due to the fact that internet access is very fast and the inclination and interest of youth population towards internet shopping. This paper studies the key factor which affects buying motives of students of Udaipur from e-shopping.

Subrato Dey (2017) analyzed the Indian consumers who spend their money on various commodities. The access of internet and social media has increased. As a result, the buying behavior of Indian consumers has changed noticeably. Urbanization is a constant phenomenon in India and it is influencing the life style and purchasing behavior of the consumers in Indian market.

Satish Chandra Pandey (2016) has examined the buyer behavior towards e-marketing and what are the factors that play a vital role to accept latest trend in shopping. Many researches show that present time internet or smart phones have become the essential part of people's life irrespective of age and gender.

## Objectives of the Study

1. To analyze the factors influencing young consumers in online buying.
2. To understanding the online buying behaviour of young consumers in Thoothukudi district.

## Research Methodology

The study intended to examine young consumers' online buying behaviour in Thoothukudi district, by adopting Stratified Random Sampling method. The primary data was obtained through an interview schedule and the secondary data was collected from various books, journals and articles of magazine from web sources.

## Data Analysis and Interpretation

**Table – 1, Demographical Characteristics of the Respondents**

| Variables | No. of Respondents | Percentage |
|---|---|---|
| **Gender** | | |
| Male | 160 | 42 |
| Female | 219 | 58 |
| **Total** | **379** | **100** |
| **Age** | | |
| 18-20 Years | 111 | 30 |
| 21-23 Years | 228 | 60 |
| 24-26 Years | 32 | 08 |
| 27-29 Years | 08 | 02 |
| **Total** | **379** | **100** |
| **Area of Residence** | | |
| Urban | 185 | 49 |
| Semi-urban | 49 | 13 |
| Rural | 145 | 38 |
| **Total** | **379** | **100** |
| **Monthly Earnings** | | |
| Nil | 321 | 85 |
| Upto Rs. 5,000 | 50 | 13 |
| Rs. 5,001 to 10,000 | 08 | 02 |
| **Total** | **379** | **100** |

Source: Primary Data

It is proved in the above table that 58 percent of the respondents are female and the remaining 42 percent of the respondents are male who prefer to shop through online. It is inferred that the maximum number of the respondents i.e. 58 percent are female and who access internet more than male for online shopping in order to purchase necessary products for themselves and for their families. It shows that online buying tendency is more among female respondents compared to male respondents.

It is clearly seen that out of 100 percent, 60 percent of the respondents are in the age group of 21 - 23 years, 30 percent of the respondents are in the age group of 18 - 20 years, 08 percent of the

respondents are in the age group of 24 -26 years and 02 percent of the respondents are in the age group of 27 - 29 years like to shop through online. It is inferred that majority of the respondents i.e. 60 percent who are in the age group of 21 - 23 years buy things online. It shows that most of the young consumers prefer to buy products online. Because, online shopping websites have variety of goods for cheaper rates.

It is seen that 49 percent of the respondents are living in urban areas, 38 percent of the respondents are living in rural areas and 13 percent of the respondents are living in semi-urban areas. It is inferred that most of the respondents i.e. 49 percent are living in urban areas and prefer online shopping. This is due to the availability and accessibility of internet and delivery options. Moreover, it is easy as well as comfortable to shop from anywhere with a secured internet facility.

It is revealed that 85 percent of the respondents are not earning, 13 percent of the respondents earn upto Rs. 5,000 monthly, and 02 percent of the respondents earn Rs. 5,001 to Rs. 10,000 per month. From the above table, it can be viewed that a predominant proportion of the respondents i.e. 85 percent, are not doing part time job. But the remaining considerable proportion of the respondents do part time and earn for themselves.

**Table – 2, Cross Tabulation of Area of Residence and Buying Behaviour of Youth**

| **Area of Residence** | **Buying Behaviour** | | | **Total** |
|---|---|---|---|---|
| | **Low** | **Medium** | **High** | |
| Urban | 14 (7.6%) | 41 (22.2%) | 130 (70.3%) | **185 (100%)** |
| Semi-urban | 9 (18.4%) | 9 (18.4%) | 31 (63.3%) | **49 (100%)** |
| Rural | 24 (16.6%) | 47 (32.4%) | 74 (51%) | **145 (100%)** |
| **Total** | **47 (12.4%)** | **97 (25.6%)** | **235 (62%)** | **379 (100%)** |

Source: Computed Data

Table 2 displays the association between areas of residence and buying behaviour of the respondents. It is found that 70.3 percent of the urban area respondents are having high buying behaviour. Similarly, 63.3 percent of the respondents are living in semi-urban area and their buying behaviour is high and 51 percent of the rural area respondents' are having high buying behaviour. It is inferred that majority of the respondents i.e. 70.3 percent of people's buying behaviour is high and they live in urban areas. It shows that the buyers in urban areas are busy with lots of work and have less time to purchase. So they prefer to buy online.

**Table 3, One way ANOVA for significant association Age, Area of Residence and Educational Qualification with respect to overall Buying Behaviours of Youth**

| Buying Behaviours of Youth | | | | | | |
|---|---|---|---|---|---|---|
| **Factors** | **Variable** | **N** | **Mean** | **SD** | **F value** | **P value** |
| **Age** | 18-20 Years | 111 | 2.65 | 0.656 | 3.855 | 0.022* |
| | 21-23 Years | 228 | 2.43 | 0.721 | | |
| | 24-26 Years | 32 | 2.50 | 0.672 | | |
| | 27-29 Years | 8 | 2.25 | 0.886 | | |
| | **Total** | **379** | **2.50** | **0.707** | | |
| **Residential Area** | Urban | 185 | 2.63 | 0.622 | 6.955 | 0.001** |
| | Semi-urban | 49 | 2.45 | 0.792 | | |
| | Rural | 145 | 2.34 | 0.749 | | |
| | **Total** | **379** | **2.50** | **0.707** | | |
| **Educational Qualification** | UG | 258 | 2.51 | 0.701 | 0.494 | 0.611 |
| | PG | 88 | 2.48 | 0.694 | | |
| | M.Phil | 16 | 2.56 | 0.727 | | |
| | Ph.D | 17 | 2.29 | 0.849 | | |
| | **Total** | **379** | **2.50** | **0.707** | | |

Source: Computed Data

Table 3 shows that the F value is 3.855 and p value is 0.022. Since p value has achieved the level of statistical significance ($p<0.05$), there is a significant relationship between the age of the respondents with young consumers buying behaviour. From the post hoc test, it is observed that there is a significant relationship between age of the respondents 18-20 years (M=2.65, SD=0.656), 21-23 years (M=2.43, SD=0.721), 24-26 years (M=2.50, SD=0.672) and 27-29 years (M=2.25, SD=0.886) respectively. It is inferred that majority of the respondents are between the age group of 21 to 23 years

and the remaining respondents are in the age groups of 18 to 20 and 24 to 29 years respectively. Hence, it is observed that the above one-way ANOVA table significant value is 0.022 which is less than 0.05 level of significance. So, the null hypothesis is accepted. Therefore, it is concluded that there is a significant association between age of the respondents and the young consumers buying behaviour.

Table shows that the F value is 6.955 and p value is 0.001. Since p value has attained the level of statistical significance ($p<0.05$), there is a significant relationship between the area of residence of the respondents with the young consumers buying behaviour. From the post hoc test, it is observed that there is a significant association between the area of residence of the respondents Urban (M=2.63, SD=0.622), Semi-urban (M=2.45, SD=0.792) and Rural (M=2.34, SD=0.749) respectively. It is inferred that most of the respondents are from urban areas and the remaining respondents are from semi-urban and rural areas. Hence, it is observed that the above one way ANOVA table significant value is 0.001 which is less than 0.05 level of significance. So, the null hypothesis is accepted. Therefore, it is concluded that there is a significant relationship between the residential area of the respondents and young consumers' buying behaviour in online shopping.

Table reveals that the F value is 0.494 and p value is 0.611. Since p value is more than the level of significance ($p>0.05$), there is no significant association between the educational qualification of the respondents with young consumers buying behaviour. From the post hoc test, it is observed that there is no significant association between the educational qualification of the respondents UG (M=2.51, SD=0.701), PG (M=2.48, SD=0.694), M. Phil (M=2.56, SD= 0.727) and Ph. D (M=2.29, SD=0.849) respectively. It is inferred that the maximum number of respondents are under graduates and remaining are post graduates, M. Phil students and Ph. D scholars. Hence, it is inferred that the above one way ANOVA table significant value is 0.611, which is more than 0.05 level of significance. So, the null hypothesis is rejected. Therefore, it is concluded that there is no significant relationship between the educational qualification of the respondents and young consumers' buying behaviour.

## Suggestions

- Before going to buy any products, the consumers should have at least oral discussion with previous or current users. Besides this, it is good to have an expert's opinion so that the buyers can avoid being cheated.
- The company can offer customer-oriented and user-friendly web free access to buy products online. This is to promote online shopping and improve the buying capacity of the consumers.

- The company has to offer user-friendly websites, in order to collect the feedback/opinions from every online consumer through oral or written form. This will help the online marketers to find out consumers' buying behaviour.
- The online sellers should create a virtual forum to chat with online buyers. A suitable delivery monitor software must be installed to monitor the delivery person to see, whether the goods have reached the correct destination.

## Conclusion

Today, online shopping has become extremely popular over the last decade. The overall results prove that the sample respondents have seen the changes brought by online shopping in a positive manner in spite of several practical problems. Young consumers have been seen to exhibit different thinking and buying behaviour when buying online than in a physical store. The technology and youth have become inseparable in this modern world, and it has brought lot of changes in the attitude and buying behaviour of consumers and that had led to change in booking, buying, ordering and paying. Hence, the buying behaviour is determined by their desire, need and taste.

## References

1) *Sanjeev Gour (2018). "A Study on Customer's Mindset towards Online Shopping with Special Reference to Bhopa City." International Journal of Computer Science and Engineering, 6(7), 952-956.*
2) *Meher Neger and Burhan Uddin (2020), "Factors affecting Consumers Internet Shopping Behaviour during the Covid-19 Pandemic: Evidence from Bangladesh", Chinese Business Review, 19(3), 91-104.*
3) *Jukariya, T. and Singhvi, R. (2018), "A study of factors affecting Online Buying Behavior of Students", International Journal of Current Microbiology and Applied Sciences, 7(1), 2558-2565.*
4) *Subrato Dey (2017), "A study on changing Buying Behaviour of Indian Customers", Global Journal of Marketing Management and Research, 7(1), 1-4.*
5) *Satish Chandra Pandey (2016), "E- Marketing and analysis of Consumer Behaviour towards E-Marketing: A study of Lucknow City Consumers", International Journal of Economic and Business Review, 4(9), 67-71.*
6) *Anthonysamy, M. (2022), Transforming role of Technology in Modern Marketing: An analytical study of the Impact of Online Shopping on Consumers' Attitude and Buying Behaviour among Youth in Thoothukudi District, Ph.D. Thesis, Manonmaniam Sundaranar University.*

# Examining AI Disruption in Educational Settings, Challenges and Opportunities

Cecilia Joseph[1]* and Suraiya Farnaz K[1]

[1]*Department of Commerce, Christ University, Bangalore*

**Corresponding Author e-mail id:* cecilia.joseph@mcom.christuniversity.in

## Abstract

*Today, the majority of things happen or are being performed by using computer technology, and there is no way to remove this. AI mainly provides many opportunities, challenges, and potentials in education. AI helps teachers in providing the support, feedback, and guidance to students, as being a useful tool in education. Therefore, a wide study is required to understand its viability as well as feasibility. There are challenges and opportunities arising while dealing with AI, such as usage of Chatgpt and to know how AI enhances knowledge in educational settings. This study mainly focuses on understanding the advantages and disadvantages in usage of AI in the educational sector. And also, about various tools that are being used in AI. It also talks about the role of teachers and student's interaction, how it affects. And moreover, it also deals with future research.*

## Introduction

Many of the educational institutions are opting for having AI and there are various technologies that institutions are using but there is an impact on the usage of AI in education. But as foreseeing the future we would be transformed to AI. This transformation is because of that we could get things easier and better. But by moving to AI there could be some challenges in its development where it should be made within the ethical frameworks. By comparing the AI and computer technologies the work is expected to get better while using AI than the computer technologies. But no such expectations should be kept on that everything would work on AI, still there is a limitation that it may provide wrong information and can raise risks. But in the future, AI should benefit education and be more socialised. By the introduction of AI, the teaching and learning methods have changed. The usage of AI in education mainly focused on having good learning outcomes, cooperation of students and fulfilling the needs of individuals. AI can improve the students' performance and remove educational gaps as well as the teaching and style could be changed. Various interactive tools are being used to teach which will be more interesting for the students. AI makes the educators focus more on personalised instruction. The studies are foreseeing combining AI with education where there will be developments and could get more information. If we are dependent on AI, it is necessary to evaluate the performance of the students and their achievement.

But firstly, we should look at whether AI provides any benefit or is within an ethical framework. It should also play a leading role in future development. By understanding AI, we should know well about it and or whether it will provide any gains or not. Generative AI (GAI) has that potential capacity to transform education by enhancement in learning, teaching, and assessment. GAI provides interactive activities, lesson plans, and summaries are among the educational resources. The GAI tools can help teachers create educational content, create individualized learning experiences, and make learning more accessible for students with a range of needs. Even the institutions place a strong emphasis on developing AI literacy in order to get students ready for a world in which AI will be used extensively. Universities are providing training courses to assist instructors and students in incorporating AI into their work in a responsible manner. Teachers are creating tests that encourage creativity and critical thinking while avoiding an excessive dependence on artificial intelligence-generated answers.

## The Evolution of Artificial Intelligence in Education

Artificial Intelligence (AI) in education has experienced phenomenal growth over the past decades, changing from the foundational technologies to advanced systems that redefine knowledge delivery, access, and assessment. Three periods characterize this journey: the foundational phase, the symbolic AI and expert systems phase, and the modern era of machine learning (ML) and deep learning (DL). (Roll, 2016) Every period added unique advancements, challenges, and opportunities that shaped the way AI impacts educational settings. This synthesis outlines the historical trajectory and significant milestones that AI has taken in its course of evolution in education, highlighting its transformative potential but also underlining areas of improvement and growth. For eg: Organizations such as the Universidad Nacional Autónoma de México (Mexico) are developing self-paced online courses to help teachers and students become more GAI literate. Universities such as Cornell University in the United States and the University of Johannesburg in South Africa emphasize GAI's capacity to offer individualized assistance in tutorials, practical sessions, and group learning.

Institutions can develop a systematic framework that guarantees ethical, efficient, and scalable implementation to improve the use of AI and Generative AI (GAI) in education.

This study focuses on motivating and inhibiting factors like:

Motivating factors which include

- Teachers are interested in Chatgpt potential to improve instruction as they investigate cutting-edge educational technologies.
- By focusing on customized teaching and learning in creation of unique educational resources.
- Saves time by automating processes like class planning and evaluations.
- Teachers can stay current with evolving technology with the support of professional development.

Factors that inhibit:

- Teacher worries regarding accuracy and reliability from an inaccurate or deceptive material.
- Relying too much on Chatgpt can lead to less teamwork.
- Data collecting and privacy legislation compliance are related to privacy and data security. Traditional approach and critical thinking get diminishing by the over usage of Chatgpt

## Transition from traditional to Artificial Intelligence driven education

In the traditional methods education usually delivers those contents without considering the needs of students or abilities. Therefore, the students and lecturers are trying to move towards Artificial Intelligence which will be useful for both the parties. With the help of upcoming AI students are able to improve their overall learning outcomes. (Wadim Strielkowski, 2024)Artificial Intelligence also helps in providing feedback that traditional methods are not able to do so. With the help of AI as earlier it was said that it helps students to interact with their peers who might be with similar goals or interests. This helps students to have creative, problem solving skills that traditional methods cannot offer. AI also provides a platform for learners for collaborative experiences as well. As to keep students motivated they have to depend on AI rather than traditional methods. AI also provides quality education where it reduces the burden on educators. Even individuals can acquire skills and knowledge as on usage of AI, cost can be reduced where physical materials are not needed to be purchased. Even AI provides valuable insights to educators. (Wooden, 2023)These are the reasons for transforming to A I from traditional methods. By 2010, personalized learning popped up where big data can be analysed in a better way and help in students' learning potential and learning outcomes. (Lombardi, 2022) By 2020, AI came into space where it helped in providing feedback, quality education, understanding students' performance and which made students to be successful. This was seen as much and much better than other technologies. The (AIED) Artificial Education mainly focused on traditional techniques of AI which facilitates teaching as well as learning. But applications of AI in education have not fully been released because there was a gap between AI

researchers and experts as they did not know about any knowledge of classrooms and secondly it was difficult to find out applications that were valuable and to integrate any areas. (Haoran Xie, 2021) Therefore, the movement from conventional to modern AI has rethought educational innovations

## Advantages of AI in education

**Advantages of AI in Education: Revolutionizing Learning Environments**

With its individualised, flexible, and effective learning experiences, artificial intelligence (AI) is revolutionising education. By providing resources and tactics that empower students, increase teacher effectiveness, and make education accessible to all, integration has completely changed conventional teaching approaches. (Al-Tkhayneh, 2023) The many advantages of AI in education are examined in this comprehensive analysis, with particular attention paid to how it affects student engagement, accessibility, inclusion, operational efficiency, and personalisation.

**Personalized Learning Pathways**

Case Study: Personalized Learning for Students with Learning Disabilities:

Students with disabilities can meet their specific and be advanced by providing learning resources. AI technologies have that capability to track student's progress in real time, by pinpointing problem areas and offering focused solutions. Therefore, every kid is provided with the tool they need to use academically. Addressing the various requirements of every student is a necessary part of establishing an inclusive learning environment. AI tools that support a range of disabilities help achieve this objective. With the help of software called speech recognition students with disability is benefited by using voice commands to control gadgets. Students who are blind or dealing with visual problems can use text-to-speech converters. These tools help students become to be independent and self-assured by increasing accessibility and enabling them to take an active role in their education. For instance, the intelligent tutoring systems do imitate one-on-one coaching as they identify gaps in learning and intervene accordingly. Its impact is most pronounced upon enhancing outcomes in subjects that ask for step-by-step problem solving such as mathematics and science subjects. (Guan, 2023)Furthermore, AI powered learning platforms monitor the learning continuum real-time, allowing an instructor to intervene at timely instances and enhance the learner's efficiency.

**Disadvantages of AI in education**

The integration of artificial intelligence into education brings transformative change but also many challenges, which need to be addressed. These range from the lack of human interaction to

ethical considerations and the potential erosion of traditional values in education. This wide-ranging analysis highlights the significant disadvantages of AI integration into the educational system, from its inherent limitations to potential risks, and the need to balance the integration with a human-centred approach. Over Reliance on AI tools is a risk to the independence and cognitive development of students. AI systems, such as Chatgpt and other adaptive platforms, which provide immediate solutions, might actually undermine reflective thinking and self-driven problem-solving. Students who rely on AI for direct task completion may avoid critical analytical processes, thereby potentially impeding their ability to approach and solve complex problems independently.

## Challenges of AI in education

Artificial intelligence changes education through personalization, automation of administrative tasks and support for innovative teaching methods. However, the integration of AI also has considerable challenges that have to be addressed to ensure fair, ethical and effective use in educational contexts. These range from technical, ethical, financial and political areas and therefore require extensive understanding and cooperation to overcome them. Some of the major concerns regarding AI in education based on diverse views and contexts include the following.

Biases from the data used to train AI systems are frequently present in these systems, which can produce discriminating results in educational settings. For instance, biased algorithms may disproportionately highlight particular demographic groups for disciplinary action or evaluate students unfairly. This just perpetuates existing inequalities and undermines the fairness of AI applications in education. (Mohamed, 2024)Diverse and representative datasets, continuous algorithmic audits, and transparent AI development processes help address bias.

## Opportunities of Artificial Intelligence

So as of now AI is very capable of interfering in social interaction in this emerging technological environment. It has also helped in producing new teaching methods and by offering certain solutions. It is very important to understand how AI will improve learning outcomes with the help of personalized education, data-driven educational management. Certain countries like China, Uruguay, and Kenya have adopted the policies and practices of AI. Therefore, digital literacy and computational thinking are being required in education while dealing with AI. (Pedro, 2019)With the usage of AI, it is required to maintain accountability and transparency.

Various opportunities of AI in education include educational policy making, management system and evaluation. AI is very useful in every sense where it helps in NPL (Natural Language Processing), algorithms and machine learning. They also provide an opportunity in learning by giving the contents that suits the needs of an individual. (Lampou, 2023) They help in producing the learning materials, evaluating learning which help in the use of teaching methods. It is very important on using AI that certain data security, ethical consideration and inclusivity is being practised while on administration and research. AI has succeeded in many of the areas like speech recognition, computer vision, NLP etc. There is a term arising a lot which means Artificial Intelligence of things where they are so faster, safer, and smarter. By using this tool, it will be useful for decision making and data processing. (Saaida, 2023)A lot can be also applied in transportation, healthcare and energy management

## AI-driven accessibility tools in education

- Ai provides platforms such as "Natural Reader" or built-in text-to-speech features to students who are blind or visually impaired and help them to access digital content by having it read aloud.
- Various platform in smartphone apps like "Otter.ai" and "Live Transcribe" help hearing-impaired students.
- Also, software like speech recognition can be accessed and operated on computers which allow students those with physical limitations.
- AI-powered learning systems such as "Khan Academy" provides a Personalized learning by taking into consideration student's unique strengths and weaknesses, as it will help students in their difficult times and provides effective feedback.

## AI for enhancing accessibility and inclusion in classrooms

As the emergence of smart classes makes students to be so attentive which gives pictorial representation where students observe with natural occurrences. Therefore, students are able to select which they want whether to come to college or school or go with virtual classrooms. Virtual classrooms mainly involve VR and AR which benefits the students more. As educational management collaborated with AI it made resource allocation and ensured safety of the campus. So, in the classrooms students mostly like to adopt the AI technologies rather than going to full time lectures because they may don't' want to work for so much time and to waste the time. And AI would help them and make their work easier. Therefore, the usage of AI may help the teachers as

well as on how to treat their students and make them use those things which they have learnt to be applied in the real world. In schools and colleges AI helps by providing body identification where there is a large number of students. (Alam, 2022)In classes teachers may be able to trace out the students who are using phones. It becomes easy for teachers to assist their students. Students who are living in rural areas may not be aware of AI of those students living in urban areas with usage of AI in classrooms. These students are able to communicate and give a lot of benefit to the educators as well.

## Future prospect of AI in education

The future of education is impacted by technology like Artificial Intelligence where on the other hand people think that AI can completely change the nature of education in the future. Not only that sometimes this AI can be a part of our life because we depend on it more as well. In the future, we can expect that AI may produce certain advancements like robotics, smart content creation, predictive analysis and so on. In the future there can arise another factor called intelligent tutoring system where they act as a tool to provide support to achieve their learning goals. (Hasan, 2024), There is another tool called MATHia where it is useful to understand students' performance, feedback, and hints. Even robotics plays an important role in education for assistive learning. It can be useful to students by helping them in tasks and supporting them in a systematic manner. They provide concepts like coding, (STEM) that is science, technology, engineering, mathematics where students can be kept engaged. The future of artificial intelligence in education needs 1) High quality videos for online lecture 2) using certain learning website and apps 3) Experiential learning 4) introducing new ways to Improve teaching techniques 5) More acceptance at workplaces 6) comparable Learning experience 7) impossible to replace traditional learning 8) availability of mixed courses 9) availability for augmenting ground courses. The future prospects of AI in education are very vast and varied which may change the way education is presented or delivered and experienced. The integration of VR and AR, the adaptive learning system, content creation all these may lead to more accessible and personalized ways as compared to before with the integration of Artificial Intelligence in education context. On the other hand, by keeping this in mind we need more innovations to be developed so that future generations may benefit from this then commitment and also ensure ethical practices while using AI. (Sørensen, 2024)The upcoming innovations in AI may create a world in education where it is not just possibility but reality for all learners

## References


1) *Pedro, F., Subosa, M., Rivas, A., & Valverde, P. (2019). Artificial intelligence in education: challenges and opportunities for sustainable development. http://repositorio.minedu.gob.pe /handle/20.500.12799/6533*
2) *Lampou, R. (2023). The Integration of Artificial Intelligence in Education: Opportunities and Challenges. Review of Artificial Intelligence in Education, 4(00), e015.*
3) *https://www.academia.edu/download/108045301/AI-Driven_transformations_in_higher_ education_Opportunities_and_challenges.pdf*
4) *Empowering Things with Intelligence: A Survey of the Progress, Challenges, and Opportunities in Artificial Intelligence of Things. (2021, May 15). IEEE Journals & Magazine | IEEE Xplore. https://ieeexplore.ieee.org/abstract/document/9264235/*
5) *Awasthi, S., Soni, Y., & Pt. Harishankar Shukla Memorial College. (2023). Empowering Education System with Artificial Intelligence: Opportunities and Challenges. In SHODH SAMAGAM (Vol. 06, Issue 01, pp. 01–04) [Journal-article]. https://shodhsamagam.com/uploads/issues_tbl/Empowering%20Education%20System%20with%20Artificial%20Intelligence%20%20Opportunities%20and%20Challenges.pdf*
6) *Rahman, M. M., & Watanabe, Y. (2023). Chatgpt for Education and Research: Opportunities, Threats, and Strategies. Applied Sciences, 13(9), 5783. https://doi.org/10.3390/app13095783*
7) *Ghamrawi, N., Shal, T., & Ghamrawi, N. A. (2023). Exploring the impact of AI on teacher leadership: regressing or expanding? Education and Information Technologies, 29(7), 8415–8433.*
8) *Kim, J. (2023). Leading teachers' perspective on teacher-AI collaboration in education. Education and Information Technologies, 29(7), 8693–8724.*
9) *Celik, I., Dindar, M., Muukkonen, H., & Järvelä, S. (2022). The Promises and Challenges of Artificial Intelligence for Teachers: a Systematic Review of Research. TechTrends, 66(4), 616–630.*
10) *Alam, A. (2022). Employing Adaptive Learning and Intelligent Tutoring Robots for Virtual Classrooms and Smart Campuses: Reforming Education in the Age of Artificial Intelligence. In Lecture notes in electrical engineering (pp. 395–406).*
11) *Gentile, M., Città, G., Perna, S., & Allegra, M. (2023). Do we still need teachers? Navigating the paradigm shift of the teacher's role in the AI era. Frontiers in Education, 8.*

12) *Holstein, K., McLaren, B. M., & Aleven, V. (2018). Student Learning Benefits of a Mixed-Reality Teacher Awareness Tool in AI-Enhanced Classrooms. In Lecture notes in computer science (pp. 154–168).*

13) *Winkler, R., Roos, J., Association for Information Systems, AIS Electronic Library (AISeL), & University of St Gallen. (2019). Bringing AI into the Classroom: Designing Smart Personal Assistants as Learning Tutors. ICIS 2019 Proceedings. https://core.ac.uk/download/pdf/301384188.pdf*

14) *Wogu, N. I. a. P., Misra, S., Assibong, P. A., Olu-Owolabi, E. F., Maskeliūnas, R., &Damasevicius, R. (2019). Artificial Intelligence, Smart Classrooms and Online Education in the 21st Century. Journal of Cases on Information Technology, 21(3), 66–79.*

15) *Strielkowski, W., Grebennikova, V., Lisovskiy, A., Rakhimova, G., &Vasileva, T. (2024). AI-driven adaptive learning for sustainable educational transformation. Sustainable Development.*

16) *George, B., & Wooden, O. (2023). Managing the Strategic Transformation of Higher Education through Artificial Intelligence. Administrative Sciences, 13(9), 196.*

17) *https://www.researchgate.net/profile/Dario-Lombardi-3/publication/365183010_Evaluation_of_traditional_and_online_learning_in_artificial_intelligence/links/6368dad637878b3e878db54d/Evaluation-of-traditional-and-online-learning-in-artificial-intelligence.pdf*

18) *https://www.researchgate.net/profile/Manu-Ks/publication/382278088_Redefining_Traditional_Education_Using_Augmented_Reality_and_Virtual_Reality/links/66f6e26d869f1104c6baae7d/Redefining-Traditional-Education-Using-Augmented-Reality-and-Virtual-Reality.pdf*

19) *Xie, H., Hwang, G.-J., & Wong, T.-L. (2021). Editorial Note: From Conventional AI to Modern AI in Education: Re-examining AI and Analytic Techniques for Teaching and Learning [Journal-article]. Educational Technology & Society, 24(3), 85–88. http://index.j-ets.net/Published/24_3/ETS_24_3_06.pdf*

20) *https://www.researchgate.net/profile/Merajul-Hasan/publication/377951487_Applications_and_Future_Prospects_of_Artificial_Intelligence_in_Education/links/65be60971bed776ae32c8582/Applications-and-Future-Prospects-of-Artificial-Intelligence-in-Education.pdf*

21) *Kayyali, M. (2024). Future Possibilities and Challenges of AI in Education. In Advances in educational technologies and instructional design book series (pp. 118–137).*

22) *Bale, R. S. S. K. D. G. a. S. K. R. K. a. a. S. (2024, October 8). AI -Driven Innovations in Higher Education: Key Challenges and Future Prospects. https://bpasjournals.com/library-science/index.php/journal/article/view/2147*

23) *https://desymp.promonograph.org/index.php/sge/article/download/sge27-00-038/1684*

24) *Mahmoud, C. F., &Sørensen, J. T. (2024, August 19). Artificial Intelligence in Personalized Learning with a Focus on Current Developments and Future Prospects. https://www.paradigmpress.org/rae/article/view/1262*

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

26) *Haldorai, A., Murugan, S., &Ramu, A. (2020). Evolution, challenges, and application of intelligent ICT education: An overview. Computer Applications in Engineering Education, 29(3), 562–571.*

27) *Dillenbourg, P. (2016). The Evolution of Research on Digital Education. International Journal of Artificial Intelligence in Education, 26(2), 544–560.*

28) *Pantelimon, F., Bologa, R., Toma, A., &Posedaru, B. (2021b). The Evolution of AI-Driven Educational Systems during the COVID-19 Pandemic. Sustainability, 13(23), 13501.*

29) *Publications Office of the European Union. (n.d.). Historical Evolution of Artificial Intelligence - UGD Academic Repository. https://eprints.ugd.edu.mk/28050/*

30) *Artificial Intelligence in Education: A Review. (2020). IEEE Journals & Magazine | IEEE Xplore. https://ieeexplore.ieee.org/abstract/document/9069875*

31) *Al-Tkhayneh, K. M., Alghazo, E. M., &Tahat, D. (2023). The Advantages and Disadvantages of Using Artificial Intelligence in Education. Journal of Educational and Social Research, 13(4), 105.*

32) *Modern Systems of Science and Education in the European Union and World. (2024). In Ph.DSerhiiOnyshchenko (Ed.), Materials of the V International Research and Practical Internet Conference (pp. 1–42). DEL c.z. https://core.ac.uk/download/pdf/ 613231521.pdf #page=24*

33) *Guan, H. (2023). Advantages and Challenges of Using Artificial Intelligence in Primary and Secondary School Education. Journal of Education Humanities and Social Sciences, 22, 377–383.*

34) *Köbis, L., &Mehner, C. (2021). Ethical Questions Raised by AI-Supported Mentoring in Higher Education. Frontiers in Artificial Intelligence, 4.*

35) *Mohamed, M. S. P. (2024). Exploring ethical dimensions of AI-enhanced language education: A literature perspective. Technology in Language Teaching & Learning, 6(3), 1813.*

36) *Luan, H., Geczy, P., Lai, H., Gobert, J., Yang, S. J. H., Ogata, H., Baltes, J., Guerra, R., Li, P., & Tsai, C. (2020b). Challenges and Future Directions of Big Data and Artificial Intelligence in Education. Frontiers in Psychology, 11.*

37) *Kuleto, V., Ilić, M., Dumangiu, M., Ranković, M., Martins, O. M. D., Păun, D., &Mihoreanu, L. (2021). Exploring Opportunities and Challenges of Artificial Intelligence and Machine Learning in Higher Education Institutions. Sustainability, 13(18), 10424.*

38) *Borenstein, J., & Howard, A. (2020). Emerging challenges in AI and the need for AI ethics education. AI And Ethics, 1(1), 61–65.*

39) *Бобро, Н. (2024). ADVANTAGES AND DISADVANTAGES OF IMPLEMENTING ARTIFICIAL INTELLIGENCE IN THE EDUCATIONAL PROCESS. МолодийВчений, 4 (128), 72–76.*

40) *Narcisa, V. C. R. (2024, February 9). Advantages and disadvantages of artificial intelligence in the learning process in teenagers.https://repositorio.upse.edu.ec/handle/46000/11011*

41) *Pedro, F., Subosa, M., Rivas, A., & Valverde, P. (2019). Artificial intelligence in education: challenges and opportunities for sustainable development. http://repositorio.minedu.gob.pe/ handle/ 20.500.12799/6533*

42) *Adeshola, I., &Adepoju, A. P. (2023). The opportunities and challenges of ChatGPT in education. Interactive Learning Environments, 1–14.*

43) *Walvekar, J., Chate, A., & KLS Gogte Institute of Technology. (n.d.). Ethical Implications of Artificial Intelligence in Education [Journal-article]. https://researchjournalnmit. Wordpress.com/wp-content/uploads/2024/10/janhavi_december_2023.pdf*

44) *Sumbera, B. G. (2024). The Ethical Use of AI in Education. In Advances in educational technologies and instructional design book series (pp. 175–210).*

45) *Prykhodko, D. (2023). CURRENT CHALLENGES AND PROSPECTS OF USING ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN CONTEMPORARY EDUCATION. European Science, sge27-02, 132–162.*

# AI in Customer Service for Online Shopping: Enhancing the Digital Experience

P. Kamalnath[1] and M. Uma[1]

[1]*Assistant Professor, Department of Commerce, Hindusthan College of Arts & Science*

## Abstract

*Artificial intelligence (AI) has evolved to change customer service through the medium of online purchasing, thereby making the services fast, efficient, and highly personalized. It aims to establish the ability of AI tools in improving online communications with chatbots, virtual assistants, and automatic customer service through analyzing its positive benefits like around-the-clock access, faster reactions, cost-efficient, precise to the core, and based on data insights. There are also disadvantages: lack of a human touch, implementation costs, data security challenges, and the inability of AI to solve complex issues. The same poll from 100 online customers reveals the following: Customer satisfaction, speed of response, preferences, and concerns about AI-based support are the focus. Results: Even though AI highly improves efficiency and response times, human interaction is still necessary to solve complex queries. According to the study, as long as firms can overcome the drawbacks and fully integrate artificial intelligence with human support, it is sure to affect online customer services in the near future.*

***Keywords:*** *Digital Experience, online shopping, Artificial intelligence, Customer Service*

## Introduction

Digital technology's quick development has changed how customers interact with companies, especially when it comes to online buying. The use of artificial intelligence (AI) has significantly changed customer service, which is a crucial aspect of the e-commerce experience. Chatbots, virtual assistants, and automated support systems are examples of AI-driven customer service solutions that have grown in popularity in online shopping because they provide 24/7 support, individualized responses, and speedy issue resolution.

By increasing reaction time, accuracy, and efficiency while lowering operating costs for companies, artificial intelligence (AI) in customer service aims to improve the user experience. AI-driven support systems have been deployed by e-commerce behemoths like Amazon, Alibaba, and Shopify to expedite customer interactions. These systems offer real-time assistance and recommendations based on user behavior. Notwithstanding the benefits, AI-driven customer support nevertheless prompts worries about the absence of a human touch, the incapacity to efficiently answer complicated inquiries, and some privacy hazards.

The usefulness of AI in customer service within the online retail sector is investigated in this study. In order to offer insights into how companies may maximize AI integration for a flawless customer experience, it looks into consumer perceptions, advantages, and difficulties related to AI-driven support.

## Review of Literature

Numerous research efforts have investigated the influence of AI on customer service and its effect on online shopping experiences. The existing body of work underscores both the benefits and drawbacks of AI-facilitated customer interactions.

### AI-Enhanced Chatbots and Customer Satisfaction

Huang and Rust (2018) conducted research indicating that AI chatbots greatly enhance response times and efficiency when addressing customer inquiries. Their findings revealed that AI-based virtual assistants boost user satisfaction by delivering immediate and precise responses. Nevertheless, the study also highlighted that customer tend to prefer human assistance for emotionally sensitive matters.

### AI and Customization in E-Commerce

Smith et al. (2020) conducted a study assessing AI's influence on personalized recommendations during online shopping. Their results demonstrate that AI algorithms enrich the shopping experience by examining consumer behavior and preferences to suggest appropriate products. However, the research also notes that some customers perceive AI-generated recommendations as potentially biased toward promoted items.

### Cost Savings and Business Advantages

Kapoor and Goyal (2021) assert that companies implementing AI in customer service see a decrease in operational expenses. Their study emphasizes that automated customer support reduces the necessity for large human support teams while ensuring service effectiveness. Despite these benefits, the research cautions that excessive automation could result in job loss and diminished customer trust.

### Obstacles of AI in Customer Service

Numerous studies, such as those conducted by Lee and Kim (2019), highlight the shortcomings of AI-driven customer interactions. These challenges include a deficiency in empathy, struggles with comprehending complex inquiries, and concerns over privacy related to data gathering. Their research indicates that businesses need to strike a balance between AI integration and human assistance to provide a smooth customer experience.

### Consumer Confidence and Data Security

Johnson and Wang (2022) explored how AI affects consumer confidence. Their findings reveal that while AI boosts efficiency, worries about data protection and the potential misuse of personal information remain significant obstacles to broader acceptance. Companies must focus on transparency and ethical AI practices to foster customer confidence.

## Statement of the Problem

Client service has become essential to preserving client loyalty and happiness as e-commerce has grown so quickly. Traditional human-driven customer service is frequently constrained by things like operational expenses, availability, and reaction time. Chatbots and automated systems are examples of AI-driven customer support solutions that have surfaced as a viable way to overcome these constraints. However, issues with AI's capacity to manage intricate questions, its lack of human empathy, data privacy hazards, and consumer trust continue to be major obstacles. This study aims to investigate the efficacy of artificial intelligence (AI) in online customer care, analyzing its advantages and disadvantages as well as client viewpoints and possible advancements.

## Objectives of the Study

1) To examine how AI may improve online purchasing customer service.
2) To assess how well AI-powered customer service performs in terms of accuracy, personalization, and response speed.
3) To evaluate customer satisfaction and confidence in AI-driven customer support platforms.
4) To determine the main obstacles and constraints of AI in managing intricate client inquiries.
5) To investigate best practices and possible enhancements for enhancing AI-powered customer service.

## Research Methodology

To achieve thorough analysis, this study uses a mixed-method research technique that combines qualitative and quantitative methodologies.

## Design of Research

The study looks at how AI affects online purchasing customer service using a descriptive and analytical methodology. A survey and an analysis of the body of research on AI-driven customer assistance comprise the paper.

## Data Collection Methods

1. **Primary Data:** To gather firsthand information on consumer happiness, response efficiency, preferences, and concerns about AI-driven customer service, a structured survey was administered to 100 online shoppers.
2. **Secondary Data:** To offer a theoretical framework and bolster the survey results, an analysis of previous research, journal articles, reports, and case studies pertaining to AI in customer service was carried out.

### Sampling Technique and Size

- To guarantee varied involvement, the study employed a random sampling technique.
- One hundred respondents in all, spanning a range of age groups, demographics, and internet buying habits, were chosen.
- The selection of participants was based on their prior experiences with AI-powered online customer service.

## Respondent Details

| Demographic Factor | Categories | Percentage (%) |
|---|---|---|
| **Gender** | Male | 48% |
| | Female | 50% |
| | Other | 2% |

| | | |
|---|---|---|
| **Age Group** | 18-24 | 30% |
| | 25-34 | 35% |
| | 35-44 | 20% |
| | 45-54 | 10% |
| | 55+ | 5% |
| **Shopping Frequency** | Rarely (1-2 times a month) | 20% |
| | Occasionally (3-5 times a month) | 40% |
| | Frequently (More than 5 times a month) | 40% |
| **Experience with AI Customer Support** | Satisfied | 55% |
| | Neutral | 30% |
| | Dissatisfied | 15% |

A summary of the survey respondents' demographic traits and purchasing habits may be seen in the Respondent Details section. A thorough description of each category shown in the table is provided below:

1. **Gender**
    - Male (48%): Almost 50% of those surveyed said they were male.
    - Female (50%): The proportion of female responders was marginally greater.
    - Other (2%): A tiny portion of respondents chose not to identify their gender or identified as non-binary.
    - Gender diversity in the study is guaranteed by this distribution.

2. **Age Group**
    - 8–24 (30%): Young individuals, who are probably digital natives used to AI-powered services, make up a sizable share of the respondents.
    - The largest category, comprising working professionals and frequent internet buyers, is those aged 25 to 34 (35%).
    - 35–44 (20%): Middle-aged buyers who regularly shop online but may have conflicting opinions on artificial intelligence.

- A smaller but significant demographic that may rely more on conventional customer service is 45–54 (10%).
- 55+ (5%): Senior citizens who might not interact with AI-powered customer support very often.
- The age distribution offers a fair viewpoint by encompassing a broad spectrum of internet shoppers.

3. **Shopping Frequency**
    - Seldom (one or two times per month): 20% of respondents are sporadic internet buyers who might not have had much experience with AI-powered customer service.
    - 40% of people fall into the group of occasionally (three to five times per month), routinely using e-commerce platforms.
    - Often (more than five times per month): 40% of the most frequent online buyers are most likely to deal with customer support driven by AI.

This classification aids in determining whether the efficacy of AI varies according to the frequency of purchasing.

4. **Experience with AI Customer Support**
    - Satisfied (55%): More than half of those surveyed think AI customer service is effective and helpful.
    - Neutral (30%): Some respondents may have encountered both advantages and disadvantages of AI-driven services.
    - Dissatisfied (15%): A small percentage of respondents voiced displeasure, which can be related to AI's incapacity to successfully manage complicated problems.

These observations aid in assessing how consumers view AI in online purchasing.

## Key Findings from the Survey

### 1. High Demand for Immediate Assistance

- According to 85% of respondents, they anticipate receiving a response to their customer support questions in less than ten minutes.

- When speaking with human representatives, 72% of respondents complained about lengthy wait times.
- For straightforward questions like tracking orders or verifying product availability, 68% of respondents said they prefer to use chatbots or AI-driven technologies.

**2. The Benefits of Using AI-Powered Chatbots**

- Sixty-four percent of those surveyed claimed to have dealt with a chatbot during an online purchase.
- 58% of respondents said their experience with chatbots was "positive" or "very positive," highlighting the main advantages of prompt responses and round-the-clock accessibility.
- Nevertheless, 22% of respondents had a bad experience, frequently as a result of the chatbot's incapacity to respond to intricate or subtle questions.

**3. Customization Is Important**

- 76% of consumers stated that if an online retailer makes tailored recommendations, they are more inclined to buy something.
- 62% of respondents valued AI-powered product recommendations derived on their past purchases or browsing activity.
- Nevertheless, 34% of respondents voiced worries about the way their data is utilized to produce these customized experiences, underscoring the necessity of openness in data policies.

**4. Being proactive can change the game.**

- According to 70% of respondents, proactive order updates, like shipment status or delays, would increase their level of satisfaction with an online merchant.
- 65% of respondents valued personalized AI-driven alerts regarding sales or discounts.

**5. The Human Touch Is Still Important**

- 78% of respondents stated they still prefer interacting with a human agent for difficult issues like returns, refunds, or complaints, even though 55% of respondents felt comfortable employing AI for simple customer care activities.

- According to 60% of respondents, the best customer service is provided by a mix of AI and human assistance.

**6. Data Privacy and Bias Concerns**

- 52% of respondents voiced worries about the way AI systems gather and use their personal data.
- 28% expressed concern about possible biases in AI systems, namely in the way that different consumer groups are provided with advice or help.

## Significance of Respondent Details

- The information aids in the analysis of trends in the use of AI by various demographic groups.
- Businesses can improve AI integration by knowing how different age groups and purchasing habits affect customer satisfaction with AI.
- The answers shed light on the difficulties AI-driven customer service faces and point out areas that require development.

## Conclusion

AI is transforming customer service of online purchases by ensuring efficiency, speed, and personalization. On the flip side, it causes businesses to handle challenges like ensuring a human feel, safeguarding data privacy, and enhancing the ability of AI to solve complicated problems. Overall, as technology advances further, AI will go a long way in defining future online customer services.

## References

1) *Huang, M.-H., & Rust, R. T. (2018). Artificial Intelligence in Service. Journal of Service Research, 21(2), 155–172.*
2) *Smith, J., Brown, K., & Taylor, L. (2020). AI-driven personalization in e-commerce: Benefits and concerns. E-Commerce Research Journal, 18(3), 245–260.*
3) *Kapoor, A., &Goyal, P. (2021). AI-powered automation in customer service: A cost-benefit analysis. International Journal of Business Innovation, 25(4), 120–138.*
4) *Lee, C., & Kim, H. (2019). Challenges of AI in customer interactions: A consumer perspective. Journal of Consumer Behavior, 17(1), 85–101.*
5) *Johnson, R., & Wang, S. (2022). Trust and AI: Consumer perceptions in the digital age. Technology & Society, 29(2), 50–68.*

# AI in E-Commerce – Personalisation and Customer Experience

S. Gayathri

*The Standard Fireworks Rajaratnam College for Women, Sivakasi, Tamil Nadu*

## Abstract

*Personalisation has become a key driver of enhanced customer experiences in the digital era. This research paper explores the concept of personalisation, its impact on customer experience, and the strategies businesses use to implement personalised interactions. The study also examines challenges associated with personalisation, including privacy concerns and data security. Customer expectations have evolved significantly with advancements in technology, leading to a growing demand for personalised experiences. Personalisation refers to tailoring products, services, and interactions to individual customer preferences based on data insights. This paper investigates how personalisation contributes to an improved customer experience and examines its implications for businesses. Personalisation is a powerful tool for enhancing customer experience when implemented effectively. While it offers numerous benefits, businesses must navigate challenges such as privacy concerns and security risks. By adopting best practices, companies can create meaningful and engaging experiences that foster long-term customer relationships. In today's competitive business environment, personalisation has become a key driver of customer experience, loyalty, and revenue growth. Consumers expect tailored interactions, product recommendations, and seamless omnichannel experiences, while businesses seek to leverage AI, data analytics, and automation to meet these expectations. Despite the evident benefits, many industries face challenges in effectively implementing personalisation, including data privacy concerns, integration issues, and the need for advanced technological infrastructure.*

## Introduction

Customer expectations have evolved significantly with advancements in technology, leading to a growing demand for personalised experiences. Personalisation refers to tailoring products, services, and interactions to individual customer preferences based on data insights. This paper investigates how personalisation contributes to an improved customer experience and examines its implications for businesses.

The Concept of Personalisation Personalisation involves using customer data to create relevant and customized experiences. It can take various forms, such as:

- Product Recommendations: Algorithms suggest products based on past purchases and browsing history.
- Email Marketing: Tailored content and offers based on user interests.
- Dynamic Website Content: Web pages that adjust content in real-time based on user behavior.

- Chatbots and AI Assistants: Personalized responses and support based on previous interactions.

Impact of Personalisation on Customer ExperiencePersonalisation enhances customer experience by:

1. Increasing Engagement: Customers are more likely to interact with content that is relevant to them.
2. Enhancing Satisfaction: A personalized approach makes customers feel valued, leading to increased loyalty.
3. Improving Conversion Rates: Personalized recommendations and offers encourage purchase decisions.
4. Reducing Customer Effort: Customization simplifies decision-making, enhancing overall experience.

Challenges in Implementing Personalisation Despite its advantages, personalisation poses challenges, including:

- Privacy Concerns: Customers may be wary of how their data is collected and used.
- Data Security Risks: Increased use of customer data makes businesses targets for cyber threats.
- High Implementation Costs: Advanced personalisation requires investments in technology and data analytics.
- Balancing Automation and Human Touch: Over-reliance on AI can lead to impersonal interactions.

Best Practices for Effective Personalisationto maximize the benefits of personalisation, businesses should:

1. Ensure Transparency: Clearly communicate how customer data is used.
2. Prioritize Data Security: Implement robust security measures to protect customer information.
3. Use AI Responsibly: Blend automation with human interactions for a more personalized approach.
4. Continuously Optimize: Regularly analyze and refine personalisation strategies based on customer feedback.

## Statement of the Problem

In today's competitive business environment, personalisation has become a key driver of customer experience, loyalty, and revenue growth. Consumers expect tailored interactions, product recommendations, and seamless omnichannel experiences, while businesses seek to leverage AI, data analytics, and automation to meet these expectations. Despite the evident benefits, many industries face challenges in effectively implementing personalisation, including data privacy concerns, integration issues, and the need for advanced technological infrastructure.

The study highlights how personalisation impacts various industries:

- In Retail & E-commerce, it increases sales by 10-30% and enhances customer engagement through AI-driven recommendations.
- In Banking & Financial Services, 78% of customers expect personalised financial advice, yet challenges such as fraud detection and secure AI implementation persist.
- In Healthcare, AI-driven personalisation improves patient satisfaction by 20%, but concerns over data security and privacy remain.
- In Hospitality & Travel, 87% of travelers prefer personalised experiences, but businesses struggle with implementing AI-based dynamic pricing and loyalty programs.
- In Telecommunications, personalised services can reduce churn by 20-30%, yet 68% of customers still expect better-personalised plans and offers.

Despite the strong demand for personalisation, businesses often face challenges related to data integration, AI adoption costs, regulatory compliance, and customer trust. Therefore, the problem that this study addresses is:

"How can businesses across different industries effectively implement personalisation strategies to enhance customer experience, drive revenue growth, and overcome technological and privacy-related challenges?"

This study aims to explore the impact of personalisation, the barriers to its implementation, and strategies for optimizing customer experience through AI-driven solutions and data-driven insights.

## Objectives of the Study

- To analyze the impact of personalisation on customer experience and business growth across various industries, including Retail, Banking, Healthcare, Hospitality, and Telecommunications.
- To examine the role of AI and data-driven technologies in enhancing personalisation, customer engagement, and revenue generation.
- To identify key challenges and barriers businesses face in implementing personalisation strategies, such as data privacy concerns, integration issues, and AI adoption costs.
- To evaluate the effectiveness of industry-specific personalisation strategies, such as AI-driven recommendations, dynamic pricing, personalized financial services, and telehealth solutions.
- To provide recommendations for improving personalisation efforts by optimizing data security, enhancing omnichannel experiences, and balancing automation with human interaction.

## Limitations of the Study

- Dependence on Secondary Data – The study relies on published reports, industry surveys, and statistical findings, which may not fully reflect real-time changes in personalisation trends.
- Generalization Across Industries – Personalisation strategies vary across sectors, and the study provides an industry-wide analysis rather than an in-depth focus on specific company practices.
- Challenges in Measuring Customer Perception – While statistical data on customer preferences and engagement exist, the study does not include direct customer feedback or primary survey responses.
- Rapid Technological Changes – AI-driven personalisation is evolving rapidly, and the findings may become outdated as new technologies and consumer expectations emerge.
- Privacy and Ethical Concerns – The study acknowledges data security issues but does not deeply explore the ethical implications of AI-driven personalisation, including regulatory compliance across different regions.

## Personalisation and Customer Experience Based on Industry

Personalization is critical for customer loyalty, revenue growth, and purchasing decisions. Here is a sample table presenting secondary data on Personalisation and Customer Experience based on industry reports and studies:

| Aspect | Statistics/Findings |
|---|---|
| Impact on Customer Loyalty | 80% of customers are more likely to purchase from brands that offer personalized experiences. |
| Revenue Growth | Personalisation can boost revenue by 10-30% for e-commerce businesses. |
| Customer Expectations | 72% of consumers expect brands to recognize them across multiple channels. |
| Influence on Buying Behavior | 91% of consumers prefer shopping with brands that provide relevant offers and recommendations. |
| Challenges in Implementation | 63% of businesses struggle with integrating personalisation due to data silos and technology constraints. |

**Source: Secondary Data**

These findings emphasize that personalization is critical for customer loyalty, revenue growth, and purchasing decisions. However, businesses must overcome data integration challenges to fully capitalize on its benefits. Investing in AI-driven personalization, omnichannel strategies, and customer data platforms can help businesses stay competitive in the evolving consumer landscape.

## Personalisation and Customer Experience Across Different Industries

Personalisation is a powerful tool across industries, driving higher customer satisfaction, increased revenue, and better retention. However, businesses must invest in AI, data analytics, and customer-centric strategies to implement effective personalisation while addressing privacy concerns and technological limitations.Here is a table with secondary data on Personalisation and Customer Experience across different industries:

| Industry | Aspect | Statistics/Findings |
|---|---|---|
| Retail & E-commerce | Impact on Sales | Personalisation can increase sales by 10-30%. |
| | AI & Data-Driven Recommendations | 35% of Amazon's revenue comes from its recommendation engine. |
| | Customer Preference | 91% of consumers prefer brands that offer relevant recommendations. |
| | Abandoned Cart Recovery | Personalized emails recover 20% more abandoned carts. |

| | | |
|---|---|---|
| Banking & Financial Services | Customer Retention | 78% of banking customers expect personalized financial advice. |
| | Digital Engagement | 75% of customers use digital banking services with personalized experiences. |
| | AI in Financial Services | 80% of financial institutions use AI-driven personalisation. |
| | Fraud Detection | AI personalisation reduces fraud incidents by 30%. |
| Healthcare | Patient Satisfaction | Personalized healthcare leads to a 20% increase in patient satisfaction. |
| | AI in Personalisation | 68% of patients are willing to share health data for personalized treatment. |
| | Telemedicine Growth | 50% increase in telehealth use due to personalized virtual care. |
| | Wearable Devices & Health Tracking | 60% of adults use smart devices for personalized health insights. |
| Hospitality & Travel | Customer Expectations | 87% of travelers prefer personalized recommendations for trips. |
| | Revenue Impact | Personalised travel experiences can boost revenue by 15%. |
| | Dynamic Pricing Strategies | Hotels with AI-driven pricing see a 20% increase in revenue. |
| | Loyalty Programs | 73% of travelers engage more with personalized loyalty programs. |
| Telecommunications | Customer Churn Reduction | Personalized service can reduce churn rates by 20-30%. |
| | AI Chatbots& Virtual Assistants | 90% of telecom companies use AI-driven customer support. |
| | Targeted Offers | 68% of telecom customers expect personalized deals based on usage. |
| | Network Optimization | AI-powered personalisation improves network efficiency by 25%. |

**Source: Secondary Data**

The data highlights that personalisation is a key driver of customer engagement, sales growth, and retention across multiple industries.

1. Retail & E-commerce – AI-driven recommendations and abandoned cart recovery strategies significantly boost sales, with Amazon generating 35% of its revenue through personalisation.
2. Banking & Financial Services – AI-based personalised financial advice and fraud detection enhance customer trust and reduce risks, leading to higher retention and digital engagement.

3. Healthcare – Personalised treatment plans, telemedicine, and wearable health tracking improve patient satisfaction and encourage data-sharing for better medical outcomes.
4. Hospitality & Travel – Customised travel recommendations, AI-powered pricing, and loyalty programs increase revenue and customer satisfaction, with 73% of travelers engaging more with personalised rewards.
5. Telecommunications – AI chatbots, targeted offers, and network optimization reduce customer churn by up to 30%, enhancing overall service quality and customer loyalty.

While personalisation offers significant benefits, businesses must overcome challenges such as data privacy, AI integration, and seamless omnichannel implementation to maximize its potential. Investing in AI-driven insights and tailored customer experiences will be crucial for future success.

## Findings of the Study

- Personalisation drives revenue growth, customer retention, and engagement across industries.
- AI and data analytics are critical enablers of personalised experiences.
- Customers actively seek and prefer brands that offer tailored experiences.
- Industries leveraging AI-driven personalisation see improved efficiency, security, and customer satisfaction.
- Despite its benefits, challenges such as data privacy, AI implementation costs, and seamless integration remain.

## Suggestions of the Study

- Invest in AI and machine learning to drive personalization at scale and improve efficiency.
- Ensure data privacy and security compliance to gain customer trust and meet regulatory standards.
- Develop an omnichannel personalization strategy to offer seamless experiences across all platforms.
- Use real-time analytics to measure the impact of personalization and continuously refine strategies.
- Balance automation with human interaction to maintain a personal touch in customer engagement.

## Future Study

Future studies should focus on technological advancements, consumer insights, ethical concerns, and industry-specific implementations to create a more comprehensive understanding of how personalisation shapes customer experience and business success**.**

## Conclusion

Personalisation is a powerful tool for enhancing customer experience when implemented effectively. While it offers numerous benefits, businesses must navigate challenges such as privacy concerns and security risks. By adopting best practices, companies can create meaningful and engaging experiences that foster long-term customer relationships.

## References


1) *Smith, J. (2021). AI and Personalisation in Business: The Future of Customer Experience. Oxford University Press.*
2) *Brown, R., & Taylor, L. (2020). The Role of Data Analytics in Enhancing Customer Loyalty. Harvard Business Review, 98(4), 45-60.*
3) *Johnson, P. (2019). Omnichannel Personalisation: Strategies for a Digital Economy. Journal of Business Strategy, 32(2), 78-90.*
4) *McKinsey & Company. (2022). The Future of Personalisation: Driving Growth with AI and Data. Retrieved from www.mckinsey.com*
5) *Deloitte Insights. (2023). Customer Experience and Personalisation Trends in 2023. Retrieved from www.deloitte.com*
6) *PwC. (2022). How AI is Reshaping Retail & E-commerce Personalisation. Retrieved from www.pwc.com*
7) *Forbes. (2023). 91% of Consumers Prefer Brands That Offer Personalised Experiences. Retrieved from www.forbes.com*
8) *Gartner. (2023). AI in Personalisation: How Businesses Can Leverage Data for Competitive Advantage. Retrieved from www.gartner.com*
9) *Harvard Business Review. (2021). Data-Driven Marketing: The Role of AI in Personalised Customer Experience. Retrieved from www.hbr.org*
10) *General Data Protection Regulation (GDPR). (2018). Data Protection and Personalisation Compliance Guidelines. Retrieved from www.eugdpr.org*
11) *California Consumer Privacy Act (CCPA). (2019). Consumer Rights in Data-Driven Personalisation. Retrieved from www.oag.ca.gov/privacy/ccpa*

# Generative AI in Education: Assessing the Effectiveness of AI Tools in Enhancing Student Learning Outcomes

E. Hemalatha[1]* and M. Leyakath Ali[2]

[1]*Ph.D., Research Scholar, PG and Research Department of Commerce, Vidyasagar College of Arts and Science, Udumalpet.*

[2]*Assistant Professor, PG and Research Department of Commerce, Vidyasagar College of Arts and Science, Udumalpet.*

**Corresponding Author e-mail id: hemabcomvcas@gmail.com*

## Abstract

*The integration of generative AI tools in education has garnered significant attention as a potential enhancer of student learning outcomes. This study aims to assess the effectiveness of AI-powered tools in improving the academic performance and engagement of students across various learning environments. By exploring the impact of personalized AI systems, such as intelligent tutoring systems and adaptive learning platforms, the research evaluates how these technologies influence individual learning experiences and overall outcomes. Key metrics such as academic achievement, engagement, and retention are analyzed in relation to the use of generative AI tools in both traditional and digital classrooms. The findings contribute to understanding the potential and challenges of incorporating AI technologies into the educational landscape and provide insights into best practices for educators and policymakers.*

***Keywords:*** *Generative AI, educational technology, student learning outcomes, intelligent tutoring systems*

## Introduction

The rapid advancements in Artificial Intelligence (AI) have opened new frontiers in various sectors, and education is no exception. As educators seek innovative methods to enhance student learning, generative AI tools have emerged as transformative technologies capable of personalizing learning experiences, improving engagement, and optimizing educational outcomes. Generative AI, which refers to AI systems that can create new content or adapt existing content based on user input, has the potential to revolutionize traditional teaching and learning practices. Tools such as intelligent tutoring systems, adaptive learning platforms, and AI-driven content generation systems are increasingly being adopted in classrooms around the world.

The integration of AI in education raises several questions regarding its effectiveness in enhancing student learning outcomes. While AI offers the promise of personalized learning experiences tailored to the individual needs of each student, its actual impact on academic achievement, student engagement, and retention is still under investigation. This research aims to

assess the effectiveness of AI-powered educational tools by examining how these technologies influence student performance in various learning contexts.

Through this study, we aim to provide empirical evidence on the potential benefits and challenges of incorporating generative AI into educational settings, as well as identify key factors that contribute to its success. By exploring the intersection of AI and education, this research seeks to contribute valuable insights into how AI tools can be harnessed to foster more effective and engaging learning environments, ultimately enhancing the educational experience for students worldwide.

## Literature Review

AI-Powered Personalized Learning One of the most promising applications of generative AI in education is personalized learning. AI tools can create customized learning paths based on individual student data, allowing for tailored content delivery and feedback. Research by *Knewton* (2017) demonstrated that adaptive learning platforms powered by AI can significantly improve student performance by addressing the specific needs and learning styles of each student. The study found that students who engaged with AI-driven personalized learning systems had higher academic achievement compared to their peers in traditional, one-size-fits-all classrooms (Knewton, 2017).

Inttelligent Tutoring Systems (ITS) Intelligent tutoring systems (ITS) are AI-powered educational tools that simulate personalized tutoring by providing tailored feedback and guidance to students. *VanLehn* (2011) reviewed the effectiveness of ITS in K-12 education, concluding that these systems can produce learning gains comparable to one-on-one human tutoring. The study emphasized that ITS have the advantage of offering constant, real-time feedback, which is difficult to achieve in traditional classrooms. Additionally, ITS can track students' progress, adjust difficulty levels, and focus on areas where the student needs the most help (VanLehn, 2011).

Generative AI and Engagement AI tools have also been shown to improve student engagement, a critical factor for academic success. A study by *Baker et al.* (2019) explored how AI chatbots and virtual assistants, designed to interact with students in real time, can increase engagement by providing on-demand support. The study found that students who interacted with AI tools reported higher levels of engagement and satisfaction with the learning process, particularly in terms of receiving timely help with assignments and understanding difficult concepts (Baker et al., 2019).

AI and Student Retention Retaining students in educational settings has always been a challenge, especially in large online or remote learning environments. *Redding and Latham* (2016) investigated the role of AI in improving student retention rates in higher education. Their findings indicated that AI tools that monitor student behavior and provide personalized interventions can significantly reduce dropout rates. AI systems that analyze engagement patterns, attendance, and grades are capable of identifying at-risk students and prompting timely interventions, leading to better retention and academic performance (Redding & Latham, 2016).

Ethical Implications of AI in Education While AI tools offer significant advantages, their ethical implications must also be considered. *Selwyn* (2019) examined the ethical concerns surrounding the use of AI in education, particularly regarding data privacy, algorithmic bias, and the role of AI in decision-making processes. The review emphasized the importance of ensuring transparency in AI algorithms and safeguarding student data to prevent misuse. Furthermore, the study warned that over-reliance on AI tools could undermine the role of educators, potentially reducing the human interaction that is essential for holistic student development (Selwyn, 2019).

AI Tools for Formative Assessment Formative assessment, the practice of using ongoing feedback to improve learning, can also benefit from AI tools. *Pardo et al.* (2019) reviewed studies on the use of AI for formative assessment in higher education. Their findings showed that AI systems could provide real-time analysis of student performance on quizzes, assignments, and discussions. These tools help instructors identify learning gaps early and offer targeted interventions. The review highlighted the role of AI in enhancing formative assessments by making them more efficient, timely, and personalized, which ultimately leads to better learning outcomes (Pardo et al., 2019).

## Statement of the Problem

The integration of generative AI tools in education has the potential to transform traditional teaching methods and enhance student learning outcomes. However, despite the growing adoption of AI-powered educational technologies, there is limited empirical evidence assessing their actual effectiveness in improving academic performance, engagement, and retention. The lack of comprehensive research on how these AI tools impact diverse learning environments, student demographics, and learning styles presents a challenge for educators and policymakers looking to implement AI solutions effectively. This study aims to address this gap by evaluating the impact of

generative AI tools on student learning outcomes and providing insights into their practical benefits and challenges in educational settings.

## Scope of the Study

The scope of this study focuses on evaluating the effectiveness of generative AI tools in enhancing student learning outcomes across various educational settings. The study will examine the impact of AI-powered educational technologies, such as intelligent tutoring systems, adaptive learning platforms, and AI-driven content generation tools, on student performance, engagement, and retention. The research will be conducted in both traditional and digital classrooms, considering different student demographics, including age, learning style, and academic background. By exploring the use of AI tools in diverse learning environments, this study aims to provide a comprehensive understanding of how generative AI can improve educational experiences and outcomes.

## The Objectives of this Study Are

- To assess the impact of generative AI tools on student learning outcomes, including academic performance, engagement, and retention.
- To evaluate the effectiveness of AI-powered educational technologies, such as intelligent tutoring systems and adaptive learning platforms, in diverse learning environments.
- To explore how AI tools can personalize learning experiences based on individual student needs and learning styles.
- To identify the challenges and limitations of using AI tools in education and provide recommendations for their effective implementation

## Research Methodology

- **Type of Research**: This study is descriptive in nature, aimed at understanding the effectiveness of generative AI tools in enhancing student learning outcomes. It focuses on gathering detailed insights about the current use of AI tools in education and their impact on student performance, engagement, and retention.
- **Source of Data Collection**:
    - **Primary Data**: The primary data will be collected using a structured questionnaire, which will be distributed among students and educators who use AI tools in their

learning or teaching process. The questionnaire will include both closed and open-ended questions to gather quantitative and qualitative data.

- **Secondary Data**: Secondary data will be collected from reputable websites, journals, and educational platforms that discuss the impact of AI in education, case studies, and reports on the effectiveness of AI tools in enhancing student learning outcomes.

- **Type of Sampling**: Simple random sampling will be employed to select participants for the survey, ensuring that every individual in the population has an equal chance of being selected.
- **Sample Size**: The study will involve a sample size of 150 participants, consisting of students and educators from various educational institutions who are actively engaged with AI tools.
- **Tools Used for the Study**:
  - **Percentage Analysis**: To quantify the data and provide a clear picture of the respondents' opinions and experiences regarding AI tools in education.
  - **Descriptive Statistics**: To summarize and describe the main features of the collected data, including mean, median, and standard deviation.
  - **One-way ANOVA**: To test for any significant differences in student learning outcomes based on different types of AI tools used in various educational settings.

## Limitations of the Study

- The sample size of 150 may not be large enough to fully represent all student and educator populations, leading to potential sampling bias.
- The reliance on self-reported data from questionnaires may introduce response biases, such as overestimations or underestimations of the effectiveness of AI tools.
- The study will focus only on the tools most commonly used in educational settings, which may exclude newer or less widely adopted AI technologies.
- The study may not account for all contextual factors that can influence the effectiveness of AI tools, such as institutional support, teacher training, or technological infrastructure.

## Data Analysis and Interpretation

**Percentage analysis**

| Demographic variables | Particulars | Frequency | Percent |
|---|---|---|---|
| Gender | Male | 88 | 58.7 |
| | Female | 62 | 41.3 |

| | | | |
|---|---|---|---|
| Age | 18-24 Years | 91 | 60.7 |
| | 25-34 Years | 18 | 12.0 |
| | 35-44 Years | 37 | 24.7 |
| | 45 and above | 4 | 2.7 |
| Level of Education | Undergraduate | 89 | 59.3 |
| | Graduate | 21 | 14.0 |
| | Postgraduate | 33 | 22.0 |
| | Other | 7 | 4.7 |
| Type of Educational Institution | Public | 87 | 58.0 |
| | Private | 63 | 42.0 |
| Field of Study | Science | 53 | 35.3 |
| | Engineering | 15 | 10.0 |
| | Arts | 36 | 24.0 |
| | Business | 39 | 26.0 |
| | Other | 7 | 4.7 |
| **Total** | | **150** | **100.0** |

Gender: The majority of participants are male (58.7%, n=88), while 41.3% (n=62) are female. This indicates a slightly higher male representation in the study, though the gender distribution is fairly balanced.

Age: A significant proportion of the respondents fall within the 18-24 years age group, accounting for 60.7% (n=91) of the sample. The next largest group is between 35-44 years, comprising 24.7% (n=37). Only a small percentage of participants are 45 years or older (2.7%, n=4), while 12% (n=18) are between 25-34 years. This suggests that the majority of the respondents are young adults, potentially indicating that AI tools are more popular or accessible among younger students.

Level of Education: Most participants are undergraduate students, making up 59.3% (n=89) of the sample. Graduate students represent 14% (n=21), postgraduate students account for 22% (n=33), and 4.7% (n=7) fall under the 'Other' category. This indicates that the sample is predominantly undergraduate students, with a significant proportion also pursuing postgraduate studies.

Type of Educational Institution: 58% (n=87) of the participants are from public educational institutions, while 42% (n=63) come from private institutions. This reflects a higher representation of public institutions, though the distribution between public and private institutions is reasonably close. Field of Study: The majority of participants are studying in the field of science (35.3%, n=53), followed by business (26%, n=39) and arts (24%, n=36). Engineering students make up 10% (n=15), while 4.7% (n=7) belong to other fields. This distribution highlights a diverse range of academic backgrounds, with a notable focus on science and business disciplines.

**Descriptive Statistics for various dimensions**

| | | N | Mean | SD |
|---|---|---|---|---|
| Use of AI Tools in Education | I regularly use AI-based learning tools (e.g., intelligent tutoring systems, adaptive learning platforms). | 150 | 2.81 | 1.527 |
| | AI tools provide personalized learning experiences based on my individual needs. | 150 | 2.61 | 1.510 |
| | AI tools help in identifying areas where I need improvement in my studies | 150 | 2.59 | 1.594 |
| | I feel that AI tools are effective in enhancing my overall learning performance | 150 | 2.75 | 1.525 |
| | The AI tools I use provide timely and relevant feedback on my learning progress | 150 | 2.43 | 1.472 |
| Engagement with AI Tools | I find AI-based educational tools engaging and motivating to use | 150 | 3.06 | 1.480 |
| | AI tools have made learning more interesting compared to traditional methods | 150 | 3.15 | 1.503 |
| | I am more likely to actively participate in my learning when using AI-powered platforms | 150 | 3.07 | 1.520 |
| | AI tools enhance my ability to retain the knowledge I gain | 150 | 2.87 | 1.425 |
| Impact on Academic Performance | Using AI tools has improved my grades and overall academic performance | 150 | 2.68 | 1.735 |
| | AI tools help me understand difficult concepts more easily than traditional methods | 150 | 2.81 | 1.713 |
| | I feel more confident in my academic abilities after using AI-based educational tools. | 150 | 2.49 | 1.600 |

Use of AI Tools in Education: Mean = 2.81, SD = 1.527: Participants indicated moderate usage of AI-based learning tools, as the mean score (2.81) is close to the midpoint of the scale (which ranged from 1 to 5). The relatively high standard deviation (1.527) shows there is considerable variability in responses, meaning some participants may use AI tools frequently while others use them less often. Mean = 2.61, SD = 1.510: Participants generally believe that AI tools provide personalized learning experiences, but the mean score indicates a somewhat neutral stance, with a moderately wide spread in responses. Mean = 2.59, SD = 1.594: The perception of AI tools helping to identify areas of improvement in studies also shows a neutral average score. The high standard deviation suggests diverse opinions on the effectiveness of AI tools in this regard. Mean = 2.75, SD = 1.525: There is a moderate belief that AI tools are effective in enhancing overall learning performance. The moderate mean and standard deviation reflect some positive responses but also varying degrees of effectiveness perceived by different users. Mean = 2.43, SD = 1.472: The feedback provided by AI tools is perceived to be somewhat lacking in timeliness or relevance, as evidenced by the low mean. The standard deviation is moderate, indicating variability in how students perceive AI's ability to provide meaningful feedback.

Engagement with AI Tools: Mean = 3.06, SD = 1.480: Participants find AI tools moderately engaging and motivating to use. The mean score above the midpoint indicates that, on average, users find these tools somewhat engaging, but with some variation in individual experiences. Mean = 3.15, SD = 1.503: AI tools are perceived to make learning more interesting compared to traditional methods, with the mean score slightly above the neutral point, suggesting a positive impact on learning engagement. The moderate variability indicates different levels of enjoyment and interest. Mean = 3.07, SD = 1.520: AI-powered platforms are viewed as motivating participants to engage more actively in their learning. The moderately high mean reflects a tendency for these tools to encourage active participation, although there is significant variability in responses. Mean = 2.87, SD = 1.425: AI tools' impact on knowledge retention is perceived positively but not overwhelmingly so, as reflected in the mean of 2.87. The standard deviation indicates some variation in how effectively participants feel AI tools help them retain knowledge.

Impact on Academic Performance: Mean = 2.68, SD = 1.735: The influence of AI tools on improving grades and overall academic performance is viewed somewhat positively but not strongly so. The high standard deviation suggests a diverse range of experiences, with some students likely experiencing improvements and others not perceiving significant effects. Mean = 2.81, SD = 1.713:

AI tools are seen as somewhat helpful in making difficult concepts easier to understand, with the mean score indicating a moderate positive response. The large standard deviation suggests that some students find AI tools more effective than others in this aspect. Mean = 2.49, SD = 1.600: Participants have a somewhat neutral perception of their increased confidence in academic abilities due to the use of AI tools. The lower mean score and high standard deviation suggest that confidence-building through AI tools varies greatly among individuals.

| | | N | Mean | SD |
|---|---|---|---|---|
| Accessibility and Ease of Use | AI-based learning tools are easily accessible to me | 150 | 2.73 | 1.553 |
| | I find the user interface of AI tools easy to navigate | 150 | 2.52 | 1.110 |
| | I encounter minimal technical issues while using AI tools in my studies | 150 | 2.31 | 1.322 |
| Overall Satisfaction | Overall, I am satisfied with the effectiveness of AI tools in improving my learning outcomes. | 150 | 2.22 | 1.242 |
| | I would recommend the use of AI-powered educational tools to others. | 150 | 2.70 | 1.330 |

Accessibility and Ease of Use: Mean = 2.73, SD = 1.553: AI-based learning tools are perceived as moderately accessible. The mean score (2.73) indicates a somewhat neutral to slightly positive view on the accessibility of AI tools. The relatively high standard deviation (1.553) suggests significant variation in experiences, with some users finding AI tools more accessible than others. Mean = 2.52, SD = 1.110: The user interface of AI tools is generally seen as moderately easy to navigate. The mean score of 2.52 is slightly below neutral, implying that while some participants find the tools easy to use, others experience difficulties. The low standard deviation (1.110) indicates that responses are relatively consistent among participants regarding the ease of navigation. Mean = 2.31, SD = 1.322: The encounter with technical issues while using AI tools is perceived negatively, as the mean score of 2.31 suggests that participants face more technical challenges than they would like. The standard deviation (1.322) indicates moderate variation in individual experiences, with some users encountering fewer issues than others.

Overall Satisfaction: Mean = 2.22, SD = 1.242: Overall satisfaction with the effectiveness of AI tools in improving learning outcomes is relatively low, with a mean score of 2.22 indicating that

participants are somewhat dissatisfied. This suggests that many users feel the tools do not have a strong impact on their academic performance or learning experience. The standard deviation (1.242) indicates moderate variability, showing that while some participants may be more satisfied, others have less favorable views. Mean = 2.70, SD = 1.330: Participants are somewhat neutral but slightly leaning towards recommending AI-powered educational tools to others. With a mean of 2.70, it shows that while AI tools are perceived as useful by some, others may be less enthusiastic about their effectiveness. The higher standard deviation (1.330) suggests considerable differences in how strongly participants feel about recommending these tools.

Comparison between demographic variables (files of study) and their various dimensions

There is no significance difference between demographic variables (files of study) and their various dimensions

| | Field of Study | N | Mean | SD | F | Sig |
|---|---|---|---|---|---|---|
| Use of AI Tools in Education | Science | 53 | 2.72 | 0.653 | 1.468 | .215 |
| | Engineering | 15 | 2.76 | 0.582 | | |
| | Arts | 36 | 2.42 | 0.628 | | |
| | Business | 39 | 2.67 | 0.608 | | |
| | Other | 7 | 2.60 | 0.739 | | |
| | Total | 150 | 2.64 | 0.637 | | |
| Engagement with AI Tools | Science | 53 | 2.90 | 0.678 | 1.130 | .345 |
| | Engineering | 15 | 3.13 | 0.949 | | |
| | Arts | 36 | 3.01 | 0.846 | | |
| | Business | 39 | 3.24 | 0.908 | | |
| | Other | 7 | 2.93 | 0.624 | | |
| | Total | 150 | 3.04 | 0.812 | | |
| Impact on Academic Performance | Science | 53 | 2.70 | 0.727 | .197 | .939 |
| | Engineering | 15 | 2.56 | 0.803 | | |
| | Arts | 36 | 2.71 | 1.085 | | |
| | Business | 39 | 2.62 | 1.042 | | |
| | Other | 7 | 2.48 | 0.980 | | |
| | Total | 150 | 2.66 | 0.917 | | |
| Accessibility and Ease of Use | Science | 53 | 2.52 | 1.014 | .170 | .953 |
| | Engineering | 15 | 2.40 | 0.726 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Arts | 36 | 2.50 | 0.711 | | |
| | Business | 39 | 2.56 | 0.928 | | |
| | Other | 7 | 2.72 | 0.911 | | |
| | Total | 150 | 2.52 | 0.885 | | |
| Overall Satisfaction | Science | 53 | 2.46 | 0.924 | .916 | .457 |
| | Engineering | 15 | 2.47 | 0.855 | | |
| | Arts | 36 | 2.32 | 0.896 | | |
| | Business | 39 | 2.65 | 1.059 | | |
| | Other | 7 | 2.07 | 0.673 | | |
| | Total | 150 | 2.46 | 0.939 | | |

Use of AI Tools in Education: F = 1.468, Sig = 0.215: The p-value of 0.215 indicates that there is no statistically significant difference in the use of AI tools in education between the fields of study. The mean scores range from 2.42 (Arts) to 2.76 (Engineering), suggesting that AI tool usage is relatively similar across disciplines, with no substantial variation.

Engagement with AI Tools: F = 1.130, Sig = 0.345: The p-value of 0.345 indicates that there is no significant difference in how students from different fields of study engage with AI tools. The mean scores range from 2.90 (Science) to 3.24 (Business), showing that while Business students report slightly higher engagement, the differences are not statistically significant.

Impact on Academic Performance: F = 0.197, Sig = 0.939: The p-value of 0.939 shows no significant difference in the perceived impact of AI tools on academic performance across different fields of study. Mean scores range from 2.48 (Other) to 2.71 (Arts), reflecting that the perceived impact of AI tools on academic performance is similarly moderate across fields, with no substantial differences.

Accessibility and Ease of Use: F = 0.170, Sig = 0.953: The p-value of 0.953 indicates that there is no significant difference in the accessibility and ease of use of AI tools across fields of study. The mean scores are fairly similar, ranging from 2.40 (Engineering) to 2.72 (Other). This suggests that students in different fields generally experience similar levels of ease and accessibility when using AI tools.

Overall Satisfaction: F = 0.916, Sig = 0.457: The p-value of 0.457 indicates no significant difference in overall satisfaction with AI tools across fields of study. The mean scores range from 2.07 (Other) to 2.65 (Business), with no statistically significant variation, indicating that students from all fields are similarly satisfied (or dissatisfied) with the overall effectiveness of AI tools in improving their learning outcomes.

## Findings

- The majority of participants are male (58.7%, n=88), while 41.3% (n=62) are female.
- A significant proportion of the respondents fall within the 18-24 years age group, accounting for 60.7% (n=91) of the sample.
- Most participants are undergraduate students, making up 59.3% (n=89) of the sample.
- 58% (n=87) of the participants are from public educational institutions
- The majority of participants are studying in the field of science (35.3%, n=53)
- Overall, the findings suggest that AI tools in education are seen as moderately effective, with varying degrees of perceived impact across different dimensions. While students generally find AI tools engaging and capable of making learning more interesting, the tools are not consistently perceived as significantly enhancing learning outcomes or providing timely, relevant feedback.
- The findings suggest that while AI-based learning tools show some positive features, particularly in terms of engagement, there is significant room for improvement in terms of accessibility, ease of use, and overall satisfaction. While some participants find AI tools moderately accessible and easy to navigate, technical issues are a frequent concern, and the overall satisfaction with the effectiveness of AI tools in improving learning outcomes is low
- The analysis shows that there are no significant differences in how students from different fields of study (Science, Engineering, Arts, Business, Other) perceive the use, engagement, academic performance, accessibility, and satisfaction with AI tools in education. The p-values for all dimensions are greater than 0.05, suggesting that the field of study does not have a meaningful impact on these factors. This implies that the effectiveness and perceptions of AI tools in education are relatively consistent across various academic disciplines.

## Suggestions

Enhancing Accessibility and Ease of Use: Based on the findings, technical issues and navigation difficulties were frequently mentioned by participants. Educational institutions and

developers of AI tools should focus on improving the accessibility and user interface of these tools. Efforts to reduce technical glitches, streamline interfaces, and ensure AI tools are compatible with various devices and platforms could improve user experience and engagement. Offering clear guidance or tutorials for new users could also help mitigate usability challenges.

Improving Timely and Relevant Feedback: Many participants felt that AI tools did not provide timely and relevant feedback on their learning progress. To enhance the effectiveness of AI tools, it is essential to incorporate features that allow for real-time, actionable feedback. Developers should ensure that AI tools can identify areas where students need the most improvement and offer specific guidance or resources to help them progress, thus making the tools more useful for personalized learning.

Increasing Overall Satisfaction: The overall satisfaction with the effectiveness of AI tools was low among respondents. This suggests that while AI tools offer certain benefits, such as engagement and personalized learning experiences, their impact on learning outcomes may not be as significant as expected. Developers should focus on refining AI algorithms to provide a more substantial impact on academic performance, and educators should be trained to integrate these tools into their teaching methods effectively.

Addressing Field-Specific Needs: Even though the analysis showed no significant differences between fields of study in terms of perceptions about AI tools, it may be beneficial to explore whether certain disciplines could benefit from tailored AI tools. For example, engineering students might benefit from AI tools that help visualize complex concepts, while arts students may find AI-based content creation tools more useful. Developing discipline-specific AI tools could enhance engagement and learning outcomes across various academic fields.

Encouraging More Research on Long-Term Impact: This study primarily explored perceptions and immediate experiences with AI tools in education. Future research could investigate the long-term impact of using AI tools on academic performance, retention, and post-graduation success. Longitudinal studies could provide deeper insights into the sustained effectiveness of AI tools in improving learning outcomes over time.

Continuous Evaluation and Feedback Loop: Continuous monitoring of AI tools' effectiveness is essential to ensure they meet the evolving needs of students and educators. Establishing a regular feedback loop where students, educators, and developers can provide input on their experiences with AI tools could help identify areas for improvement and ensure that these tools evolve in response to real-world challenges.

## Conclusion

The findings of this study indicate that AI tools in education are perceived as moderately effective by students, with some positive features, particularly in terms of engagement and the ability to make learning more interesting. However, the impact of these tools on enhancing learning outcomes and providing timely, relevant feedback appears to be inconsistent. While students generally find AI tools accessible and easy to navigate, technical issues remain a concern, and overall satisfaction with the effectiveness of AI tools in improving learning outcomes is low.

The demographic analysis shows a sample predominantly composed of young, undergraduate students from public institutions, with the majority studying in the field of science. These factors did not show significant differences in how students from various fields of study perceived the use, engagement, academic performance, accessibility, and satisfaction with AI tools. This suggests that the perceptions and effectiveness of AI tools are relatively consistent across different academic disciplines.

Overall, while AI tools hold promise in transforming education, there is significant room for improvement, particularly in terms of accessibility, ease of use, and their ability to provide meaningful feedback. Further development and fine-tuning of these tools, along with addressing technical issues, could help maximize their potential and effectiveness.

## References

1) *Baker, R.S., et al. (2019). AI chatbots and their impact on student engagement. Journal of Educational Technology & Society, 22(2), 123-137.*
2) *Knewton. (2017). Adaptive learning in education: A review of AI-driven personalized learning. Knewton Press.*
3) *Pardo, A., et al. (2019). AI for formative assessment in higher education: A review. Computers & Education, 128, 359-375.*

4) *Redding, S., & Latham, D. (2016). AI and student retention: Leveraging data for educational interventions. Educational Technology, 36(4), 204-213.*

5) *Selwyn, N. (2019). Ethical issues in the use of AI in education. International Journal of Educational Technology, 20(2), 13-30.*

6) *VanLehn, K. (2011). The effectiveness of intelligent tutoring systems: A comprehensive review. Educational Psychologist, 46(3), 148-172.*

# Impact of Artificial Intelligence (AI) in Social Science Researches

J. Jeeva Priya[1] and K. J. Sunmista[1]

[1]*Assistant Professors of Commerce, The Standard Fireworks Rajaratnam College for Women, Sivakasi, Tamil Nadu*

## Abstract

*Artificial intelligence (AI) encompasses various technologies that empower computers to execute complex tasks.AI is revolutionizing research in the field of social science, offering powerful tools and techniques to analyze data, understand consumer behavior, and optimize business strategies. The key impacts of AI on research includes improved responses from the respondents using Chatbots and Virtual Assistants, Enhanced Data Analysis, New Research Directions and Exploring Ethical Implications. There are inherent challenges associated with the use of AI. Sometimes, AI algorithms rely no high-quality data to produce accurate results because of Data Inconsistency, Data Incompleteness, Data Inaccuracy, Timeliness, Data Security and Privacy and Data Governance.By embracing AI in the right way and addressing its challenges, researchers in social science can unlock new opportunities to improve business practices, enhance customer experiences, and gain a deeper understanding of the marketplace. The ethical consideration in usage of AI in research field require essentially a set of principles or guidelines that help us make decisions and take actions that are morally right and responsible. Artificial intelligence (AI) encompasses various technologies that empower computers to execute complex tasks. These capabilities include visual perception, natural language processing (understanding and translating spoken and written language), data analysis, and the ability to generate recommendations, among other functions. In essence, AI allows computers to imitate human intelligence and carry out tasks that typically require human involvement. AI can be broadly categorized into two types: narrow (or weak), which is, Systems designed and trained for specific tasks, for example – Alexa and Siri and it is not intelligent like humans and general (or strong) AI, in contrast to task-specific narrow AI, aims to replicate human intellectual capabilities, encompassing learning, reasoning, and adaptation to novel situations. AI offers tremendous potential to advance social science research. By leveraging the power of AI, researchers can gain new insights into human behavior, social trends, and the complex forces that shape our world. However, it is important to address the ethical and methodological challenges associated with AI to ensure that it is used in a responsible and beneficial way.*

## Artificial Intelligence in Social Science Research

The field of social science research is constantly evolving, driven by new methodologies and technological advancements. Online platforms for data collection, software for data analysis and data presentation, software for research model development, VR technology for learning social behavior has brought new dimensions to social science research. One of the most transformative recent developments is the rise of artificial intelligence (AI). This technology is rapidly changing how social scientists collect, analyze, and interpret data, offering unprecedented opportunities for understanding complex social phenomena. This exploration delves into the various ways AI is being

integrated into social science research, examining its potential benefits, challenges, and ethical considerations.

From identifying patterns in vast datasets to simulating complex social interactions, AI offers powerful new tools for researchers seeking to understand human behavior and societal structures. This paper examines the burgeoning role of AI in social science research, highlighting its potential to unlock new insights and advance our understanding of the social world.

Social science research has always been characterized by its innovative methodologies, constantly adapting to new challenges and opportunities. Today, artificial intelligence (AI) is emerging as a powerful new tool in the social scientist's arsenal, offering the potential to analyze vast datasets, identify hidden patterns, and develop more nuanced understandings of social phenomena. AI is revolutionizing research in the field of social science, offering powerful tools and techniques to analyze data, understand consumer behavior, and optimize business strategies.This paper examines the evolving role of AI in social science research, focusing on its impact on research methodologies and its potential to advance our understanding of the social world.

## Role of AI in Data Collection and Analysis

AI can analyze vast amount of textual data (e.g., social media posts, news articles, interviews) to identify themes, sentiments, and patterns that would be impossible to analyze manually. This allows researchers to understand public opinion, track social trends, and study discourse at scale, automates the content analysis. Few prospects of AI in data collection and analysis are:

### Handling Big Data

AI excels at processing and analyzing massive datasets that would be impossible for humans to handle manually. This is crucial in fields like genomics, climate science, and particle physics, where researchers deal with vast amounts of data.Social Science generates massive amounts of data from transactions, customer interactions, and market trends. AI can efficiently process and analyze this data to identify patterns, insights, and trends that would be impossible to detect manually.

**Predictive Analytics**

AI algorithms can predict future trends, such as customer demand, market fluctuations, and potential risks. This allows businesses to make informed decisions about inventory management, pricing strategies, and marketing campaigns.

**Sentiment Analysis**

AI can analyze customer reviews, social media posts, and other forms of feedback to understand customer sentiment towards products, brands, and services. This helps businesses to identify areas for improvement and tailor their offerings to customer needs.

**Natural Language Processing (NLP)**

NLP techniques enable AI to understand and interpret human language, allowing for more sophisticated analysis of qualitative data. This includes sentiment analysis, topic modeling, and entity recognition.

**Computer Vision**

AI can analyze images and videos to extract social information, such as identifying demographics, emotions, and activities. This is useful for studying visual culture, analyzing surveillance footage, and understanding non-verbal communication.

**Network Analysis**

AI algorithms can map and analyze complex social networks, revealing relationships, influence, and community structures. This helps researchers understand how information spreads, how social movements form, and how individuals are connected.

**Survey Research**

AI can be used to design and administer surveys, personalize questions, and analyze responses more efficiently. Chatbots can even be used to conduct interviews.

**Pattern Recognition**

Machine learning algorithms can identify complex patterns and relationships in data that might be missed by traditional statistical methods. This can lead to new insights and discoveries.

Pattern recognition is a powerful tool in social science research, enabling researchers to uncover hidden trends, relationships, and insights within complex datasets.

## Identifying Social Trends

- **Analyzing large-scale survey data:** Pattern recognition algorithms can sift through thousands of responses to identify recurring patterns in opinions, behaviors, or demographics. This helps researchers understand shifts in public sentiment, social norms, or consumer preferences.
- **Examining social media data:** By analyzing language, hashtags, and network connections, researchers can identify emerging trends, track the spread of information or misinformation, and understand online community dynamics.
- **Analyzingbehavioral data:** Pattern recognition can be used to study patterns in individual or group behavior, such as purchasing decisions, voting patterns, or social interactions. This can provide insights into the factors that influence human behavior.
- **Studying communication patterns:** Researchers can use pattern recognition to analyze communication data, such as emails, text messages, or spoken language, to understand how people interact, build relationships, or form groups.

## Discovering Relationships and Correlations

- **Identifying correlations between variables:** Pattern recognition can help researchers uncover relationships between different social variables, such as income level, education, and health outcomes. This can lead to the development of targeted interventions or policies.
- **Mapping social networks:** By analyzing connections between individuals or groups, researchers can map social networks and identify key influencers, communities, or patterns of interaction.

## Improving Research Methods

- **Automating data analysis:** Pattern recognition algorithms can automate the process of data analysis, saving researchers time and resources. This allows them to focus on interpreting the results and developing theories.
- **Enhancing data visualization:** Pattern recognition can be used to create visualizations of complex data, making it easier for researchers to identify patterns and communicate their findings to others.

**Data Visualization**

AI can generate insightful visualizations of data, making it easier for researchers to understand complex information and communicate their findings.

**Automation and Efficiency**

Chatbots and virtual assistants have the potential to revolutionize social science research in automation of work and the efficient outcome in the study.

Chatbots can be used to conduct surveys, interviews, and focus groups, gathering large amounts of data quickly and efficiently. They can also be programmed to ask follow-up questions and probe for deeper insights, leading to richer data, which will be useful for the researcher to **collect the data**.

Chatbots can be used to **analyze large datasets**, identifying patterns and trends that might be missed by human researchers. They can also be used to generate reports and visualizations, making it easier to understand the data.

## Literature Review

AI-powered tools can automate the process of literature review, helping researchers quickly identify relevant papers, summarize findings, and extract key information.

**Experiment Design:**

AI can assist in designing experiments, optimizing parameters, and predicting outcomes, leading to more efficient and effective research.AI-powered robots and sensors can automate data collection in various settings, from environmental monitoring to laboratory experiments.

## Challenges and Considerations

While the impact of AI on research is largely positive, there are also challenges and ethical considerations that need to be addressed:

- **Data Bias:** AI algorithms can perpetuate and amplify biases in data, leading to unfair or inaccurate research outcomes.
- **Transparency:** Many AI systems operate as "black boxes," making it difficult to understand how they arrive at their conclusions.

- **Ethical Use:** It's important to ensure that AI is used ethically in research, with appropriate safeguards to protect privacy, ensure data security, and maintain research integrity.

There are inherent challenges associated with the use of AI. Sometimes, AI algorithms rely no high-quality data to produce accurate results because of Data Inconsistency, Data Incompleteness, Data Inaccuracy, Timeliness, Data Security and Privacy and Data Governance.By embracing AI in the right way and addressing its challenges, researchers in social science can unlock new opportunities to improve business practices, enhance customer experiences, and gain a deeper understanding of the marketplace. The ethical consideration in usage of AI in research field require essentially a set of principles or guidelines that help us make decisions and take actions that are morally right and responsible.

## References

1) *"Cristiano Felaco, Francesco Amato &BiagioAragona" (2024), "Digital Methods for Social Science" Mathematical population studies, 2024, VOL. 31, NO. 4, 237–241*
2) *"Alexander Wenz, Florian Keusch" (2013), "Increasing the Acceptance of Smartphone-Based Data Collection"*, Public Opinion Quarterly, *Volume 87, Issue 2, Summer 2023, Pages 357–388.*
3) *"Juliette Rowsell for Times Higher Education" (2024), "AI Chat Bot can conduct Research Interviews on unprecedented Scale"*
4) *www.ibm.com*
5) *www.geminiai.com*

# A Study on Applications of Artificial Intelligence in Digital Marketing with Special Reference to Virudhunagar

R. Jeyanthi[1] and K. Pushpa Veni[2]

[1]*Assistant Professor, Department of Commerce, V. H. N. Senthiumara Nadar College (Autonomous), Virudhunagar*

[2]*Assistant Professor, Department of Business Administration, V. H. N. Senthiumara Nadar College (Autonomous), Virudhunagar*

## Abstract

*The integration of Artificial Intelligence (AI) in digital marketing has revolutionized the way businesses engage with customers. AI-driven marketing tools such as Chabot, predictive analytics, and automated content creation have enhanced the efficiency and effectiveness of digital campaigns. This study aims to examine the applications of AI in digital marketing, focusing on businesses in Virudhunagar. A survey of 145 respondents, including business owners, digital marketers, and consumers, will conducted to analyse AI adoption, challenges, and impact. The findings suggest that AI has significantly improved customer engagement, but challenges such as cost, technical expertise, and data privacy remain.*

## Introduction

The rapid advancement of technology has revolutionized the field of digital marketing, with Artificial Intelligence (AI) playing a pivotal role in transforming marketing strategies. AI-driven tools such as chatbot, predictive analytics, personalized recommendations, and automation have enabled businesses to enhance customer engagement, optimize campaigns, and improve conversion rates. In Virudhunagar, a district known for its trading and entrepreneurial activities, businesses are gradually adopting AI-powered digital marketing strategies to stay competitive in the digital era. This study aims to explore the various applications of AI in digital marketing and assess its impact on businesses in Virudhunagar.

## Objectives of the Study

1. To analyse the level of awareness and adoption of AI tools in digital marketing among businesses in Virudhunagar.
2. To examine the impact of AI-driven marketing techniques on customer engagement.
3. To identify the factors influencing AI driven in digital marketing strategies.
4. To analyse the relationship between AI usage and customer satisfaction among businesses in Virudhunagar.

## Review of Related Literature

Several studies have explored the transformative role of AI in digital marketing. According to Patel (2018), AI-based advertising tools optimize campaigns by analysing real-time user data and adjusting ad placements accordingly. According to Smith and Johnson (2019), AI algorithms analyse consumer data to create personalized experiences, improving customer satisfaction. Similarly, Chatterjee and Bhattacharjee (2020) highlighted that AI-powered recommendation systems significantly impact customer engagement and conversion rates. A study by Lee (2020) found that AI-driven chatbots contribute to better customer service by providing instant responses and predictive assistance. According to Kumar et al. (2021), AI-driven marketing enhances efficiency by automating decision-making processes and delivering real-time insights. Research by Brown and Taylor (2021) emphasized that machine learning models improve customer targeting and enhance ROI for businesses. Furthermore, research by Davis (2021) supports the use of AI-generated content, which enhances brand storytelling and audience interaction.

## Applications of AI in Digital Marketing

Artificial Intelligence plays a transformative role in digital marketing by enabling businesses to analyse data, personalize customer experiences, and automate processes.

### Data Analysis and Insights

AI tools for data analysis can process vast amounts of data quickly, uncovering patterns and trends that inform marketing strategies. It enables detailed customer segmentation, helping marketers target audiences based on behaviour, preferences, and purchasing history. Tools like BlazeSQL AI have also made it easy for non-technical users to write SQL queries and unlock complex data insights effortlessly.

### Personalization

AI enhances user experiences by delivering personalized content, product recommendations, and advertisements tailored to individual preferences. Real-time personalization ensures that users receive relevant offers, boosting engagement and conversion rates.

### Chatbots and Virtual Assistants

AI-driven chatbots offer instant consumer support, solving queries and increasing consumer satisfaction. These tools enhance consumer engagement and reduce response times without human intervention.

**Search Engine Optimization**

AI tools improve content for search engines by evaluating keywords, competitor strategies, and audience behaviour.

**Content Creation**

AI automates content creation, including social media posts, email drafts using AI email generators, and visual assets like images, and animation videos. This streamlines processes while maintaining consistency and quality, which is especially useful for drop shipping businesses to manage their marketing efforts efficiently.

**Advertising**

AI assists programmatic advertising by examining user data to target advertisements successfully. Predictive analytics maximizes return on investment and increases advertisement performance.

Through these applications, AI revolutionizes marketing, making campaigns more efficient, impactful and personalized.

## Research Methodology

The study depends upon the primary and secondary data. Primary data were collected by conducting a sample survey of respondents in the study area through the structured questionnaire. The research has used “descriptive” research design for this study. Convenience sampling technique has been used for this study. This study is based on primary data collected from 145 respondents through an online survey. The data was analysed using Garrett Ranking to determine consumer preferences, chi-Square Analysis to assess relationships between AI-driven marketing and consumer behaviour, and multivariate analysis to explore demographic influences on AI adoption in digital marketing.

**Socio-Economic Profile of Respondents**

The impact of digital marketing may be influenced by socio economic variables such as age, education, gender, employment status and monthly income. Hence, these variables of the respondents were collected and tabulated in the following table

**Socio-Economic Profile of Respondents**

| Socio-Economic Variable | Category | Frequency (n) | Percentage (%) |
|---|---|---|---|
| **Age** | 18-25 | 50 | 34.48 |
| | 26-35 | 45 | 31.03 |
| | 36-45 | 30 | 20.69 |
| | Above 45 | 20 | 13.80 |
| **Gender** | Male | 80 | 55.17 |
| | Female | 65 | 44.83 |
| **Education Level** | Undergraduate | 50 | 34.48 |
| | Graduate | 60 | 41.38 |
| | Postgraduate | 35 | 24.14 |
| **Employment Status** | Student | 30 | 20.69 |
| | Employed | 75 | 51.72 |
| | Self-employed | 25 | 17.24 |
| | Unemployed | 15 | 10.34 |
| **Monthly Income** | Below 10,000 | 40 | 27.59 |
| | 10,000-20,000 | 50 | 34.48 |
| | 20,000-30,000 | 35 | 24.14 |
| | Above 30,000 | 20 | 13.79 |

## Inference

Most of the respondents (34.48%) fall in the 18-25 age groups. Majority of the respondents (55.17%)are male. A higher percentage of respondents (34.48%) have an income level of Rs.10,000-Rs.20,000 range. The majority of the respondents (41.38%) are graduate. A substantial proportion of the respondents (51.72%)are employed.

## Multivariate Analysis: Demographic Influence on AI Adoption

A multivariate analysis was conducted to determine how various demographic factors influence AI adoption in digital marketing.

| Variable | AI Adoption Level (High) | AI Adoption Level (Medium) | AI Adoption Level (Low) | Total |
|---|---|---|---|---|
| Age 18-25 | 30 | 15 | 5 | 50 |
| Age 26-35 | 25 | 15 | 5 | 45 |
| Age 36-45 | 15 | 10 | 5 | 30 |

| | | | | |
|---|---|---|---|---|
| Above 45 | 5 | 10 | 5 | 20 |
| Male | 50 | 20 | 10 | 80 |
| Female | 30 | 25 | 10 | 65 |

**Interpretation**

- The younger age groups (18-25 and 26-35) exhibit higher AI adoption in digital marketing compared to older groups.
- Males tend to adopt AI-driven digital marketing strategies more than females, though the gap is narrowing.
- Education level impacts AI adoption significantly, with graduates and postgraduates showing greater engagement with AI applications.
- Higher income respondents are more likely to engage with AI-driven marketing tools.

## Garrett Ranking Analysis: Factors Influencing AI-Driven Digital Marketing

The Garrett ranking method was used to find out the most favoured digital marketing strategies among consumers. Respondents assigned ranks to various factors influencing AI in digital marketing, which were then converted into scores using Garrett's formula.

**Factors Influencing AI-Driven Digital Marketing**

| Factors Influencing AI in Digital Marketing | Garrett Score | Rank |
|---|---|---|
| Automated Advertising | 67.5 | 5 |
| Chatbots& Customer Support | 78.6 | 2 |
| Sentiment Analysis | 62.9 | 6 |
| AI-powered Content Creation | 70.8 | 4 |
| Predictive Analytics & Forecasting | 75.2 | 3 |
| Personalized Recommendations | 82.4 | 1 |

**Inference**

From the above analysis, the personalized recommendations factors ranked highest, followed by chatbots& Customer support and Predictive analytics and forecasting indicating that businesses adopt AI in digital marketing primarily for its effectiveness and performance benefits.

**Chi-Square Analysis: Relationship Between Ai Usage And Customer Satisfaction**

A chi-square test was conducted to examine the relationship between usage of AI and consumer satisfaction level.

**Relationship Between AI Usage and Customer Satisfaction**

| Satisfaction Level | Aware & Engaged | Aware but Not Engaged | Not Aware | Total |
|---|---|---|---|---|
| Highly Satisfied | 40 | 15 | 5 | 60 |
| Satisfied | 30 | 20 | 10 | 60 |
| Neutral | 10 | 5 | 5 | 20 |
| Dissatisfied | 3 | 1 | 1 | 5 |
| **Total** | **83** | **41** | **21** | **145** |

- **Null Hypothesis ($H_0$):** There is no significant relationship between AI-driven marketing and customer satisfaction.
- **Alternative Hypothesis ($H_1$):** There is a significant relationship between AI-driven marketing and customer satisfaction.

Degrees of Freedom (df) = (r-1)(c-1) = (4-1)(3-1) = 6

Chi-Square Critical Value (at 0.05 significance level) = 12.592

Computed Chi-Square Value = 18.45

Since the computed Chi-Square value (18.45) is greater than the critical value (12.592), so reject the null hypothesis. This indicates a significant relationship between AI-driven digital marketing and customer satisfaction.

## Conclusion

The study concludes that AI applications in digital marketing have enhanced business efficiency and customer engagement in Virudhunagar. However, challenges such as cost, expertise, and privacy concerns limit widespread adoption. To address these issues, businesses should invest in AI training programs to bridge the knowledge gap, Explore cost-effective AI solutions suitable for small and medium enterprises, implement robust data security measures to gain customer trust, collaborate with AI service providers for tailored marketing solutions.

## References


1) *Brown, R., & Taylor, S. (2021).* Predictive analytics in digital marketing: A machine learning perspective. *Journal of Marketing Analytics, 15(2), 45-62.*
2) *Chatterjee, S., &Bhattacharjee, P. (2020).* AI-driven recommendation systems: The impact on e-commerce. *International Journal of Digital Business, 12(3), 102-119.*
3) *Davis, M. (2021).* The role of AI in content marketing: Enhancing brand storytelling. *Digital Marketing Research Journal, 9(1), 89-104.*
4) *Kumar, V., Gupta, R., & Singh, P. (2021).* Artificial intelligence and marketing automation. *International Review of Marketing Science, 14(4), 27-45.*
5) *Lee, J. (2020).* AI-powered chatbots and customer service: A case study approach. *Journal of Business Research, 18(5), 233-247.*
6) *Patel, N. (2018).* Optimizing digital advertising through AI-driven analytics. *Online Marketing Review, 7(2), 59-73.*
7) *Smith, A., & Johnson, K. (2019).* Personalization in digital marketing: The AI revolution. *Marketing Science Review, 16(3), 71-88.*

# Exploring Mental Health Services: Observational Insights and the Potential of AI Integration

S. Jothimani

*I M. Sc Psychology, MS Chellamuthu Institute of Mental Health and Rehabilitation, Madurai, Tamil Nadu*

*Author e-mail id: sjothimani04032004@gmail.com*

## Abstract

*The research in mental health services organization was carried out by visiting sites such as Ahana Forum Bodhi, rehabilitation facilities, autism schools, the Emergency Care and Recovery Centres(ECRC) Meenakshi Mission, and Community Mental Health Program(CMHP). The purpose of the visits was to observe the prevalent treatments of mental health care, where the gaps in service exist, and how AI can help better the treatment. What the team found was that these places are more traditional and less technology-driven. The researchers identified some problems, that included; Limited real time patient observation, Lack of patient centered care, and overworked mental health care givers. However, in current settings, AI is not applied in these places, but it can serve to identify problems, perform routine checks, and provide AI-based therapy support. In use internationally are AI chat programs for therapy, such as Woebot and Wysa, and data analysis for mental health risks. The study creates the understanding that although AI has the potential of going a long way in helping mental health care, there is a lack of awareness among the populace on how this can be achieved. Future work should also focus on how to integrate AI into mental health care, address ethical concerns, and develop training to enhance the mental health treatment facilities.*

## Introduction

Mental health services are important for psychological well-being, yet most of the institutions still adopt traditional, manual approaches to care. AI is fast emerging as a transformational tool in health care, offering solutions such as predictive diagnostics, AI-powered therapy, and automated data management. The study will attempt to observe the delivery of mental health services with the aim of identifying gaps and feasibility of integrating AI into these settings. AI in the field of mental health began with the introduction of simple chatbots that were meant to offer very basic therapeutic interactions in the early 2010s. With time, developments in machine learning and natural language processing gave way to more sophisticated tools capable of diagnosis and even prediction of mental health conditions. Into the mid-2020s, applications were expanded further in personal treatment suggestions and real-time monitoring of patients' well-being.

**Current Role of AI in Mental Health**

Diagnostic Support, AI algorithms analyze patient data to assist clinicians in diagnosing mental health disorders. For example, Limbic, a British AI startup, has developed an "e-triage" tool that has screened more than 210,000 patients with a claimed 93% accuracy across common mental disorders, including depression, anxiety, and PTSD. Therapeutic Interventions, AI-powered chatbots like Wysa provide cognitive-behavioral therapy (CBT) techniques to users, offering immediate support and coping strategies. In March 2024, the UK's National Health Service introduced Wysa to support adults and teens dealing with anxiety, stress, and depression.

**Predictive Analytics**

AI models predict patient outcomes by analyzing large datasets, enabling early intervention and personalized treatment plans. The development of AI-CDSS focused on supporting the selection and management of treatment in major depressive disorder is discussed within a study titled "Applying Artificial Intelligence to Clinical Decision Support in Mental Health: What Have We Learned?" .

## Global Implementation of AI Tools in Mental Health

AI tools are increasingly being adopted globally; some exemplary implementations can be found in different countries. In United States, Companies such as Talkspace and BetterHelp have used AI to enhance patient-therapist matching, thereby improving the effectiveness of therapy. In addition, an American startup called Kintsugi uses AI to analyze voices for signs of clinical depression and anxiety and has integrated its tool into clinical call centers and telehealth apps.

The NHS has deployed AI-powered mental health tools in large-scale clinical settings across the UK. Limbic's "e-triage" tool is one that supports the clinician in the diagnosis of a mental health disorder, effecting a 45% reduction in treatment changes. In India, there is an Indian AI chatbot, Wysa, that offers support for mental health through an app very much accepted by the population. It offers users a platform where they can monitor their mental health through AI-driven conversations. Wysa is popular among many users in India, as it offers support for the Hindi language and conversational AI. AI in Mental Health Services in **Tamil Nadu and Abroad:** In Tamil Nadu, there is an increasing trend of integrating AI in mental health services with efforts underway to use technology to bridge gaps in care. While specific AI tools tailored for Tamil Nadu are still under development, the state can draw insights from global implementations to inform its strategies.

More countries are adopting AI in the world of mental health care. This unending conflict has driven many innovations in medical technology, including AI-driven platforms such as Aidoc for real-time trauma care and Kemtai for remote physical therapy, applicable in mental health rehabilitation. China's AI chatbots, like Xiaobing, offer emotional support and counseling to millions of users, a clear testimony to the potential scalability of AI solutions in addressing mental health needs.

## AI-Driven Mental Health Care

## Advantages

### Accessibility and Affordability

AI-driven mental wellness solutions such as chatbots or self-help apps can facilitate assistance round the clock. Less expensive than in-person therapy. Useful to anyone residing in remote or underserved areas.

### Scalability

AI can simultaneously process numerous users to ensure that mental health emergencies are administered on a large scale. Best suited for large population samples of students, or employees within organizations.

### Anonymity and Reducing Stigma

Users may find it easier to confide in an AI on sensitive matters without fearing the stigma. Encourages those who may be reluctant to seek help from a human therapist to engage with mental health support.

### Data-Driven Insights and Early Detection

AI is capable of processing vast amounts of data on user interaction with APIs that can detect patterns of distress. Potential signals of depression, anxiety, or suicidal tendencies could be indicated.

### Personalization and Customization

AI systems can customize their intervention based on user history and response. The recommendations are optimized over time through adaptive learning.

**Integration with Digital Health Ecosystems**

AI systems can collaborate nicely with wearables, social media, and electronic health records. This enables an integrated approach to track mental well-being.

## Limitations

**Absence of Emotional Intelligence and Human Connection**

AI lacks true empathy, warmth, and gut feeling that are needed badly in therapy. Users may feel disjointed, or even alienated.

**Ethical Issues and Breach of Privacy**

Security threats against data, Confidential mental health data are in peril of exposure. Exploited by corporations or governments.

**Limited Scope of Perception**

AI relies on an in-built algorithm and finds itself tangled in complicated, nuanced emotions. It cannot replace the grueling process of therapeutic conversations dealing with trauma, personality disorders, or existential crisis.

**Risks of Misinformation and Bias**

AI models may propagate biases existing in the training data, leading to the dissemination of misinformation or damaging suggestions. Could misinterpret cultural as well as personal differences.

**Over-Reliiance and Dwindling Human Contact**

Heavy reliance on AI can deter people from pursuing professional help from humans. AI can cause social isolation if its users opt for it over human relationships.

## Human-Driven Mental Health Care

## Advantages

**Empathy, Emotional Support and Human Connection**

These therapists offer warmth, compassion, and a safe space for deep healing. Non-verbal communication, too, such as body language, tone of voice, and facial expressions, embodies such richness.

**Complex Problem Solving and Personalization**

Human therapists are in the positions to make dynamic interventions in direct response to their clients' needs. Utilization of creative modalities such as art therapy, mindfulness, and existential inquiries.

**Ethical Responsibility and Professional Oversight**

There are governing boards that oversee therapeutic practice to assure ethical treatment and confidentiality. Treatment adjustments will be made in consideration of ethics and immediate client feedback.

**Seriousness and Crisis Intervention**

Suicide prevention, trauma healing, and crisis intervention require intervention in human judgment. Handle unpredictable emotional response during therapy sessions from the human end.

**Cultural Sensitivity and Contextual Awareness**

Informed by the client's cultural background. AI tends to fail to understand cultural nuances well.

## Limitations

**Limited Access and High Expense**

Therapy is highly expensive and often out of reach for people with minimal income. Long waiting lists and therapist shortages inhibit immediate intervention.

**Subjectivity and Variation in Quality**

The effectiveness depends on the therapist's skill, style, and experience. Appraisal of treatment quality.

**Time-Holding Constraints and Availability**

There are limited hours for the therapist and availability during an emergency will also be lacking. Scheduling conflicts can deepen delays in getting help.

**Stigma and Reluctance in Seeking Help**

Social stigma keeps many individuals from attending therapy. Anxiety about being judged hinders an honest conversation.

## Balanced Approach: AI and Human Integration

This argues that there are potential benefits of each side, thus giving rise to a hybrid solution that blends AI and human-centered car, AI in Screening & Early Intervention: Chat Bots (like Woebot, Wysa) for self-care and mood monitoring. Such human therapy for deep processing and crisis support will involve a tailored high-intensity intervention.

AI-Enabled Therapy, AI systems assist therapists with data analysis and tracking progress as an adjunct for the human perspective. The presence of AI as an assistive system rather than as a substitute makes mental health treatment more accessible, efficient, and compassionate.

## Future of AI in Mental Health Care

It involves several key directions, Enhanced Personalization it Developing AI systems capable of tailoring interventions to individual needs, thereby improving engagement and outcomes. Integration with Human Care, Combining AI tools with traditional therapy to augment, rather than replace, human interaction, ensuring a holistic approach to mental health care. Ethical Frameworks, establishing guidelines to ensure the ethical use of AI, including data privacy, consent, and transparency in AI-driven interventions. Research and Validation: Conducting rigorous studies to validate the effectiveness of AI tools across diverse populations and settings, ensuring their reliability and generalizability.

## Review of Literature

**Artificial Intelligence in Mental Health: A Systematic Review** was conducted by F. Fiori et al. ( 2020) Study Location based at Global. Findings are, AI can improve mental health diagnosis, treatment, and patient outcomes. **AI-Powered Chatbots for Mental Health Support: A Systematic Review** was conducted by S. Hoermann et al. ( 2020) in UAE. Findings are, AI-powered chatbots can provide effective mental health support, but more research is needed. **Machine Learning in Mental Health: A Review of Current Applications** Conducted by J. M. Kane et al. ( 2019) in Global wise. Findings are, Machine learning can improve mental health diagnosis, treatment, and patient outcomes. **Artificial Intelligence in Mental Health: Opportunities and Challenges**

Conducted by M. J. Larson et al. ( 2019) in USA. Findings are, AI can improve mental health services, but there are challenges related to data quality, bias, and ethics. **AI-Assisted Diagnosis of Mental Health Disorders: A Systematic Review** Conducted by Y. Zhang et al. (2020) in Global wise. Findings are, AI-assisted diagnosis can improve accuracy and efficiency in mental health diagnosis. **Virtual Reality and Artificial Intelligence in Mental Health Treatment.** Conducted by S. K. Kim et al. (2020) in USA. Findings ARE, Virtual reality and AI can improve mental health treatment outcomes, but more research is needed. **Artificial Intelligence in Mental Health: A Review of Current Applications and Future Directions** Conducted by J. M. Kane et al. (2020) in Global wise diverse populations. Findings are, AI can improve mental health services, but more research is needed to address challenges and limitations. **Artificial Intelligence in Mental Health: Opportunities and Challenges for Clinicians** Conducted by M. J. Larson et al. (2020 in USA. Findings are, AI can improve mental health services, but clinicians need to be aware of challenges and limitations. **AI-Assisted Cognitive Behavioral Therapy for Mental Health Disorders: A Systematic Review**, Conducted by S. K. Kim et al. (2020) in Global wise diverse populations. Findings are, AI-assisted cognitive behavioral therapy can improve mental health treatment outcomes.

## Methodology

### Observation Method

This research relied on qualitative observation, wherein almost all observations were conducted in nonparticipating mental health settings. Data were then collected via note taking and analyzed thematically.

### Settings and Participants

The observations took place in a range of institutions such as therapy centers, rehabilitation programs, autism schools, and community outreach programs. The observations included mental health professionals, caregivers, and service users.

### Data Collection

Field notes documented the interactions-therapy methods-institutions practices and gave special attention on the employment-or absence-of technologies in their service delivery. The study was conducted with a sample size of approximately 100 participants across various observation

centers, including Ahana Forum, Bodhi, rehabilitation centers, autism schools, ECRC, Meenakshi Mission, and community mental health settings.

### Data Analysis

The observations were classified into important themes current practices in mental health traditional therapeutic approaches resource constraints. Gaps in service delivery lack of real-time monitoring high patient load potential areas in the AI where efficiency could improve the service-delivery process.

## Results and Findings

Traditional Service Delivery-the institutions relied primarily on face-to-face counseling, group therapy, and physical rehabilitation workouts but AI tools could barely be found in any institution. Service Gaps; High patient-to-therapist ratio, poor data tracking, and limited use of relatively few digital tools hinder effective care. AI Potential could easily be enhanced in areas such as AI-based chatbots, predictive analytics, or virtual therapy.

### AI in Global Mental Health Services

Various countries have embraced AI in their mental health services Chatbots & Virtual Therapy: Woebot and Wysa are popular examples of the AI-based CBT in use. Predictive Analytics AI tools in US and European countries analyze patient data and predict mental health risks. AI-enhanced diagnostics Models using artificial intelligence detect depression and PTSD through the use of speech, text, and facial recognition.

### Discussion

This research exhibits an increasing gap of awareness and uptake on AI in the observed institutions. Thus AI integration in mental health care will be faced with hurdles such as those involving ethics, data privacy, and lack of professional training.

## Conclusion

AI could be a powerful tool in reframing mental health services toward increased accessibility and efficiency. However, awareness and structured implementation are necessary to facilitate effective adoption. Future research will include pilot programs on AI, professional training, and establishing ethics.

## References


1) *AI in Mental Health: Opportunities and Challenges in Developing Intelligent Digital Therapies https://www.forbes.com/sites/bernardmarr/2023/07/06/ai-in-mental-health-opportunities-and-challenges-in-developing-intelligent-digital-therapies/*
2) *Bonta, M. (2025). AI impersonation in mental health services: Legislative responses and ethical implications. Journal of Law and Technology, 12(2), 45-67.*
3) *Brown, T., & Harris, K. (2019). AI and mental health: Transforming diagnosis and treatment. Journal of Artificial Intelligence Research, 65, 573-591.*
4) *Chopra, D. (2024). Digital Dharma: Integrating artificial intelligence into spiritual well-being. Harmony Books. Chopra, D. (2024). Digital Dharma: Integrating AI into spiritual well-being. Journal of Consciousness Studies, 31(4), 12-25.*
5) *Carrillo, S., & Carrillo, J. (2025). AI chatbots in pediatric mental health: A parental perspective. Journal of Child and Adolescent Psychology, 42(1), 78-85.*
6) *D'Alfonso, S., Rudz, K., & Wootton, B. (2023). Digital mental health and artificial intelligence: A new era of psychological support? Clinical Psychology Review, 97, 102120.*
7) *Goswami, R., & Sheth, A. (2023). AI-assisted virtual therapy: Enhancing mental health care delivery. Journal of Medical Internet Research, 25, e60589.*
8) *Inkster, B., Sarda, S., & Subramanian, V. (2018). An empathy-driven, conversational artificial intelligence agent (Wysa) for digital mental well-being: Real-world data evaluation.*
9) *Kumar, S., & Sahay, S. (2024). Artificial intelligence in mental healthcare: An overview and uture research directions. British Journal of Radiology, 96(1150), 20230213.*
10) *Luxton, D. D. (2016). An introduction to artificial intelligence in behavioral and mental health care. Cognitive Computation, 8(2), 1-7.*
11) *Montague, A. (2021). The AI therapist: Artificial intelligence in mental health practice. Journal of Mental Health Counseling, 43(3), 201-215.*
12) *Torous, J., & Roberts, L. W. (2017). The ethical use of mobile health technology in clinical psychiatry. Journal of Nervous and Mental Disease, 205(1), 4-8.*
13) *Zhou, X., & Chen, L. (2017). Intelligent systems for mental health: A systematic review of AI applications in clinical settings. Artificial Intelligence in Medicine, 81, 101-112.*

# Artificial Intelligence: is Boon or Bane?

S. Kartheeswari

*Assistant Professor of Commerce, The Standard Fireworks Rajaratnam College for Women, Sivakasi, Tamil Nadu*

*Author e-mail id: Kartheeswari-com@sfrcollege.edu.in*

## Abstract

*At present, Artificial Intelligence is becoming one of the basic essential needs of our life. Simply, we can't survive without AI in the competitive digital era. In this article, I covered the meaning & objective of AI, reasons for using AI, Challenges in AI, benefits & applications of AI, the top 10 AI followed in the world and the current facts about AI.*

***Keywords:*** *Challenges in AI, Benefits and Applications of AI, Recent Launch AI.*

## Introduction

A person has an activity of assembling a simple puzzle; he has to examine the individual pieces with the recognition of each and every piece by its size, shapes, colours and so on. Intelligence is acquiring and applying knowledge and skills to solve problems, adapt new situations, and learn from experiences.

Intelligence is the ability to gain and use knowledge and skills to address challenges, adjust to new circumstances, and learn from past experiences. It encompasses reasoning, problem-solving, planning, abstract thought, and understanding. An entity capable of carrying out these tasks is considered intelligent. Intelligence is significant enough to be quantified using the intelligence quotient (IQ), a measure of human intellect. A person may struggle to make timely and accurate decisions or complete tasks on time due to emotional intelligence. This challenge can be addressed through Artificial Intelligence.

Artificial intelligence (AI) is a field of computer science focused on creating machines or systems that replicate human-like cognitive functions. It involves designing algorithms and systems to carry out tasks that typically require human intelligence, such as recognizing images, understanding speech, making decisions, translating languages, and more.

## Objective

The main aim of AI is to replicate human level intelligence. Most of the AI systems are narrow that is they are good only at a particular task. As an example, a system made to differentiate from apple and orange but it can't be distinguishing between bitter guard and bottle guard without retraining. Voice recognition has improved so much due to AI that it is now being easily and reliably used in applications like home assistants and phones.

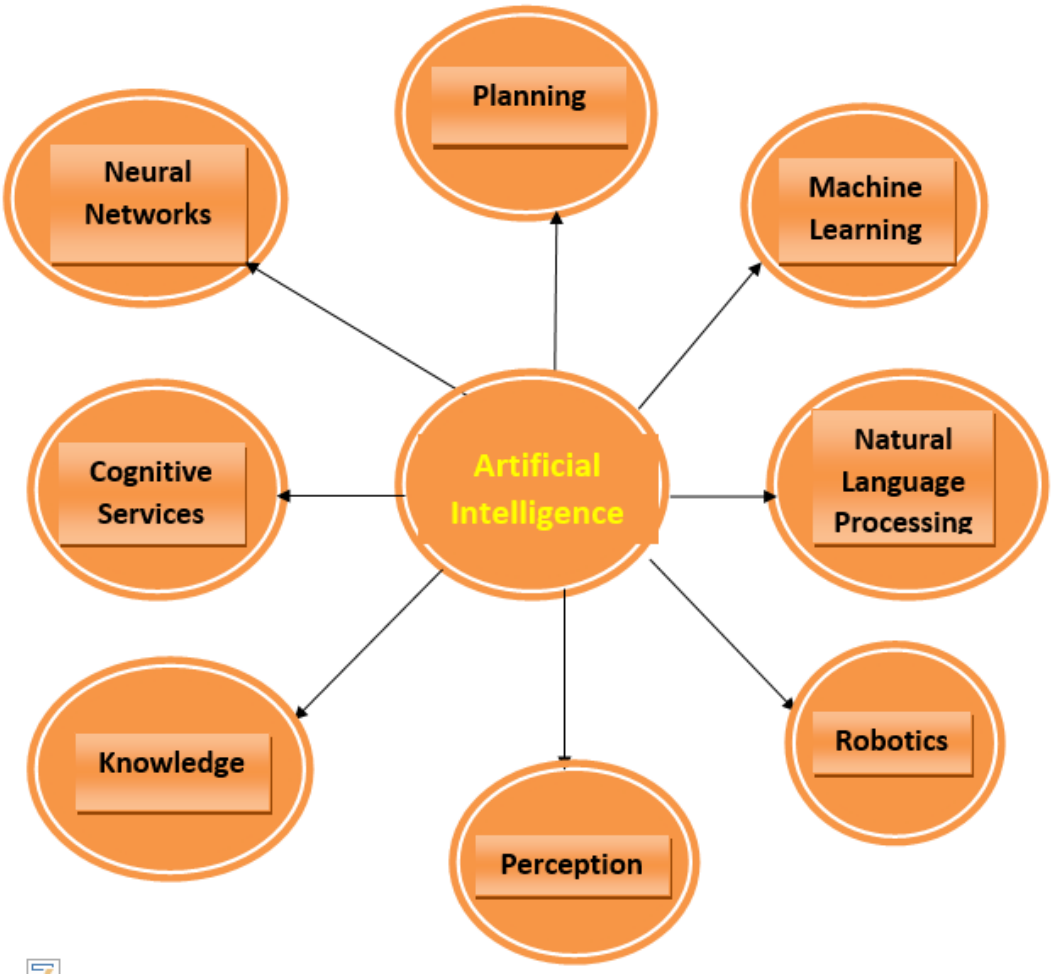
## Reasons for using AI

1. Automation of tasks which have to be done manually such as generating boundary maps using raw satellite image data, generating Google Earth maps from satellite images etc.
2. Achieving tasks where traditional computer algorithms fail due to the large set of input cases that exist.
3. AI is being used to program websites and apps by combining symbolic reasoning and deep learning.
4. AI helps businesses develop an edge over their competitors as AI provides them with enough time to make better decisions.
5. AI works to advance healthcare by accelerating medical diagnoses, drug discovery and development and medical robot.
6. AI enabled computers make zero errors if programmed correctly.
7. AI achieves incredible accuracy through deep neural networks. For example, interactions with Alexa and google are all based on deep learning.
8. By leveraging ML (Machine Learning) algorithms, predictive analytics and advanced automation business can harness the power of AI to streamline operations, optimize resource utilization and gain insights into consumer behaviour and market trends.
9. AI programs are available at all times, whereas humans work 8 hours a day. Machines can work all through the day and night.
10. AI has been effectively used in business to automate tasks done by humans including customer service work, lead generation, fraud detection and quality control. So, AI enhanced customer experience.
11. AI enables automation of routine monotonous tasks like data collection and data entry.
12. AI adapts through progressive learning algorithms to let the data do the programming in continuous manner.

13. AI will revolutionize agriculture. AI used in the agriculture industry extensively. Robots can be used to plant seeds, to cultivate the land, to distribute water and so on.
14. AI helps in detecting and preventing cyber threats by analyzing network traffic, identifying anomalies and predicting potential attacks.
15. Digital personal assistants like smart phones, alexa use AI to provide services that are as relevant and personalized as possible.

## Challenges in AI

The impact of AI on human lives and the world has been astonishing. Many companies have predicted that the use of AI can boost business productivity by up to 40%. Also the number of AI based startups has increased 14 times since the year 2000.




AI applications span a wide range, from monitoring asteroids and other celestial objects to forecasting diseases on Earth, developing novel strategies to combat terrorism, and creating

industrial designs. The potential uses are virtually limitless. However, the field also faces several challenges, including the following:

1. **Computing Power**

All AI algorithms are resource-intensive. Machine learning and deep learning, which are foundational to AI, require a growing number of processors and Graphics Processing Units (GPUs) to function optimally. While there are areas like asteroid tracking, healthcare, and cosmic body observation where we have the knowledge to implement deep learning techniques, these fields demand the computing power of supercomputers. However, as we know, supercomputers come with a hefty price tag. While some developers can work more efficiently on AI systems thanks to cloud computing and parallel processing, these systems also come with high costs. The increasing volume of data and the complexity of algorithms mean that not everyone can afford such advanced infrastructure.

**2. Trust Deficit**

Despite the widespread use of AI in many systems today, one major concern remains the mysterious nature of how deep learning models generate predictions. The way a specific set of inputs leads to solutions for a variety of problems is often difficult for the average person to grasp. Many people around the world are unaware of AI's existence, its applications, or how it is embedded in everyday devices they use, such as smartphones, smart TVs, banking systems, and even cars.

**3. Limited Knowledge**

AI is now widely used as a more efficient alternative to traditional systems, but aside from tech enthusiasts, students, and researchers, most people remain unaware of its full potential. For instance, many organizations that could benefit from AI—such as improving work schedules, boosting production, managing resources, handling e-commerce, or analyzing consumer behavior—are often unaware of services like Google Cloud, Amazon Web Services, and others that could help them leverage AI to enhance their operations.

**4. Data Privacy and Security**

The foundation of all deep learning and machine learning models relies on the availability of data and resources for training. While we have vast amounts of data, much of it is generated by millions of users globally, making it highly susceptible to misuse. For instance, imagine a medical service provider serving 1 million people in a city. If a cyber-attack occurs, the personal data of all 1

million users such as disease information, medical history, personal details, and more could be compromised. With the rapid increase in data, incidents of data leakage and hacking are inevitable.

To address these risks, some companies are developing models that train data on smart devices themselves, preventing the need to send sensitive information back to central servers. Instead, only the trained model is transmitted to the organization, reducing the risk of data breaches.

**5. The Bias Problem**

The quality of an AI system largely depends on the data it is trained on. Therefore, obtaining high-quality data is key to building effective AI systems in the future. However, in practice, much of the data collected by organizations is often poor and lacks meaningful value on its own. A significant portion of this data is biased, reflecting the characteristics and preferences of a narrow group of people with similar interests, which may be influenced by factors like religion, ethnicity, gender, community, and other racial biases. To drive real change, it's crucial to develop algorithms that can effectively identify and address these biases, ensuring that AI systems are fair, unbiased, and more inclusive.

**6. Data Scarcity**

Major companies like Google, Facebook, and Apple are already facing accusations of unethical use of user data generated on their platforms. In response, countries like India have implemented strict IT regulations to limit the flow of personal data and information. As a result, these companies face the challenge of using local data to develop global applications, which can lead to biased models. Data plays a critical role in AI, with labeled data used to train machines to learn and make predictions. Some companies are exploring new methods to develop AI models that can deliver accurate results despite limited data. However, when the data is biased, it can lead to faulty systems, undermining the reliability and fairness of AI applications.

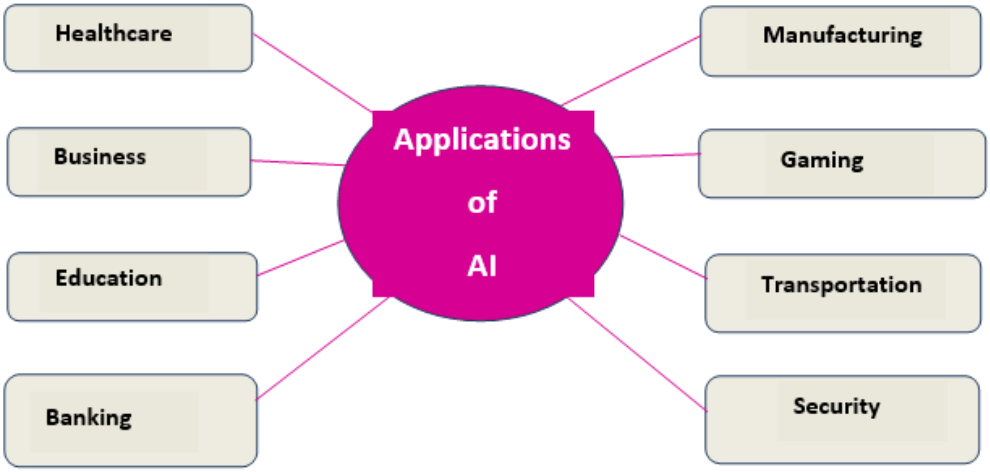
While many of the challenges in AI may seem disheartening, they can be overcome through collective efforts. According to Microsoft, the next generation of engineers must up skill in these cutting-edge technologies to remain competitive and work with future-focused organizations. The key to success lies in minimizing AI-related problems while maximizing its benefits. This can be achieved by creating a comprehensive technology adoption roadmap that thoroughly understands the

core capabilities of AI, ensuring a more responsible and effective integration of AI into society and business.

"Upskill" means to improve or acquire new skills, particularly in areas that are relevant to one's job or career. In this context, it refers to engineers learning new technologies or enhancing their knowledge to stay competitive and meet the demands of evolving fields like AI.

## Applications of Artificial Intelligence

Here are some applications of AI.




1. **Healthcare**

Medical and pharmaceutical companies are applying AI to make better and faster diagnostics than humans. AI applications can be used to analyse medical image data such as X-rays and draw inference about disease from them. OCR can also be used.

2. **Business**

Integration of ML algorithms into analytics and Customer Relationship Management (CRM) platforms helps to get information on serving customers better.

3. **Education**

AI can help educators assess students and help them to adapt to their needs and work at their own pace. The following AI used tools in education E.g. Kaggle, ChatGPT, QuillBot, Chatbot, Canva, and so on.

4. **Banking**

Banks are employing AI enabled chatbots to create awareness in their customers about their services and offerings.

5. **Manufacturing**

Industrial robots which were earlier programmed to perform single tasks and were separated from human workers now function as multitasking robots. These robots collaborate with workers in management, production, etc.

6. **Gaming**

AI enabled machines can play strategic games like chess with machines. In order to improve the quality of the visuals of the game user can use graphics.

7. **Transportation**

AI plays a fundamental role in operating autonomous vehicles. AI technology is being used to manage traffic, predict flight delays and make ocean shipping safer and more efficient.

8. **Security**

AI is used in security information and related areas to detect and identify suspicious activities that indicate threats. AI enabled systems can provide alerts to new and emerging attacks even before human employees. Today, the security of data is crucial for every company and cyber-attacks are growing very rapidly in the digital world. AI technology is playing a big role in helping organizations fight cyber-attacks and to make more data more become safe and secure.

## Benefits of AI

1. Efficient information analysis
2. Ease automation of work
3. Enhanced user experiences
4. Supporting healthcare industries
5. Assisting transportation of goods and services
6. Boosts productivity

7. Eliminate algorithmic bias
8. Saves cost
9. Helping to Research & Development team
10. Time consuming
11. Developed cyber security
12. Enhanced financial support
13. Assisting Retailing sector
14. Ease scalability
15. Helping Agriculture sector
16. Minimized human errors and risk
17. Helped in decision making
18. Achieved incredible accuracy
19. Protecting digital transactions
20. Enhanced optimum level of production
21. Worked for 24 X 7
22. Applied in Space centre

## The Top 10 AI Platforms

The popular 10 AI platforms used in the tech-world are hereunder.

1. TensorFlow
2. PyTorch
3. IBM Watson
4. Google Cloud AI - Chatbot
5. Microsoft Azure AI - Copilot
6. Amazon Sagemaker - Alexa
7. OpenAI - ChatGPT
8. H2O.ai
9. DataRobot
10. KNIME

From the above popular list, Google Assistant is ranked as first AI in the world. As a leader in the AI space, Google Assistant is considered to be one of the most advanced virtual assistants of

its kind on the market. Using natural language processing, it supports both voice and text commands and can handle everything from internet searches to voice activated control of other devices.

## Recent Launch AI

Move over ChatGPT the next peak AI buzzword in the world is DeepSeek. It is the Chinese start-up which is shaking up in the Indian AI based digital arena. For the long time, the Google AI race dominated by US Companies likes Open AI, Google AI, Meta AI, Claude 3.5, Grok, Perplexity AI, Poe. The DeepSeek has actually created a Cutting-Edge AI Model and a new Large Language Model (LLM) that designed for advanced reasoning, problem solving tasks just like ChatGPT. The DeepSeek are one in just less than 2 months and at a fraction of the cost i.e. 5.6 million dollars. So, it is a affordable and powerful ideal for startups and it is emerging ad strong alternative to ChatGPT.

Data redundancy, data privacy and data analytics are playing the pivotal role in AI. AI developers don't use AI for information hacking and cybercrime. Developers should not give rights to the public to access and editing the truthful information.

But China government collected personal information from public of all the countries those who used such AI. It is dangerous to the public because their information is theft. Some of the countries banned usage of DeepSeek AI such as India, Japan, South Korea, Australia, Taiwan, New York and Italy for security reasons. In this case, AI is bane one.

But, DeepSeek is reshaping the other AI tools used by the followers and providers in the competitive arena

## Cautious on Cyber Crime.

1. Bluebugging – It is a type of cyber-attack that exploits Bluetooth technology to gain unauthorized access to a mobile device.
2. Vishing – This is a tool for committing financial crime using mobile like online shopping, online payment by un- known Apps.
3. Smishing - It is a type of cyber-attack through SMS.
4. Malware – It is software designed to perform malicious activities in the infected device.
5. Phishing – It is a term and attacks occur when scammers use e-mails to fetch the information.

6. Whaling – It is one of the cybercrimes, phishing attacks that target a specific, high-profile person like celebrities.

## Conclusion

AI is the blessed one due to numerous benefits such as reducing human errors, time saving capabilities, digital assistance, and unbiased decisions. Besides, AI is becoming more popular and growing in all the areas like education, banking, transportation, manufacturing, gaming, security, business, healthcare, personal care, tourism, food and beverage industry and so on. Today, people can live without following AI. We are moving towards mechanized world by such AI in the digital world. While using AI, be cautious to select the best AI and to avoid banned AI for any needs. **So, I concluded that AI is a boon and not for bane.**

## References

1) *Archana Shukla (2023), "COMPU-BYTES", Eupheus Learning Proficiency Learning Solutions Pvt. Ltd., New Delhi*
2) *Melanie Mitchell (2019), "Artificial Intelligence: A Guide for Thinking Humans", Pelican Publishing Company, Louisiana*
3) *Shukla (2024), "WOW! COMPU-BYTES", Proficiency Learning Solutions Pvt. Ltd., New-Delhi*
4) *https://www.publicissapient.com/insights*

# The Role of AI in Advertising in India's Retail Sector: Innovations, Impact, and Future Trends

R. R. Vishnupriya[1]* and D. V. Jeyanthi[2]

[1]*Assistant Professor, Department of Commerce and Research Centre, Sourashtra College, Madurai, Tamil Nadu*

[2]*Assistant Professor, Department of Computer Science, Sourashtra College, Madurai, Tamil Nadu*

**Corresponding Author e-mail id:* vishnupriya1836@gmail.com*

## Abstract

*This paper examines how advanced AI technologies are transforming advertising strategies within India's retail market. By integrating machine learning, deep learning, natural language processing (NLP), computer vision, and real-time analytics, Indian retailers are achieving unprecedented levels of personalization, operational efficiency, and customer engagement. This presentation synthesizes recent research, market data, and innovative case studies to demonstrate how AI is reshaping the advertising landscape and attracting consumers across diverse segments of India's retail industry.*

***Keywords:*** *Artificial Intelligence (AI), Retail Sector, Data Analytics, Digital Marketing, Market trends.*

## Introduction

Artificial Intelligence has revolutionized the way businesses engage with customers, particularly in the retail sector. India's retail sector is undergoing a digital transformation, fueled by the adoption of AI in advertising. India's retail chains has integrated AI-driven advertising strategies to enhance customer experience and increase profitability. AI-powered tools enable personalized recommendations, predictive analytics, and automated ad placements, ensuring targeted marketing and cost efficiency. With consumers increasingly connected via mobile and digital platforms, AI offers Indian retailers the ability to:

- **Segment and Target Consumers More Precisely:** Deep learning and predictive analytics reveal complex consumer behavior patterns.
- **Create Hyper-Personalized Campaigns:** NLP and generative AI deliver context-aware content in real time, often in regional languages.
- **Optimize Ad Spend:** Automated bidding and real-time data processing ensure efficient resource allocation and improved ROI.

These capabilities are essential for Indian brands to capture market share, enhance customer experiences, and build lasting relationships in a competitive digital ecosystem (Impact of Artificial Intelligence on the Indian Retail Industry, 2023) .

## Literature Review

Several studies have highlighted the impact of AI on advertising effectiveness and provided insights relevant to this paper.

- Smith and Brown (2020) highlight how AI-driven algorithms enhance personalized advertising by analyzing user behavior and preferences. Their study found that AI-based recommendation systems increased user engagement by 35% compared to traditional methods.
- Johnson (2019) discusses the impact of AI on reducing advertising costs while improving engagement rates, noting that programmatic advertising reduced campaign costs by up to 25%.
- Lee and Kim (2021) emphasize ethical considerations, such as data privacy concerns and algorithmic biases, associated with AI-driven marketing. They argue that AI-powered personalization often leads to excessive data collection, raising questions about user consent and transparency.
- According to Kumar and Gupta (2022), AI-powered predictive analytics significantly enhance ad targeting, with 78% of surveyed marketers reporting improved conversion rates.
- Miller (2023) explores the growing role of natural language processing (NLP) in advertising, highlighting how AI-generated content achieves a 20% higher click-through rate (CTR) than human-created content.
- Research by Patel and Singh (2022) supports these findings, demonstrating that chatbots powered by AI improve customer interaction rates by 50%, ultimately leading to higher sales conversions. These studies collectively provide a comprehensive understanding of AI's role in advertising and its ongoing evolution.

## Advanced AI Technologies in Indian Advertising

### Deep Learning and Neural Networks

- **Usage:** Deep learning models are used to analyze vast datasets, enabling precise consumer profiling and segmentation.

- **Impact:** Indian retail chains have reported up to a 35% increase in ad engagement after implementing AI-enhanced targeting solutions (Deloitte India, 2022) . Research published in the Journal of Advances in Technology and Innovative Engineering also highlights the efficacy of neural networks in improving ad targeting accuracy and consumer insight generation (JATIT, 2022) .

**Natural Language Processing (NLP)**

- **Usage:** NLP powers multilingual chatbots, voice assistants, and sentiment analysis tools that can handle India's linguistic diversity.
- **Impact:** Integration of NLP in advertising has been shown to reduce customer service response times by up to 50% and significantly boost engagement in local languages (PwC India, 2021) . Additionally, market research indicates a rapid expansion of NLP applications, which are attracting consumers through more interactive and personalized brand communications (The Growing Influence of AI in Market Research in India, 2023) .

**Computer Vision**

- **Usage:** Computer vision analyzes visual data to assess consumer reactions to product images and video advertisements.
- **Impact:** Retailers using computer vision have noted an approximate 25% increase in click-through rates, as the technology helps optimize visual content to align with regional tastes and cultural aesthetics (ET Tech, 2023) .

**Generative AI**

- **Usage:** Generative AI automates the creation of dynamic ad content—from personalized text to bespoke visuals—tailored to individual consumer profiles.
- **Impact:** This technology has reduced creative turnaround time by up to 30%, while increasing campaign relevance and consumer engagement (ET Tech, 2023) .

**Predictive Analytics and Real-Time Data Processing**

- **Usage:** AI-driven predictive analytics forecast consumer trends and adjust ad placements in real time across digital channels.
- **Impact:** This has led to conversion rate improvements from approximately 3% (traditional campaigns) to nearly 7% in AI-driven strategies, along with CPA reductions of up to 40%

(Statista India, 2023) . Academic studies also emphasize the role of predictive analytics in enabling retailers to swiftly adapt to shifting consumer behaviors (IJNRD, 2022) .

## Statistical Overview and Market Trends in India

### AI Adoption and Market Growth

- **Adoption Rates:**

  Approximately 45% of mid-to-large Indian retailers have adopted AI-driven advertising tools, while an additional 15% of smaller retailers are beginning to integrate these solutions (NASSCOM, 2022).

- **Market Growth:**

  The AI segment in India's digital advertising market is projected to grow at a CAGR of about 30% from 2021 to 2026. This rapid growth is driven by increasing digital penetration and innovative AI implementations (NASSCOM, 2022), (Impact of AI on the Indian Retail Industry, 2023)

- **Efficiency Gains:**

  Early AI adopters report a jump in conversion rates from ~3% to ~7% and a reduction in cost per acquisition by up to 40% (Statista India, 2023).

## Comparative Analysis: Traditional vs. AI-Driven Advertising

*Table 1: Comparative Analysis of Advertising Metrics*

| Metric | Traditional Advertising | AI-Driven Advertising (Latest Technologies) |
|---|---|---|
| **Customer Reach Efficiency** | ~65% | ~85% (due to real-time targeting and personalization) |
| **Conversion Rate** | ~3% | ~7% (enhanced by deep learning and predictive analytics) |
| **Cost per Acquisition (CPA)** | ₹2000 | ₹1200 (thanks to automated optimization tools) |
| **Campaign Adjustment Speed** | Days to Weeks | Real-Time (with AI-based monitoring systems) |

### Consumer Attraction through Innovation

Recent innovations have dramatically reshaped consumer expectations:

- **Interactive and Personalized Ads:** AI-driven campaigns that adapt in real time are capturing consumer attention more effectively than static ads. For instance, dynamic ads that incorporate real-time data have seen up to a 40% improvement in engagement.
- **Hyper-Personalization:** With AI, brands are now able to deliver content that reflects the consumer's browsing history, location, and even local cultural nuances, thereby increasing relevance and trust (The Growing Influence of AI in Market Research in India, 2023) .
- **Omni-Channel Integration:** Seamless integration across digital, mobile, and in-store experiences has been noted to enhance customer loyalty and drive multi-channel purchases.

### Real-World Impact and Case Studies

- **Retail Chain A (India):**

  Utilizing deep learning for segmentation and real-time bidding, this chain achieved a 40% reduction in CPA and a 50% increase in conversion rates within six months (Deloitte India, 2022).

- **E-commerce Platform B (India):**

  By integrating NLP-powered chatbots and generative AI for ad personalization, the platform experienced a 35% uplift in digital sales directly attributable to enhanced advertising efficiency (PwC India, 2021) .

## Challenges and Considerations

### Data Quality and Integration

- **Localized Data Needs:**

  Effective AI relies on high-quality, localized data—a significant challenge given India's diverse regional consumer behaviors.

- **Data Silos:**

  Integrating data from disparate channels remains a key challenge, as highlighted by academic research (IJNRD, 2022) .

**Investment and Technical Expertise**

- **High Initial Costs:**

  Although advanced AI platforms require considerable upfront investments and specialized skills, long-term efficiency gains justify these costs.

- **Skill Shortages:**

  The rising demand for AI talent in India is spurring increased investments in training and development programs (The Growing Influence of AI in Market Research in India, 2023)

**Privacy and Regulatory Compliance**

- **Data Protection:**

  With evolving regulations such as the upcoming Personal Data Protection Bill, maintaining consumer trust through compliance is paramount.

## Future Trends in AI-Driven Advertising in India

- **Voice and Regional Language Integration:**

  Future platforms will incorporate advanced voice assistants and NLP tools tailored to India's multilingual market.

- **Real-Time Generative AI:**

  Further advancements will enable even faster and more precise ad content creation, reducing production cycles.

- **Omni-Channel Campaigns:**

  AI will increasingly support unified advertising strategies that seamlessly integrate digital, mobile, and in-store experiences, enhancing the overall customer journey.

## Conclusion

The integration of advanced AI technologies is fundamentally transforming the advertising landscape in India's retail sector. With significant improvements in targeting precision, personalization, and cost efficiency, AI-driven advertising is rapidly becoming indispensable for Indian retailers. As the market continues to evolve, these technologies will play an ever more critical role in shaping consumer engagement and driving the future of retail in

## References


1) *Johnson, T. (2019).* AI and Advertising: A Cost-Effective Future. *Digital Marketing Review, 12(3), 45-58.*
2) *Kumar, R., & Gupta, S. (2022).* Predictive Analytics in Digital Advertising: The AI Advantage. *Journal of Marketing Technology, 15(2), 78-93.*
3) *Lee, H., & Kim, J. (2021).* Ethical Considerations in AI-Powered Marketing: Balancing Personalization and Privacy. *AI & Ethics Journal, 10(4), 213-228.*
4) *Miller, D. (2023).* The Power of NLP in Digital Advertising: AI's Impact on CTRs. *Advertising Trends Journal, 18(1), 67-82.*
5) *Patel, M., & Singh, A. (2022).* Chatbots and AI-Powered Customer Engagement in Advertising. *Journal of Consumer Interaction, 7(3), 34-50.*
6) *Smith, B., & Brown, C. (2020).* AI in Personalized Advertising: A Data-Driven Approach. *Marketing Science Journal, 14(5), 98-112.*
7) *NASSCOM. (2022). AI in Retail: Trends, Adoption, and Impact in India. Retrieved from https://www.nasscom.in*
   *Provides detailed insights into the adoption of AI in India's retail sector, including market growth projections and efficiency metrics.*
8) *Deloitte India. (2022). Digital Transformation in Indian Retail: The Role of AI in Advertising. Retrieved from https://www2.deloitte.com/in/en.html Discusses the implementation of advanced AI technologies by Indian retailers and their impact on ad engagement and ROI.*
9) *PwC India. (2021). Advertising and Retail: Leveraging AI for Enhanced Consumer Engagement in India. Retrieved from https://www.pwc.in Analyzes case studies and efficiency gains achieved by Indian retailers through AI-driven advertising strategies.*
10) *Statista. (2023). AI in Retail Advertising in India: Market Size and Growth Projections. Retrieved from https://www.statista.com Offers updated statistics on market growth, adoption rates, and digital ad spend trends in India.*
11) *Economic Times Tech. (2023). How AI is Disrupting Retail Advertising in India. Retrieved from https://tech.economictimes.indiatimes.com*
    *Highlights recent technological advancements and real-world examples of AI implementation in Indian retail advertising.*
12) *Impact of Artificial Intelligence on the Indian Retail Industry. (2023). Retrieved from https://www.researchgate.net/publication/372430924_Impact_of_Artificial_Intelligence*

*_on_the_Indian_Retail_Industry Provides research-based insights on AI adoption and efficiency improvements in India's retail sector.*

13) *The Growing Influence of AI in Market Research in India. (2023). Retrieved from https://kadence.com/en-us/the-growing-influence-of-ai-in-market-research-in-india/ Explores the impact of AI on market research trends in India, emphasizing its influence on consumer insights and advertising strategies.*
14) *https://www.ijnrd.org/papers/IJNRD2405220.pdf*
15) *Journal of Advances in Technology and Innovative Engineering. (2022). [Paper Title]. Retrieved from http://www.jatit.org/volumes/Vol101No15/13Vol101No15.pdf Discusses innovative AI techniques and their applications in improving advertising strategies in India.*

# An Overview of Artificial Intelligence in Indian Banking Sector

C. Karthikkumar

*Assistant Professor, Department of Commerce with Computer Applications, N.M.S. S.Vellaichamy Nadar College, Madurai, Tamil Nadu*

## Abstract

*In the current digital landscape, technology is pivotal for businesses and organizations striving to deliver exceptional services to their customers. Artificial Intelligence (AI) is rapidly reshaping global markets, with significant advancements observed in various sectors, particularly banking. In recent years, the adoption of AI in India's banking industry has surged. AI is defined as the capability of machines to execute cognitive tasks typically associated with human intelligence, such as perception, reasoning, learning, environmental interaction, problem-solving, and even creativity. In banking, AI is implemented through algorithms that have proven highly effective in customer management, credit information services, FAQ support, and financial assistance. Currently, the performance enhancement of banking systems is largely driven by AI applications. The banking sector is experiencing numerous reforms, prioritizing customer-centric approaches. Tech-savvy customers, who frequently engage with advanced technologies, expect banks to deliver seamless experiences. To meet these demands, banks have broadened their operational scope to include retail, IT, and telecommunications, utilizing services such as mobile banking, e-banking, and real-time money transfers. This paper seeks to explore the concept of Artificial Intelligence, examine its opportunities within the Indian banking sector, and analyze the growth trajectory of AI in this domain.*

***Keywords:*** *Artificial Intelligence, Financial Services, Digital Services, Technology.*

## Introduction

In the current digital landscape, technology significantly contributes to the ability of businesses and organizations to deliver high-quality services to their customers. **A**rtificial **I**ntelligence (AI) is rapidly reshaping global markets. AI encompasses computer-controlled systems that execute tasks typically requiring human intelligence and comprehension. In the banking sector, AI is employed to identify fraudulent activities, address customer inquiries, analyze customer behavior, and offer tailored services. It streamlines processes, enhances decision-making, and facilitates the management of customer requests with greater efficiency. Additionally, AI plays a crucial role in risk management by detecting and preventing fraud and money laundering in real time. The applications of artificial intelligence in banking are diverse and impactful.

In India, banks are currently grappling with significant challenges, particularly in the areas of data quality and customer segmentation. The rise of payment technology firms like Airtel Payments

Bank and Paytm Payments Bank, along with the advent of neo banks and **N**on-**B**anking **F**inancial **C**ompanies (NBFCs), has intensified competition, making it increasingly difficult for traditional banks to thrive. In response to this evolving landscape, banks are leveraging advanced technologies to enhance and refine their customer services. **A**rtificial **I**ntelligence (AI) is playing a pivotal role in transforming various aspects of banking operations, including insurance, sales, contracts, and cyber security. By employing analytics, block chain, and machine learning, banks are working to future-proof their offerings. The integration of AI in banking and finance is enhancing the efficiency and competitiveness of financial institutions. Banks are utilizing AI for multiple applications, such as fraud detection, enhancing customer experiences, analyzing customer behavior for improved service delivery, and assessing credit histories to evaluate loan risks. Notably, one of the primary applications of AI in banking is the deployment of AI-driven chatbot services. These chatbots assist customers by providing precise answers to inquiries and delivering a personalized experience. Consequently, AI chatbots are instrumental in attracting customers, elevating service quality, and broadening the brand's influence in the market. Additionally, intelligent mobile applications can monitor user behavior and gather sensitive data based on browsing patterns, enabling service providers to offer tailored recommendations. This study aims to explore the role of AI in the Indian banking sector, highlighting the various opportunities it presents and examining the growth trajectory of AI within this industry.

## Review of Literature

1) ***Adrian Lee (Jan 23, 2017)*** Leveraging Artificial Intelligence in Banking - This article aimed to identify the key applications of AI in the banking sector. Among the various uses, AI-enhanced customer service, immediate fraud detection, and risk management stand out, with the latter likely attracting the most attention from those focused on transformative changes in the industry.

2) ***In the 2019 study by Sindhu J,*** the adoption of artificial intelligence (AI) within five Indian commercial banks—SBI, ICICI, Axis, HDFC, and HSBC—is examined through the lens of cost-benefit analysis. The research relies on secondary data sourced from existing literature to assess the information leveraged in the banking sector. Additionally, it explores the AI technology services available in India.

3) ***Emmanuel Mogaji, Taiwo O. Soetan, and Tai Anh Kieu (2020)*** explore the impact of artificial intelligence on the digital marketing strategies employed by financial services aimed at vulnerable customers. The paper delves into the interplay between AI, digital marketing, and financial services, emphasizing the significant implications for the collection, processing, and dissemination of information. It also underscores the necessity of maintaining human connections to enhance customer experience and engagement with financial service providers. A thorough understanding of ethical considerations, along with challenges related to data and modeling, is essential for the effective implementation of AI. This research offers a theoretical framework that benefits financial service providers, AI developers, marketers, policymakers, and scholars, facilitating a deeper comprehension of the challenges faced by vulnerable customers and identifying more effective outreach strategies.

4) ***Neeraj Gupta, 2020*** **-** The analysis presented here examines various institution-specific financial factors, including size, capitalization ratio, risk, price-to-earnings ratio, investment price, sales diversification, labor productivity, and age, and their influence on the performance of financial institutions. The results indicate that the primary determinants of commercial bank performance in India are the size of the financial institution, the percentage of non-performing mortgages, and sales diversification. Furthermore, the findings reveal that the size of the financial institution, its age, workforce productivity, and sales diversification significantly affect the overall performance of Indian banks during periods of crisis.

5) ***This article by Hickam Sadok, published in 2022***, examines the impact of artificial intelligence (AI) on the credit score evaluation processes employed by banks and other financial institutions. The limitations discussed lay the groundwork for a new era of economic regulation that encompasses the certification of AI algorithms and the data utilized by banks.

6) ***Saloni Tripathi, 2022*** **-** Highlights the evolving role of AI platforms within the banking sector and their potential as major disruptors. Financial institutions are encountering obstacles from advanced technologies that employ intelligent algorithms to supplant human labor. To maintain a competitive edge, companies need to incorporate AI into their business strategies and operations.

## Objectives of the Study

The research primarily focuses on examining the role of Artificial Intelligence within the Indian Banking sector. The key objectives include:

1) Analyzing the fundamental concepts of Artificial Intelligence.
2) Exploring the potential opportunities presented by Artificial Intelligence in the Indian Banking sector.
3) Assessing the development and expansion of Artificial Intelligence in the Indian Banking sector.

## Research Methodology

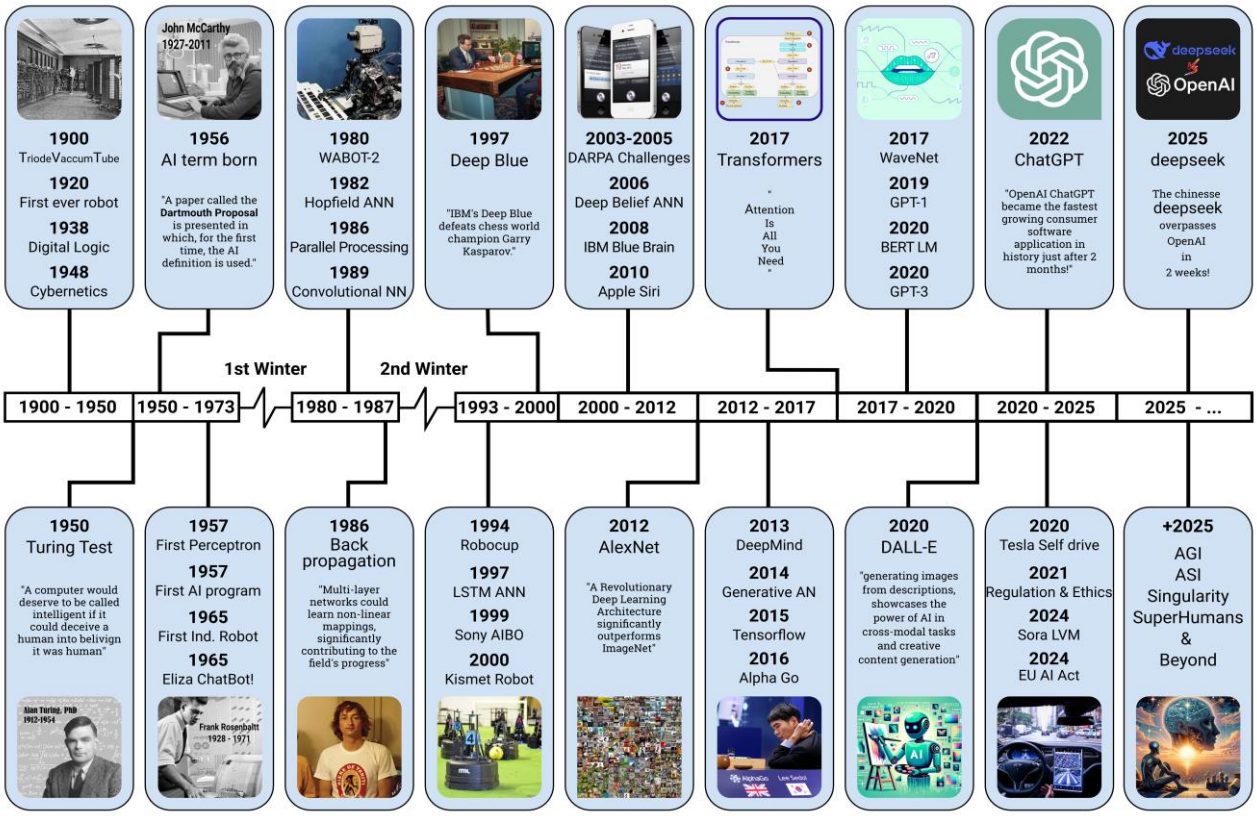
This descriptive study explores the definition and objectives of artificial intelligence, along with its benefits and drawbacks within the Indian banking sector. It relies on secondary data for its findings. The entire analysis is grounded in evidence derived from observation and examination. Furthermore, relevant secondary data is gathered from a range of research papers, journals, and various publications, including websites. Additionally, recommended readings are provided for theoretical insights on the subject as needed.

## History of Artificial Intelligence in India

The advent of AI technologies has led retailers to adopt intelligent chatbots, enabling customers to interact in a conversational manner. This evolution naturally progressed to the development of voice-enabled bots, contributing to the current surge in voice technology. The origins of this voice technology can be traced back to the Seattle World's Fair in 1962, where IBM introduced a device known as "Shoebox," capable of performing mathematical calculations. Since then, significant advancements have been made, highlighted by the introduction of voice assistants from major tech companies: Apple's Siri in 2011, Google Now in 2012, Microsoft's Cortana and Amazon Alexa in 2014, and Google Assistant in 2016.

Forecasts suggest a substantial increase in the number of voice-enabled assistants, with projections estimating 1.83 billion by 2025. The capability to issue voice commands via smart phones was first introduced with the Google voice search app in 2008, followed by the launch of Siri in 2011. This rapid evolution has facilitated the use of voice commands for sending texts, emails, and

conducting basic searches, leading to the development of voice recognition software that converts spoken commands into text to execute desired actions.




## Artificial Intelligence in India

The Indian economy is undergoing a significant transformation driven by artificial intelligence (AI), which is reshaping conventional management practices. The burgeoning AI sector is anticipated to serve as a catalyst for job creation. Currently, there are approximately 400 start-ups engaged in AI and machine learning. In 2016, private investments in the AI sector in India reached around $150 million, a figure that continues to rise. This vast potential for job generation underscores the critical role that AI can play in addressing employment challenges and fostering economic development in the country. The Indian government has initiated several key programs, such as the National Strategy on Artificial Intelligence and AI for India, reflecting its commitment to advancing this field.

The influence of AI is already evident across various organizations and sectors in India. Companies are leveraging AI to enhance operational efficiency in diverse industries, including finance, retail, and manufacturing. Indian retailers are utilizing AI to optimize supply chains, tailor recommendations, and maximize operational efficiency. In the manufacturing sector, AI is being

employed to elevate quality control measures and enhance cost-effectiveness, showcasing the numerous advantages AI offers. Additionally, Indian banks are implementing AI to bolster fraud detection mechanisms and enhance customer service, resulting in a more secure and streamlined experience for users.

## AI – Transforming Banking in India

The integration of **A**rtificial **I**ntelligence (AI) within the Indian banking sector has been a steady and progressive journey. Recently, Indian banks have adopted AI-driven solutions to enhance operational efficiency, elevate customer service, and mitigate fraud risks. A significant driver of AI advancement in this sector has been the proliferation of big data and digital technologies. Indian banks are equipped with vast amounts of data, which they leverage to guide their strategic decisions and develop AI-enhanced solutions. The Reserve Bank of India (RBI) plays a crucial role in the adoption of new technologies within the banking landscape, taking a balanced approach to regulation that encourages innovation. The RBI's proactive stance on technology integration extends beyond mere policy creation.

India has emerged as a prominent global fintech center, with leading banks such as ICICI Bank, Axis Bank, and HDFC Bank actively engaging with fintech initiatives. In 2017, the **S**tate **B**ank of **I**ndia (SBI) launched the Bank Chain project, a consortium of over 30 members, including banks, **N**on-**B**anking **F**inancial **C**ompanies (NBFCs), and the **N**ational **P**ayments **C**orporation of **I**ndia (NPCI), which was established to facilitate retail payments. Bank Chain serves as a collaborative platform for banks to explore, develop, and implement blockchain technologies, with support from Pune-based startup Prime chain Technologies in crafting these innovative solutions.

## AI Applications in the Indian Banking Sector

Technologies such as biometric fraud detection systems, AI-driven chatbots, and digital payment solutions enhance service delivery to a diverse clientele. The realm of artificial intelligence encompasses various technologies, including machine learning, natural language processing, expert systems, computer vision, speech recognition, planning, and robotics. The applications of AI within the Indian banking sector include:

***(a) Chatbots:***

Chatbots represent one of the most prevalent applications of artificial intelligence across various industries. They offer significant cost savings and a high return on investment. Commonly requested services, such as fund transfers, access to mini statements, and balance inquiries, can be efficiently managed by chatbots. This capability reduces the burden on other service channels, including call centers and online banking platforms.

***(b) Cybersecurity:***

By analyzing data from previous threats and recognizing patterns and indicators that may seem unrelated, artificial intelligence (AI) can significantly enhance the effectiveness of cybersecurity measures. AI not only defends against external threats but also monitors for internal risks or breaches, suggesting corrective actions to prevent data theft or misuse.

***(c) Smart Wallets:***

Mobile wallets that integrate artificial intelligence facilitate payments for various services, including bus tickets, taxis, events, movies, and utility bills.

***(d) Credit Scoring:***

AI evaluates data from both conventional and unconventional sources, playing a vital role in helping alternative lenders assess the creditworthiness of borrowers. This capability enables the creation of innovative lending solutions for individuals or organizations with limited credit histories, supported by a robust credit rating framework.

***(e) Robo Advice:***

Automated financial guidance is a significant challenge within the financial services sector. A robo-advisor utilizes information provided by users to assess their financial health. Based on this analysis and the client's objectives, the robo-advisor can offer tailored investment recommendations, ranging from specific product categories to individual stocks.

## Integration of AI in the Banking Industry

Artificial intelligence is significantly impacting the Indian economy. In 2016, worldwide investments in AI applications reached USD 5.1 billion (EUR 4.3 billion), according to the PwC

FinTech Report India (2017). Major Banks in India, including PNB, SBI, HDFC, ICICI, HSBC, and Axis Bank, among others, have embraced AI technology. Several of these institutions have integrated AI into their operations:

***1) State Bank of India:***

SBI has launched SIA, a chatbot solution that facilitates customer interactions with the bank via natural language dialogue. This innovation minimizes wait times and lessens the reliance on human customer service agents. SIA effectively assists customers with standard financial tasks and provides answers akin to those from bank personnel. The system is continually advancing to offer enhanced AI-driven solutions aimed at improving the overall customer experience.

***2) Bank of Baroda (BoB):***

The bank has established a digital branch featuring advanced technologies, including an AI-based robot named Baroda Brainy, along with a Digital Lab that offers complimentary Wi-Fi services.

***3) Canara Bank:***

Canara Bank has unveiled Mitra, an AI-driven virtual assistant designed to deliver prompt and precise answers to customer queries through natural language interaction. This innovative robot aids visitors in navigating the bank. Additionally, Candi serves as another AI chatbot solution, allowing customers to access banking services via a conversational interface.

***4) Allahabad Bank:***

Allahabad Bank leverages artificial intelligence (AI) across various operational facets, including fraud detection, automated customer service, and loan processing, as well as risk management. By utilizing AI, banks can efficiently process large volumes of data, enhance operational effectiveness, and offer improved, personalized services to their clientele.

***5) Andhra Bank:***

Andhra Bank has introduced an AI initiative known as Float Bot to enhance customer service and minimize manual tasks. This AI chatbot is integrated with the bank's Core Banking systems, facilitating digital interactions and managing on boarding and training for visitors. It allows

customers to engage with the bank through natural language conversation, thereby reducing wait times and the necessity for human customer service representatives.

***6) ICICI Bank:***

ICICI Bank was a pioneer in the country by extensively incorporating AI technology into its visually engaging operations. While it has launched various AI initiatives, there is no singularly named program. The bank has introduced AI-driven chatbots, fraud detection systems, and personalized service offerings. These advancements have enabled ICICI Bank to enhance operational efficiency, reduce costs, and elevate customer satisfaction.

***7) HDFC Bank:***

HDFC Bank has developed EVA, which stands for Electronic Virtual Assistant, an AI-driven chatbot solution that allows customers to engage with the bank through natural language interactions. EVA efficiently addresses customer inquiries, significantly reducing wait times and the reliance on human customer service representatives.

***8) Axis Bank:***

Axis Bank has introduced Axis AI and Automation, an AI-driven platform that offers a variety of services to its customers, including chatbots for customer support, fraud detection, and risk management. This AI initiative focuses on enhancing the bank's operational efficiency, lowering costs, improving customer experiences, and maintaining a competitive edge in the fast-changing banking landscape. Through AXAA, the bank can deliver more tailored products and services, mitigate fraudulent activities, and strengthen its market reputation.

***9) YES Bank:***

YES Bank has launched two significant AI initiatives: YESm Power, an AI-driven platform that offers various services such as chatbots for customer support, fraud detection, and risk management, and YES ROBOT, aimed at enhancing operational efficiency and customer experience.

## Opportunities for AI in the Indian Banking Sector

AI enables banks to analyze customer spending habits effectively. This allows financial institutions to create tailored investment strategies and provide budgeting assistance to clients.

Additionally, banks can issue notifications offering advice to help customers monitor their expenses and investments based on collected data. By tracking transactional and other data sources, banks can gain insights into customer behavior and preferences, ultimately enhancing the overall customer experience. Several opportunities for AI in the Indian banking sector include:

***1) Utilize Customer Insights:***

The fintech sector is harnessing the power of Artificial Intelligence, machine learning, and natural language processing to extract valuable customer insights, enabling the customization and enhancement of their services.

***2) Enhanced Customer Support:***

With advancements in speech processing and natural language technologies, computers are now capable of managing the majority of customer service inquiries. This development eliminates long wait times, leading to increased customer satisfaction.

***3) Retail Banking Applications:***

Financial institutions can implement voice technology to deliver tailored banking experiences, helping individuals enhance their financial well-being and effectively manage their personal finances.

***4) Facilitate Convenient Banking Services:***

Voice technology empowers consumers to effortlessly check account balances, request evaluations of their financial health, and seek information about their investment portfolios.

***5) Strengthen Loyalty via Digital Platforms:***

Financial service providers can foster customer loyalty through voice applications that contribute to both short-term and long-term financial wellness.

***6) Blockchain Accelerating Payments:***

The banking sector is experiencing a significant transformation in consumer purchasing behaviors and preferences, largely influenced by the digital age, especially through social media and mobile platforms. There is a growing demand for greater choice and control in banking interactions.

Outdated payment processes will soon be obsolete as Blockchain technology introduces real-time payment capabilities, expediting transactions and enhancing customer support and satisfaction.

***7) Customized Financial Services:***

The level of personalized engagement will soar as automated financial advisors and planners offer insights for informed financial decision-making. They assess market conditions in relation to the user's financial objectives and personal portfolio, providing tailored recommendations for stocks and bonds.

## Beneficial Effects of AI on the Banking Sector

**A**rtificial **I**ntelligence (AI) plays a crucial role in helping banks analyze consumer spending habits, develop tailored investment strategies, and assist clients in budgeting. It can provide timely notifications and advice on managing expenses and investments based on comprehensive data analysis. By examining transactional data alongside other relevant information, banks can gain valuable insights into consumer preferences and behaviors, ultimately enhancing the customer experience. AI's capability to process vast amounts of data allows it to detect patterns that may elude human analysts. This feature is particularly beneficial for fraud prevention, as numerous financial institutions leverage AI and machine learning technologies to identify fraudulent activities in real time.

***1) Enhanced Fraud Detection:***

It is evident that artificial intelligence excels in processing large datasets and identifying fraudulent activities much earlier than humans can. By utilizing various algorithms, AI can perform these repetitive tasks accurately and efficiently. This advantage is particularly beneficial for banking and financial institutions, which already operate in a data-intensive environment.

***2) Improved Loan and Credit Assessment:***

In a similar vein, banks are increasingly adopting AI-driven systems to enhance their loan and credit decision-making processes, making them more informed, secure, and profitable. Many financial institutions still rely heavily on traditional metrics such as credit scores, credit history, customer references, and banking transactions to evaluate the creditworthiness of individuals and businesses.

***3) Account Management and Fund Transfers:***

Banking customers can utilize chatbots to check their account balances, review transaction histories, and access other account-related details. Additionally, these chatbots may facilitate fund transfers to other accounts or enable payments to merchants.

***4) Automating Human Tasks:***

Artificial intelligence has the potential to take over certain human roles, resulting in reduced costs, faster response times, and keeping personnel updated on regulatory changes. Moreover, it streamlines the process of generating reports. For instance, banks have automated the handling of data requests from external auditors, among other repetitive tasks.

***5) Enhancements in Efficiency and Consistency:***

By managing extensive datasets and boosting productivity, accuracy, and speed in mathematical computations, banks can identify the most effective combinations of initial margin-reducing deals at any moment, based on historical data from various trade amalgamations.

***6) Automated Customer Support:***

The availability of a chatbot around the clock ensures that customers are not constrained by traditional banking hours, including holidays and weekends. This well-documented chatbot can efficiently address customer issues, often more effectively than a human customer service representative. Although chatbots are not a novel concept, their integration within financial institutions enhances their capability to manage numerous routine banking functions that once necessitated human intervention.

## Adverse Effects of AI on the Banking Sector

Changes in the dynamics between employers and employees may occur due to a rise in job mobility, an increase in contract work, self-employment, and unstable job conditions, which could undermine workers' rights and the role of trade unions. The disruptive nature of artificial intelligence (AI) may also influence economic disparities, income distribution, and wage levels. While AI holds the promise of transforming business practices, it is essential to consider the potential drawbacks that warrant thorough examination. This section explores the possible negative implications of AI for

organizations, including ethical challenges, job displacement, privacy concerns, and biases inherent in AI systems.

***1) Ethical Implications:***

The implementation of AI brings forth significant ethical dilemmas, including potential biases in decision-making processes and the risk of job loss. Financial institutions must prioritize the transparency, fairness, and impartiality of their AI systems.

***2) Job Displacement and Economic Disparity:***

A report from the **W**orld **E**conomic **F**orum (WEF) predicts that automation and AI could lead to the elimination of 5 million jobs in the banking sector by 2025, representing around 30% of the industry's workforce. The findings indicate that the most affected positions will likely be those in data entry, customer service, and transaction management.

***3) Unpredictable Ecosystem Dynamics:***

Humans possess the ability to evaluate unique circumstances and make nuanced judgments, a capability that Artificial Intelligence may struggle to replicate, regardless of its learning and adaptation abilities. The replacement of human adaptability with AI could result in irrational behaviors within both human and object ecosystems.

***4) Data Protection and Security Threats:***

Given that AI systems process extensive amounts of sensitive financial information; there is an inherent risk of data breaches and unauthorized access. It is essential to implement strong cyber security protocols and comply with data protection laws to address these vulnerabilities effectively.

***5) Challenges related to regulation and ethics:***

Banks operate under stringent regulations and compliance standards. The integration of AI can lead to regulatory issues, particularly concerning the use of opaque AI algorithms. The rapid evolution of AI technology poses challenges for existing regulatory frameworks, and the ethical ramifications of AI applications may remain ambiguous. Financial institutions may face regulatory uncertainties, ethical dilemmas, and compliance difficulties as regulations struggle to keep pace with technological advancements.

***6) Power Dynamics:***

There is a prevalent concern among individuals that artificial intelligence might supplant or dominate human roles. Those few individuals who oversee AI development could potentially wield significant power as a result. Consequently, artificial intelligence (AI) poses a threat by potentially undermining human authority and fostering dehumanizing behaviors in various contexts.

## Current Landscape of AI in the Indian Banking Sector

In India, the top four commercial banks have collaborated with Fintech startups to lead the way in utilizing AI to enhance customer experiences, lower costs, and boost overall efficiency. Numerous research institutions and universities have been engaged with various AI technologies for many years, particularly focusing on societal transformation. The integration of AI and **M**achine **L**earning (ML) into different banking functions has allowed these institutions to provide a more personalized and streamlined customer service. This advancement has also enabled banks to gain deeper insights into their customers' preferences and expectations. Consequently, the automation of back-end processes has yielded improved results. Currently, SBI is employing an advanced AI solution from Chapdex, which analyzes cameras in bank branches to assess customers' facial expressions. Additionally, SBI has introduced the SIA chatbot, developed by the Silicon Valley and Bengaluru-based startup PAYJO. HDFC is also exploring in-store robotic applications, known as IRA - Intelligent Robotic Assistant, to further enhance customer experiences and transform its business model. Research firms remain optimistic about the potential of AI in the financial sector, particularly within banking. According to a 2017 Fintech India report by PwC, global spending on AI applications reached $5.1 billion, an increase from $4 billion in 2015. Furthermore, financial organizations are adopting a comprehensive approach to harness the benefits of artificial intelligence. Indian banks have begun implementing a range of AI applications, including chatbots, risk monitoring, and training programs.

## Conclusion

In recent years, India has been prioritizing technology as a crucial element of its economic growth. **A**rtificial **I**ntelligence (AI) is significantly improving business outcomes and is rapidly becoming the preferred technology globally. The banking sector is among the early adopters of AI, utilizing it in various innovative ways. AI applications range from advanced chatbots for customer support to personalized services tailored to individual needs, and even the deployment of AI-driven

robots for self-service in banks. Beyond these fundamental uses, banks can leverage AI to enhance back-office efficiency and mitigate fraud and security threats. Consequently, artificial intelligence is poised to be a key factor in determining the competitive edge of Indian banks.

## References


1) *Sindhu, J., & R. N. (2019). The effects of Artificial Intelligence on a selected Indian commercial bank: A cost-benefit analysis. Asian Journal of Management, 2-7.*
2) *Neeraj Gupta, J. M. (2020). The relationship between ownership, bank size, capitalization, and performance: Insights from India. Cogent Economics & Finance, 4-34.*
3) *Hickam Sadok, F. S. (2022). A review of artificial intelligence applications in bank credit analysis. Cogent Economics & Finance, 2-10.*
4) *Saloni Tripathi, R. G. (2022). The Impact of Artificial Intelligence on the Banking Industry. International Journal of Research Publication and Reviews, 3-8.*
5) *The Future of Banking: Are Financial Institutions Prepared for the AI Revolution?*
6) *https://www.analyticsinsight.net/banking-of-tomorrow-top-indian-banks-using-artificialintelligence/*

# Customer Predictive Analytics in E-Commerce Using AI

R. K. Manju @ Mahalaskhmi

*Assistant Professor of Commerce, VHNSN College (Autonomous), Virudhunagar*

## Abstract

*E-commerce has completely changed the way we shop. Instead of needing to visit physical stores, consumers can now browse and purchase products online from the comfort of their homes. This shift has made shopping incredibly convenient, allowing people to buy a wide variety of products from all over the world without leaving their homes. By using predictive analytics, businesses can make more informed decisions. They can optimize their operations by ensuring they have the right amount of stock, planning more effective marketing campaigns, and improving customer service. This not only helps them stay competitive but also enhances the overall shopping experience for their customers.*

## Introduction

E-commerce has completely changed the way we shop. Instead of needing to visit physical stores, consumers can now browse and purchase products online from the comfort of their homes. This shift has made shopping incredibly convenient, allowing people to buy a wide variety of products from all over the world without leaving their homes. Whether it's clothes, electronics, groceries, or even furniture, almost anything can be bought online with just a few clicks. However, with this convenience come significant challenges for e-commerce businesses. One major challenge is the intense competition in the online market. With countless online stores available, businesses must work hard to stand out and attract customers. They need to offer competitive prices, unique products, and exceptional customer service to gain and retain customers.

Another challenge is the constantly changing preferences of consumers. What customers want and expect from their shopping experience can change quickly. Trends can come and go rapidly, and businesses need to keep up with these changes to remain relevant and meet their customers' needs. This can be difficult because it requires continuously adapting strategies and offerings.

To overcome these challenges, e-commerce businesses are increasingly turning to predictive analytics. Predictive analytics is a powerful tool that helps businesses understand and anticipate future trends. It involves using statistical techniques and machine learning algorithms to analyze past data and make predictions about future outcomes. In simple terms, predictive analytics looks at historical data— such as past sales, customer behavior, and market trends—to forecast what might

happen in the future. For example, it can help a business predict which products will be popular next season, how much inventory to stock, or which customers are likely to make a purchase.

By using predictive analytics, businesses can make more informed decisions. They can optimize their operations by ensuring they have the right amount of stock, planning more effective marketing campaigns, and improving customer service. This not only helps them stay competitive but also enhances the overall shopping experience for their customers.

## Objectives of the Study

The following are the Objectives of the Study,

- To assess the changing trends in E – Commerce and its impact on Business models.
- To explore the critical factors that determine the success of Predictive analytics
- To furnish the impact of applying Customer predictive analytics for the success of the business

## Research Methodology

The study is qualitative and descriptive in nature and most of the data is based on secondary sources of survey data.

### E-Commerce and its impact on Business models

The two concepts e-business and e-commerce are often mixed up. E-business can be understood as the ability of a firm to electronically connect, in multiple ways, many Internet technology (internet, intranet, extranet) in all aspects of the business world. This includes, apart from e-commerce processes, for example Internet and service providers, and providers of market places and reversed auctions. The Five e-commerce marketing trends[1]that dominated in 2015 is Prominence of Content marketing, Merging of SEO and Social Signaling, Diversification of social media, Increase in Mobile marketing and Growth in Re-marketing Ads.

In the initial years of dot com explosion era in 2000s, search engines and directory systems for locating web content formed the crux of data analytics and giving importance to aspects like web spidering, site ranking, and search log analysis. Whereas in the off late social media era i.e., post adoption of large social media giants like Facebook (FB) and Twitter, customer opinions and

sentiment analysis techniques are frequently adopted[14]. Business analytics and data mining have become increasingly important in business communities and government sector respectively in the last ten years. Emerging analytics research opportunities encompassing big data analytics, network and mobile analytics—all of which can contribute to BI&A 1.0, 2.0, and 3.0.

**Data Analytics**

Data mining and statistical analysis are the founding pillars of Business Intelligence & Analytics (BI & A) technologies. Relational DBMS, data warehousing, OLAP and BPM are some of the mature commercial technologies that support BI&A. When it comes to handling large data (Big Data input a bytes), instead of putting tiresome efforts and resource on large data sets, it is practically advisable to focus on small data sets based on which the large data sets can be estimated and predicted. Under these situations Apriori algorithms, probabilistic approaches and multivariate techniques are utilized (clustering, regression, association analysis).

**Text and Web Analytics**

Text analytics techniques are mainly used for information extraction and opinion mining. NER (named entity recognition) for classification of data and topic modeling algorithms are currently researched in a very large way. With social media and its impact on various aspects of business and day to day life, large amounts of data produced from blogs, social forums, and networking websites can be analyzed using Web Analytics. The corporate can extract valuable insights on products, services, customer feedback, and the government can attempt to tap public opinion on societal needs and feedback on government reforms and programs.

**Network Analytics**

Community detection in social networks is possible by utilizing graph partitioning algorithms to identify dense sub graphs representing user communities. Tools like UCI Net are widely used for large-scale network analysis and visualization. Similarly, ERGM is a network analytic tool available to the academic community. Network analytics tools life these listed enables to identify criminal and terrorist networks, trust and reputation networks and much more. On the predictive capability of network analytics, using link mining, one seeks to predict links between nodes of a social network (network of customers, end users with collaboration, product adoption) or email group.

**Mobile Analytics**

The m-commerce (Mobile commerce) platforms goes hand in hand complementing and competing with e-commerce platforms. Though both look similar in functionality, the technical requirements and analyzing methods are totally different in interaction styles and value chain. The maturing mobile development platforms such as Android and iOS have contributed to the rapid development various mobile pervasive applications, from disaster management to health care support. The major advantage of mobile analytics research is that mobile devices and apps are location-aware and being activity-sensitive. And this unique feature has led to development of various m health and m learning systems and applications.

## Factors contribute the success of Predictive analytics

The analysis of predictive analytics in e-commerce reveals several critical factors that contribute to its success:

- **Quality and Granularity of Data:** The accuracy of predictions heavily depends on the quality and granularity of the data used. High-quality, detailed data provides a solid foundation for precise modeling and forecasting. This means that the more accurate and comprehensive the data is, the better the predictive models will perform. Data sources include historical sales records, customer interactions, market trends, and more. Ensuring that this data is clean, complete, and relevant is essential for generating reliable predictions.

- **Choice of Algorithms and Models:** The algorithms and models used in predictive analytics play a crucial role in determining the accuracy and reliability of the forecasts. Traditional statistical methods, such as linear regression, offer simplicity and ease of use but may lack the sophistication needed for complex patterns. In contrast, machine learning algorithms, like neural networks and decision trees, provide greater flexibility and accuracy. These advanced models can handle large datasets, identify intricate patterns, and improve over time as they learn from new data.

- **Integration into Business Processes:** Successfully integrating predictive analytics into business processes requires more than just technology; it demands a cultural shift within the organization. Businesses must invest in the right technology infrastructure and ensure that their teams have the necessary skills to work with advanced analytics tools. This includes training staff to understand and interpret predictive models, as well as fostering a data-driven decision-making culture. Without this integration, the potential benefits of predictive analytics cannot be fully realized.

- **Enhancement of Customer Behavior Analysis** Understanding customer behavior is essential for creating personalized marketing strategies and improving over all customer satisfaction. Predictive analytics enables e-commerce platforms to gain deep insights into customer behavior by analyzing purchasing patterns, preferences, and browsing habits.

Using techniques like clustering and regression analysis, businesses can segment their customers into different groups based on their behaviors and preferences. This segmentation helps identify high value customers who are more likely to make repeat purchases. It can also predict which customers might stop buying from the business, known as churn prediction. Additionally, predictive analytics can personalize product recommendations, making suggestions that are more likely to interest individual customers. By anticipating customer needs and behaviors, businesses can tailor their marketing strategies to engage customers more effectively. This personalized approach enhances customer loyalty and satisfaction, as customers feel understood and valued.

## Impact of Applying Customer Predictive Analytics

The implementation of predictive analytics in e-commerce has led to substantial benefits, demonstrating its potential to drive significant business outcomes:

- **Improved Inventory Turnover Rates:** Businesses using predictive analytics have reported better inventory turnover rates. By accurately forecasting demand, they can maintain optimal stock levels, reducing the time products spend in storage and increasing the frequency of inventory cycles.

- **Reduced Stockouts and Decreased Holding Costs:** Accurate demand forecasting helps businesses avoid stockouts, ensuring that products are available when customers want them. This leads to higher customer satisfaction and loyalty. Additionally, businesses can reduce holding costs by avoiding overstocking, which ties up capital and incurs storage expenses.

- **Higher Engagement Rates and Increased Customer Retention:** Customer behavior analysis through predictive analytics has resulted in higher engagement rates. By understanding and anticipating customer preferences, businesses can personalize marketing efforts, recommend relevant products, and create a more engaging shopping experience. This personalization fosters stronger customer relationships and increases retention rates.

- **Improved Sales Forecasting Accuracy:** Predictive analytics has enhanced the accuracy of sales forecasts, enabling better strategic planning and resource management. With reliable forecasts, businesses can allocate resources more effectively, plan marketing campaigns, and make informed decisions about expansion and diversification.

## Conclusion

Predictive analytics is a powerful tool for e-commerce businesses aiming to optimize operations and enhance customer experiences. By leveraging historical data and advanced algorithms, businesses can make informed decisions, anticipate market trends, and stay ahead of the competition. The findings of this research highlight the transformative impact of predictive analytics on inventory management, customer behavior analysis, and sales forecasting. As technology continues to evolve, the adoption of predictive analytics in e-commerce is expected to grow, offering even greater opportunities for maximizing business incomes.

## References


1) *Pang B, Lee L. Opinion Mining and Sentiment Analysis. Foundations and Trends in Information Retrieval. 2008; 2(1-2):133–5.*
2) *Chaudhuri S, DayalU, Narasayya V. An Overview of Business Intelligence Technology. Communications of the ACM. 2011; 54(8):88–98.*
3) *WuX, Kumar V, Quinlan J R, Ghosh J, Yang Q, MotodaH, Mc Lachlan GJ, NgA, Liu B, Yu PS, Zhou ZH, Steinbach M, Hand DJ, SteinbergD.Top10AlgorithmsinDataMining. Knowledge and Information Systems. 2007; 14(1):1–37.*
4) *Blei DM. Probabilistic Topic Models. Communications of the ACM. 2012; 55(4):77–84.*
5) *O'Reilly T. What Is Web 2.0? Design Patterns and Busi- ness Models for the Next Generation of Software Avail- able from: http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html, Data accessed:2-2015.*
6) *Ananthi S, Jayanthi R. A Text Mining Approach to Extract Opinions from Unstructured Text. Indian Journal of Science and Technology. 2015; 8(36):3–4.*
7) *Fortunato S. Community Detectionin Graphs. Physics Re- ports. 2010; 486(3-5):75–174.*
8) *Borgatti SP, Everett.MG, Freeman.LC. UCInet for Windows: Software for Social Network Analysis, Harvard, MA: Analytic Technologies. 2002.*

9) *Hunter DR, Handcock MS, Butts CT, Goodreau SM, Morris MM. ergm: A Package to Fit, Simulate and Diagnose Ex-Potential-Family Models for Network. Journal of Statistical Software. 2008; 24(3):1–29.*

10) *Clark I. Emerging value propositions for m-commerce. J Bus Strat. 2009; 25(2):41–57.*

11) *Snider M. More Businesses Getting Their Game On. USA Today.2012.*

12) *Premkumar Balaraman and Sabarinathan Chandrasekar, Indian Journal of Science and Technology, Vol9(32),*

# Artificial Intelligence in FinTech: Understanding Chatbot Adoption among Users

Neha Sharma[1]* and Ruby Mittal[2]

[1]*Research Scholar, MVN University, Palwal*

[2]*Assistant Professor, MVN University, Palwal*

**Corresponding Author e-mail id: 23ms9001@mvn.edu.in*

## Abstract

### Objective of the Study

With the increasing integration of Artificial Intelligence (AI) in financial technology (FinTech), chatbots have emerged as a key innovation in user interactions. This study develops a research framework to better understand the factors influencing chatbot adoption among potential users in the financial sector.

### Research Methodology

In this study, data was collected from a web-based survey of 175 respondents (Delhi-NCR), comprising potential chatbots users. The study analyzed the data by using Structural Equation Modeling (SEM) to validate the measurement scales and determine the factors adoption behavior. The objective of the SEM analysis is to identify the direct and indirect relationships among the constructs influencing chatbots adoption.

### Findings

The findings of the reveals that Performance Expectancy (PE) is the strongest predictor of chatbot adoption, followed by Effort Expectancy (EE). Trust (TR) does not directly influence adoption but positively impacts Effort Expectancy by employing SEM analysis. Moreover, Behavioral Intention (BI) significantly reflects adoption, confirming the model's robustness in the context of AI-driven FinTech services.

### Practical Implications

To increase adoption, Banks and financial institutions should develop AI-powered chatbots that prioritize user experience, ease of use, and trust-building mechanisms. Marketing strategies should focus on increasing user awareness and confidence in AI-driven financial services.

## Originality of the Research

This study covers existing Fintech adoption models by identifying key psychological and technological factors that influence chatbots adoption. In addition, this study provides new perspectives into how to effectively use chatbots for better customer engagement and improve the efficacy of financial institutions.

***Keyword:*** *AI, Fintech, Chatbot, SEM, Trust, Adoption*

## Introduction

The term Artificial Intelligence (AI) was first introduced at the Dartmouth Summer Research Project on Artificial Intelligence (DSRPAI), organized by Marvin Minsky and John McCarthy at Dartmouth College in 1956 (Haenlein & Kaplan, 2019). AI aims to enable computers to perform tasks typically associated with human intelligence (Boden, 2018).

A chatbot, derived from the term "robot," is a computer program designed to simulate human conversation. Chatbots utilize Natural Language Processing (NLP), image processing, and video processing to interact with users via text or spoken language, executing tasks as instructed (Sivathanu, 2019). The widespread adoption of chatbots has accelerated with AI-driven virtual assistants like Alexa and Siri, which have replaced traditional customer service roles (Gupta & Jana, 2003).

According to the DigiDhan Dashboard maintained by the Ministry of Electronics and Information Technology, digital payment transactions have surged significantly, recording over 18,807 crore transactions from April 1, 2023, to March 31, 2024. AI-powered chatbots are a transformative force in customer service, bridging technological advancements with the demand for real-time digital support (Kenwright, 2023). These chatbots serve as valuable tools for organizations aiming to provide personalized and immediate assistance across diverse, geographically dispersed markets (Prahalad & Ramaswamy, 2004). Despite global AI adoption, cultural differences, communication preferences, and service expectations necessitate a nuanced examination of user satisfaction in different socio-cultural contexts (Dwivedi et al., 2021).

**Chatbots' Role in Customer Support**

To enhance customer service, businesses are adopting intelligent virtual assistants (chatbots) that transform traditional customer interactions. Initially developed to handle frequently asked questions (FAQs) and basic inquiries, chatbots now deliver real-time support, personalization, and seamless user experiences (Abdellatif et al., 2020; Cordero et al., 2022).

A key advantage of chatbots is their 24/7 availability. Unlike human agents, chatbots do not require rest, ensuring uninterrupted customer support regardless of time zones or business hours (Jarvenpaa & Ives, 1994; Ikwuagwu et al., 2020; Ekechi et al., 2024). Businesses can efficiently scale support operations to meet increased demand without compromising service quality.

Natural Language Processing (NLP) has significantly enhanced chatbot capabilities, enabling them to comprehend and interpret human language, leading to more natural and intuitive conversations (Paliwal et al., 2020). Moreover, chatbots employ machine learning algorithms to analyze user interactions, feedback, and evolving customer needs, ensuring continuous improvement in their effectiveness.

Chatbots also provide consistent support across multiple digital platforms, including websites, social media, and messaging applications (Krishnan et al., 2022). The integration of chatbots and virtual assistants in customer service operations enhances efficiency, allowing human agents to focus on more complex, high-value tasks. Combining AI with human expertise leads to higher customer satisfaction through timely and effective support (Atobatele, Akintayo, & Mouboua, 2024; Atobatele & Mouboua, 2024b).

The evolution of AI-powered chatbots has significantly improved response times and customer satisfaction (Adam et al., 2020). A landmark development in chatbot technology was the introduction of virtual assistants, exemplified by Apple's Siri in 2011. By leveraging advanced speech recognition and NLP, Siri set the foundation for interactive and user-centric customer service applications (Gruber, 2012). These advancements continue to shape the development of next-generation AI-driven chatbots capable of handling complex customer support tasks.

## Problem Statement

Despite the expanding use of AI chatbots in FinTech, their adoption faces obstacles in terms of Performance Expectancy (PE), Effort Expectancy (EE), Trust (TR), and overall user adoption. Users frequently question chatbot reliability (PE), simplicity of engagement (EE), and security concerns (TR), causing hesitancy in usage. Adoption rates are also influenced by a lack of awareness and opposition to AI-powered services. This paper looks at Constructs relation among the variables by using SEM analysis chatbot acceptance in the FinTech sector

## Research Gap

The existing literature focuses mostly on the technical capabilities of AI chatbots in FinTech, but there is an acute shortage of understanding of how Performance Expectancy (PE), Effort Expectancy (EE), and Trust (TR) influence user acceptance. This study fills the gap by examining the impact of these factors on chatbot acceptance while also addressing user concerns and adoption difficulties.

## Research Objectives

i. Investigate the effect of Performance Expectancy (PE) on user adoption of AI chatbots in fintech.
ii. Examine how Effort Expectancy (EE) impacts user adoption and ease of interaction with chatbots.
iii. Evaluate the impact of trust (TR) on user perceptions and willingness to use AI-powered chatbots.

## Literature Review

The adoption of AI-powered chatbots in FinTech has gained significant attention due to their impact on customer service efficiency and user experience. This section reviews existing research on chatbot adoption, key influencing factors, and their role in enhancing digital financial services.

## AI in FinTech

Artificial intelligence (AI) has transformed the FinTech business by automating procedures, boosting decision-making, and providing better consumer experiences. Chatbots, Robo-advisors, fraud detection systems, and predictive analytics are examples of AI-powered innovations that have considerably enhanced financial services efficiency and accessibility (Arner et al., 2016). These

technologies provide personalized financial solutions, real-time risk assessment, and improved consumer interactions, allowing financial institutions to optimize operations while lowering costs (Huang and Rust, 2018). Despite these developments, trust issues, security risks, a lack of transparency, and user adoption challenges continue to be important research topics (Gomber et al., 2017). AI-powered technologies, such as automated fraud detection, risk assessment, credit scoring, and personalized financial planning, have altered how financial institutions run their business. Machine learning (ML) systems use patterns and abnormalities to

Detect fraudulent transactions quickly (Patel & Shah 2021). AI-powered chatbots and virtual assistants improve client connections by responding in real time and making personalized recommendations (Brown et al., 2020). AI models use enormous volumes of alternative data, such as transaction history and social behavior, to evaluate creditworthiness and provide financial access for underbanked groups (Zhang & Li, 2019). Furthermore, Robo-advisors lower the cost of financial advice services by making automated investment recommendations based on consumer risk preferences (Chen et al., 2022). Despite these advantages, substantial hurdles remain, including ethical concerns, algorithmic biases, and data privacy issues, which impede AI adoption in FinTech (Kumar & Singh, 2021). Addressing these issues is critical for promoting mainstream acceptance of AI-powered financial solutions.

## Chatbots for Financial Services

AI chatbots are increasingly employed in financial institutions to answer regular inquiries such as balance checks, transaction status updates, and loan application processes, decreasing customer support costs and response times (Burgess, 2019).A study by Butt and Ahmad (2023) studied the behavioral dynamics of client interactions using AI chatbots. The study used recognized frameworks, such as the Information Systems Success (ISS) model, Technology Acceptance Model (TAM), and user engagement theories, to collect data from 554 respondents via an online survey. The findings show that AI chatbots dramatically increase user satisfaction and promote favorable behavioral consequences. The report also emphasizes the importance of AI chatbots in electronic word-of-mouth (e-WOM), which influences online shopping decisions and improves the digital user experience. These findings highlight the growing importance of chatbots in digital financial services, making them essential for financial organizations looking to improve consumer engagement in the digital era.

## Research Methodology

The study adopts a quantitative research design, with primary data collection and analysis at its core. The procedure involves developing an online poll for users of e-commerce platforms that use AI chatbots. The survey will assess product selection accuracy, user satisfaction, chatbot response time, overall user experience, and consumer trust. The survey data will be collected from a representative sample of e-commerce users and analyzed using statistical methods like regression and structural equation modeling to test hypotheses. This method demonstrates how AI-powered chatbots can improve e-commerce functionality.

A well-defined research approach serves as the cornerstone of the entire research process. This guide outlines data collection, hypothesis testing, and conclusion drawing techniques. The article covers sample concerns, data gathering and analysis methodologies, and ethical considerations for research.

## Sample Size

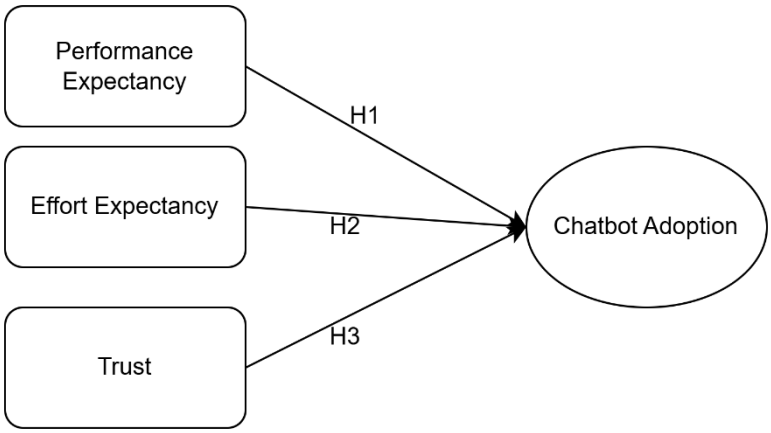
A standardized questionnaire and stratified random selection will be used to survey chatbot users from different regions of India. 200 surveys were delivered to fintech users across India via WhatsApp groups, Facebook, LinkedIn and other social media channels. 175 responses were gathered accounting for 87.5% of the total. However, 25 of the responses were invalid because they contained missing or erroneous information. The study has a total sample size of 175 based on genuine responses. The sample size is sufficient to detect significant effects of chatbot adoption integrating AI-driven performance expectancy, effort expectancy, Customer trust and overall adoption of Chatbot in Fintech.

## Framework and Hypothesis

A hypothesis is a tested statements that predicts the relationship between variables using theoretical foundations and previous research. In the context of FinTech and AI chatbot adoption, hypotheses aid in determining how critical characteristics such as performance expectancy (PE), effort expectancy (EE), and trust (TR) influence user behavior. A framework provides a systematic model for understanding these interactions, which are frequently used to investigate Artificial Intelligence in FinTech: Understanding Chatbot Adoption among Customers by considering aspects such as performance expectancy, effort expectancy, and trust problems. Using such a framework,

researchers may systematically examine how users interact with AI-powered chatbots in financial services.

**Figure 1: Proposed Model**




## Hypothesis Formulation

**H1:** Performance Expectancy (PE) has a significant positive effect on the adoption of chatbots.

**H2:** Effort Expectancy (EE) has a significant positive effect on the adoption of chatbots.

**H3:** Trust (TR) has a significant positive effect on the adoption of chatbots.

## Data Analysis and Interpretation

Data analysis and interpretation is looking through acquired data to find patterns, relationships, and insights that support or refute assumptions. In the context of FinTech and AI chatbot adoption, this method aids in understanding user behavior, preferences, and concerns, resulting in actionable insights for increasing chatbot efficiency and trust.

## Demographic Profile

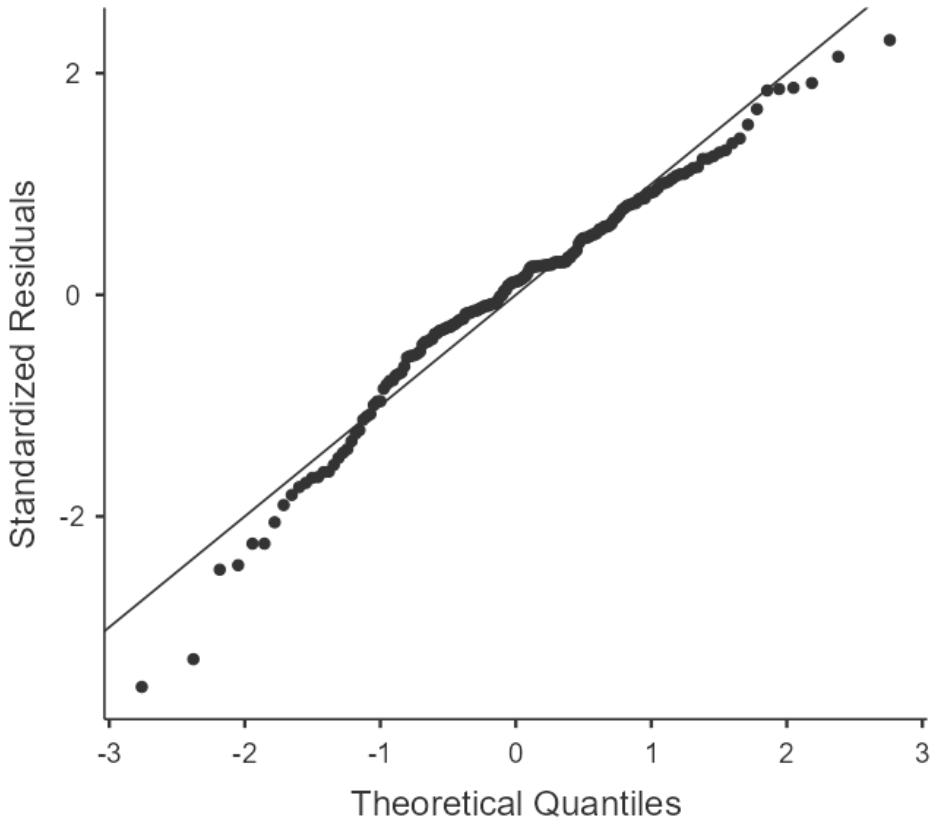
The demographic profile of the respondents provides valuable context for understanding the adoption of AI chatbots in FinTech. Since 70% of respondents are male and 30% female, chatbot adoption trends may differ based on gender preferences, with males potentially showing a higher inclination toward technology adoption. The age distribution, where 50% belong to the 30–40 age group and 20% to the 40–50 age group, suggests that middle-aged professionals, who are typically more tech-savvy and financially active, are the primary users of AI chatbots.

## Q-Q Plot

The Q-Q (Quantile-Quantile) plot of standardized residuals is often used in regression analysis to determine residual normality. The graphic compares the distribution of standardized residuals to the theoretical quantiles of a normal distribution. If the residuals are regularly distributed, the points should be nearly aligned with the diagonal reference line. The dots in this plot largely follow the diagonal, indicating a nearly normal distribution; however, minor deviations at the tails indicate probable departures from normality, such as skewness or heavy tails (Field, 2018).

A normal residual distribution is an important assumption in linear regression since it ensures that the model's predictions are unbiased and accurate (Kutner, Nachtsheim, and Neter, 2004). If considerable variations exist, transformations or alternate modeling methodologies may be required (Gujarati & Porter, 2009). The points mainly follow the diagonal line, indicating an almost normal distribution, but modest deviations at the tails indicate minor deviations from normality. This indicates that the regression model meets normality assumptions but may contain some skewness or outliers.

**Figure 2: Q-Q Plot (Derive by Jamovi)**



## Reliability and Validity Test

Reliability test is used to test the consistency of a research study. It is defined as degree to which a test consistently measures whatever it measures. Cronbach's alpha is calculated to do the reliability test of the research work questionnaire, Internal Consistency reliability method. The calculated value of Cronbach's Alpha is 0.904 (Table 1) and Cronbach's Alpha based on standardized items is 0.700. Value equal to 0.7 and more than 0.70 is acceptable. As calculated value is 0.904 so it can be stated that collected data is reliable in questionnaire.

**Table 1: Reliability& Validity**

| No. of item | Cronbach's Alpha | Cronbach's Alpha Acceptance | KMO | KMO Acceptance |
|---|---|---|---|---|
| 19 (PE, EE, TR, BI) | 0.904 | Excellent reliability | 0.859 | Good |
| 5 (PE) | 0.831 | Good reliability | 0.812 | Good |
| 4(EE) | 0.921 | Excellent Reliability | 0.803 | Good |
| 5 (TR) | 0.869 | Good reliability | 0.784 | Average |
| 5 (BI) | 0.843 | Good reliability | 0.790 | Average |

The reliability and sample adequacy tests of the constructs—Performance Expectancy (PE), Effort Expectancy (EE), Trust (TR), and Behavioral Intention (BI)—show good internal consistency and readiness for further statistical analysis. The total scale, which had 19 items, has a high reliability score (Cronbach's Alpha = 0.904) and strong sample adequacy (KMO = 0.859), indicating that the dataset is well-structured for factor analysis.

On the basis of Individually construct, PE (Cronbach's Alpha = 0.831, KMO = 0.812) and EE (Cronbach's Alpha = 0.921, KMO = 0.803) have strong reliability and sample adequacy, indicating their eligibility for factor analysis. The TR construct (Cronbach's Alpha = 0.869, KMO = 0.784) and BI construct (Cronbach's Alpha = 0.843, KMO = 0.790) have strong internal reliability, but their KMO values are slightly lower, indicating that while factor analysis is still appropriate, further validation may be required. Overall, the findings indicate that the constructs are statistically trustworthy and appropriate for future Structural Equation Modelling (SEM) investigation. However, considering the KMO values for TR and BI are within the normal range

**Table 2: Common Fit Indices & Standard Thresholds**

| Fit Indices | Thresholds | Fit Indices Value | Interpretation |
|---|---|---|---|
| **Chi-Square ($\chi^2$/df)** | ≤ 5 | 2.15 | Acceptable |
| **CFI (Comparative Fit Index)** | ≥ 0.90 | 0.994 | Acceptable |
| **TLI (Tucker-Lewis Index)** | ≥ 0.90 | 0.993 | Acceptable |
| **RMSEA (Root Mean Square Error of Approximation)** | ≤ 0.08 | 0.082 | Reject |
| **SRMR (Standardized Root Mean Square Residual)** | ≤ 0.08 | 0.075 | Acceptable |

The model fit indices examine the overall goodness-of-fit of the Structural Equation Modeling (SEM) investigation by determining how well the proposed model correlates to the observed data. The Chi-Square/Degrees of Freedom ratio ($\chi^2$/df) is 2.15, which is lower than the acceptable criterion of ≤ 5, indicating a reasonable model fit. Similarly, the Comparative Fit Index (CFI) = 0.994 and the Tucker-Lewis Index (TLI) = 0.993, both beyond the recommended ≥ 0.90 threshold, indicating a robust model fit and support the model's interpretation of the variation in the data.

The model's adequacy is further supported by the Standardized Root Mean Square Residual (SRMR) of 0.075, which falls within the acceptable ≤ 0.08 range. However, the RMSEA = 0.082 is somewhat higher than the required criterion of ≤ 0.08, indicating a marginal mismatch. Despite this, RMSEA levels around 0.08 are frequently regarded reasonable in practice. Overall, the model shows an acceptable fit, with most fit indices.

The Model Summary table displays key regression statistics, including R = 0.756, which shows a significant connection between the predictors and the dependent variable. The R Square score of 0.572 indicates that the model accounts for about 57.2% of the variation in the dependent variable. The Adjusted R Square (0.565) compensates for the number of predictors, whereas the Root Mean Square Error (0.402) assesses the model's accuracy in predicting outcomes.

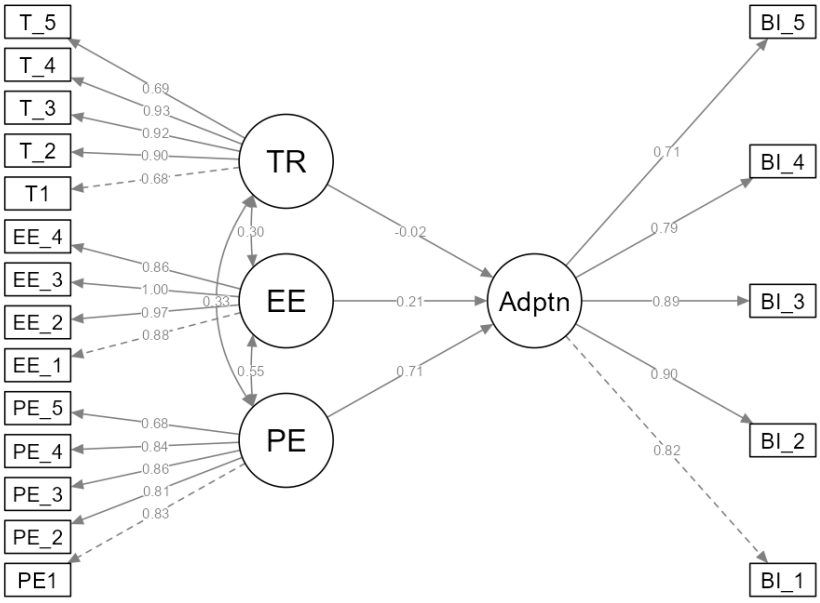
**Table 3: Model Summary**

| Model | R | R square | Adjusted R Square | Root mean of square error |
|---|---|---|---|---|
| 1 | 0.756 | 0.572 | 0.565 | 0.402 |

## SEM Analysis

Structural Equation Modeling (SEM) is a sophisticated statistical tool for investigating complex interactions between observable and latent variables. SEM was used in this study to examine the important determinants impacting chatbot adoption in FinTech, based on survey data acquired from Delhi-NCR respondents. The findings show that Performance Expectancy (PE) is the most important predictor of adoption, followed by Effort Expectancy (EE), with Trust (TR) indirectly influencing adoption by increasing EE. The model's validity was confirmed using key fit indices, which supported the suggested framework and provided insights into user perceptions of AI-powered financial services.

**Figure 3: SEM Analysis using Jamovi**




## Hypothesis Testing Results

| Hypothesis | Path coefficient (β) | Decision |
|---|---|---|
| H1: PE → AD | 0.71 | Accepted |
| H2: EE → AD | 0.21 | Accepted |
| H3: TR → AD | -0.02 | Rejected |

The use of Artificial Intelligence (AI) in FinTech, particular through chatbots, can be studied using the same framework as the supplied hypothesis testing table. Understanding chatbot adoption among customers encompasses key characteristics such as Performance Expectancy (PE), Effort Expectancy (EE), and Trust (TR), all of which influence customer acceptance of AI-powered financial solutions. The use of AI chatbots in FinTech correlates with key factors such as performance expectancy (PE), effort expectancy (EE), and trust (TR). Customers are more likely to use chatbots that efficiently address queries, complete transactions, and provide tailored recommendations, as shown by a high PE ($\beta$ = 0.71 β=0.71). A positive EE ($\beta$ = 0.21, β = 0.21) suggests that chatbot adoption is enhanced by ease of use, intuitive design, and NLP-driven interactions. Although TR ($\beta$ = -0.02, β = -0.02) was not a significant predictor in the previous study, it may be more important for chatbots due to privacy concerns and data security threats that may limit adoption. Improving security, transparency, and human-like interactions can boost client confidence in AI-powered financial assistants.

## Findings and Conclusion

According to the survey, chatbot usage in FinTech differs by demographic, with middle-aged professionals (30-40 years old) being the most active users, indicating greater computer savvy and financial participation. The reliability study validates the data's robustness, with Cronbach's Alpha values exceeding the acceptable threshold of 0.7, indicating internal consistency across constructs. The SEM model fit indices show an excellent model fit, with CFI (0.994) and TLI (0.993) exceeding the recommended 0.90 benchmark, although SRMR (0.075) is still within acceptable limits. However, the RMSEA (0.082) is just above the optimal threshold, indicating a little divergence. Performance Expectancy (PE) ($\beta$ = 0.71) indicates user value for efficiency and personalized help, whereas Effort Expectancy (EE) ($\beta$ = 0.21) emphasizes intuitive design and ease of use. Although trust (TR) ($\beta$ = -0.02) is not a strong predictor, worries about data security and privacy may nevertheless affect adoption. Strengthening chatbot security, maintaining transparency, and increasing user experience through natural language processing (NLP) and human-like interactions can boost customer trust and speed up AI-driven financial services adoption.

## Suggestion & Recommendation

Enhancing security, transparency, and AI-powered fraud detection will increase trust in chatbot usage. Improved user experience, including intuitive design and multilingual support, will increase accessibility. AI-powered personalized recommendations and predictive support can

improve engagement. Targeted marketing and awareness campaigns will increase adoption among various populations. Regular updates, feedback integration, and validation will ensure long-term efficiency. Future developments should focus on voice-enabled AI chatbots, blockchain-based security, sentiment analysis for enhanced interactions, and regulatory compliance to ensure ethical and responsible AI use in financial services.

## Funding

This research was supported by **Anangpuria School of Management &Technology**, whose assistance and resources played a crucial role in facilitating the study. We extend our sincere gratitude for their support, which contributed significantly to the successful completion of this work.

## References

1) *Abdellatif, A., Costa, D., Badran, K., Abdalkareem, R., & Shihab, E. (2020). Challenges in chatbot development: A study of Stack Overflow posts. Proceedings of the 17th International Conference on Mining Software Repositories.*
2) *Adam, M., Wessel, M., & Benlian, A. (2020). AI-based chatbots in customer service and their effects on user compliance. Electronic Markets, 30(2), 427–445.*
3) *Arner, D. W., Barberis, J., & Buckley, R. P. (2016). The evolution of FinTech: A new post-crisis paradigm? Georgetown Journal of International Law, 47(4), 1271–1319.*
4) *Atobatele, F. A., & Mouboua, P. D. (2024b). Navigating multilingual identities: The role of languages in shaping social belonging and political participation. International Journal of Applied Research in Social Sciences, 6(5), 828–843.*
5) *Atobatele, F. A., Akintayo, O. T., & Mouboua, P. D. (2024). The impact of instructional design on language acquisition in multilingual STEM classrooms. Engineering Science & Technology Journal, 5(5), 1643–1656.*
6) *Brown, T., Smith, J., & Williams, L. (2020). The role of AI-powered chatbots in financial services. Journal of Financial Technology, 15(2), 45–60.*
7) *Burgess, M. (2019). How AI chatbots are changing customer service in banking. Journal of Financial Technology, 12(3), 45–58.*
8) *Butt, A. H., & Ahmad, H. (2023). AI chatbot innovation leading toward consumer satisfaction, electronic word of mouth, and continuous intention in online shopping. Journal of Telecommunications and the Digital Economy, 11(4), 156–184.*

9) *Chen, Y., Lin, M., & Wang, X. (2022). Robo-advisors and AI-driven investment strategies. Financial Innovation Review, 20(1), 112–128.*

10) *Cordero, J., Barba-Guaman, L., & Guamán, F. (2022). Use of chatbots for customer service in MSMEs. Applied Computing and Informatics.*

11) *Dwivedi, Y. K., Hughes, L., Ismagilova, E., Aarts, G., Coombs, C., Crick, T., Duan, Y., Dwivedi, R., Edwards, J., Eirug, A., & Galanos, V. (2021). Artificial Intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice, and policy. International Journal of Information Management, 57, 101994.*

12) *Ekechi, C. C., Chukwurah, E. G., Oyeniyi, L. D., & Okeke, C. D. (2024). AI-infused chatbots for customer support: A cross-country evaluation of user satisfaction in the USA and the UK. International Journal of Management & Entrepreneurship Research, 6(4), 1259–1272.*

13) *Field, A. (2018). Discovering statistics using IBM SPSS statistics (5th ed.). SAGE Publications.*

14) *Gomber, P., Koch, J., & Siering, M. (2017). Digital finance and FinTech: Current research and future research directions. Journal of Business Economics, 87(5), 537–580.*

15) *Gruber, T. (2012). Siri, a virtual personal assistant—Knowledge navigator 2.0. AI Magazine, 33(1), 13–15.*

16) *Gujarati, D. N., & Porter, D. C. (2009). Basic econometrics (5th ed.). McGraw-Hill Education.*

17) *Gupta, M. P., & Jana, D. (2003). E-government evaluation: A framework and case study. Government Information Quarterly, 20(4), 365–387.*

18) *Huang, M. H., & Rust, R. T. (2018). Artificial intelligence in service. Journal of Service Research, 21(2), 155–172.*

19) *Ikwuagwu, C. V., Ajah, S. A., Uchenna, N., Uzoma, N., Anutaa, U. J., Sa, O. C., & Emmanuel, O. (2020). Development of an Arduino-controlled convective heat dryer. UNN International Conference: Technological Innovation for Holistic Sustainable Development (TECHISD2020), 180–195.*

20) *Jarvenpaa, S. L., & Ives, B. (1994). The global network organization of the future: Information management opportunities and challenges. Journal of Management Information Systems, 25–57.*

21) *Kenwright, B. (2023). Exploring the power of creative AI tools and game-based methodologies for interactive web-based programming. ArXiv preprint arXiv:2308.11649.*

22) *Krishnan, C., Gupta, A., Gupta, A., & Singh, G. (2022). Impact of artificial intelligence-based chatbots on customer engagement and business growth. In Deep Learning for Social Media Data Analytics (pp. 195–210). Cham: Springer International Publishing.*

23) *Kumar, S., & Singh, R. (2021). Ethical concerns and biases in AI-driven financial decision-making. AI & Society, 36(4), 205–222.*

24) *Kutner, M. H., Nachtsheim, C. J., & Neter, J. (2004). Applied linear regression models (4th ed.). McGraw-Hill Irwin.*

25) *Paliwal, S., Bharti, V., & Mishra, A. K. (2020). AI chatbots: Transforming the digital world. Recent Trends and Advances in Artificial Intelligence and Internet of Things, 455–482.*

26) *Patel, A., & Shah, K. (2021). Fraud detection in financial transactions using machine learning. Journal of AI in Finance, 10(3), 99–115.*

27) *Prahalad, C. K., & Ramaswamy, V. (2004). The future of competition: Co-creating unique value with customers. Harvard Business Press.*

28) *Sivathanu, B. (2019). Adoption of digital payment systems in the era of demonetization in India: An empirical study. Journal of Science and Technology Policy Management, 10(1), 143–171.*

29) *Zhang, L., & Li, P. (2019). Credit scoring with AI: A new approach for financial inclusion. Banking & Finance Journal, 22(5), 150–168.*

# Impact of AI on Mobile Accounting App: Zoho Invoice

P. Indumathy[1] and L. Malarvizhi[1]

[1]*Assistant Professor, Department of Commerce, Hindusthan College of Arts & Science, Coimbatore, Tamil Nadu*

## Abstract

*This research examines the effects of Artificial Intelligence (AI) on the utilization and effectiveness of Zoho Invoice, a mobile accounting application, through a survey conducted with 100 users. The objective of the study is to evaluate how AI functionalities, including automated invoicing, predictive analytics, and tailored reporting, impact the productivity and financial decision-making processes of small enterprises and freelancers. Data gathered via a structured survey investigates the perceived benefits, challenges, and enhancements introduced by AI in Zoho Invoice. The results indicate that AI improves invoicing accuracy, reduces time expenditure, and provides valuable insights, while also raising concerns about data security and user adaptability. The study concludes that although AI in Zoho Invoice leads to greater efficiency, there is a necessity for enhanced user education and stronger security protocols to fully leverage its capabilities.*

***Keywords:*** *Artificial Intelligence, Zoho Invoice, Mobile Accounting, Predictive Analytics, Business Efficiency, Time Savings.*

## Introduction

The incorporation of artificial intelligence (AI) into accounting software has transformed the management of financial operations for businesses. Zoho Invoice, a prominent mobile accounting application, utilizes AI to provide features such as automated invoicing, predictive analytics, and tailored reporting, thereby streamlining processes for small enterprises and freelancers. This research seeks to investigate the effects of AI on the efficiency, accuracy, and user satisfaction associated with Zoho Invoice by conducting a survey of 100 active users of the application. The study will focus on the influence of AI in improving efficiency, user satisfaction, and financial decision-making within mobile accounting applications, particularly highlighting how AI is redefining the landscape of these solutions.

## Review of Literature

This research conducted by **Imanbaeva et al. (2017)** seeks to evaluate and examine an innovative financial instrument through an exploratory approach. It focuses on pertinent applications in Accounting and Finance available in the market, utilizing criteria established through a review of

scientific literature and assessments obtained from interviews with Accounting professionals employed in start-ups across Germany.

The primary advantage of incorporating AI into mobile accounting applications lies in the automation of repetitive and labor-intensive tasks. As noted by **Khanna & Rai (2021),** automation serves as a significant catalyst for the integration of AI within accounting software. Zoho Invoice utilizes AI to streamline processes such as invoice creation and distribution, expense classification, and the production of financial reports.

**Zhang et al. (2020)** highlight that the automation features of AI-driven accounting software, such as Zoho Invoice, not only enhance efficiency by saving time but also reduce the likelihood of human errors, thereby promoting precise record-keeping. Furthermore, AI has the ability to forecast billing cycles and identify trends, which facilitates prompt invoicing and the collection of payments.

## Objectives

1. To evaluate the impact of Zoho Invoice's AI-driven functionalities on productivity enhancement.
2. To measure customer satisfaction regarding the application's precision, efficiency, and cost-effectiveness.
3. To explore the challenges faced by users in adapting to the AI-enhanced features of the application.
4. To identify areas for improvement in the AI integration of Zoho Invoice for future development.

## Methodology

This study utilizes a survey methodology to gather information from 87 users out of 100. Because 13 questionnaires were rejected due suspicious answers. The Zoho Invoice engaged in freelance or business operations. The survey includes both quantitative and qualitative questions designed to evaluate user satisfaction, perceived value, and the difficulties encountered with the application's AI features. The participants consist of a varied cohort of small business owners, freelancers, and accountants who depend on mobile accounting tools.

## Data Analysis and Interpretation

**Table 1: Frequency of Zoho Invoice Use**

| S. No | Frequency | Number of Respondents |
|---|---|---|
| 1 | Daily | 38 |
| 2 | Weekly | 27 |
| 3 | Monthly | 12 |
| 4 | Rarely | 10 |

### Interpretation

Most respondents (38) users Zoho Invoice on a daily basis, indicating the importance of the app in their business operations. This suggests that AI features are integral to their financial management practices.

**Table 2: Improvement in Accuracy of Invoicing due to AI**

| S NO | Improvement Level | Number of Respondents (%) |
|---|---|---|
| 1 | Significant | 44 |
| 2 | Somewhat | 20 |
| 3 | No Change | 10 |
| 4 | Not Applicable | 13 |

### Interpretation

A significant majority (44) of respondents report a substantial improvement in invoicing accuracy due to AI features, suggesting that AI-driven automation in Zoho Invoice helps minimize errors and ensures accuracy in invoicing.

**Table 3: Satisfaction with Predictive Analytics and Reporting Features**

| S. No | Satisfaction Level | Number of Respondents |
|---|---|---|
| 1 | Very Satisfied | 37 |
| 2 | Satisfied | 25 |

| | | |
|---|---|---|
| 3 | Neutral | 17 |
| 4 | Dissatisfied | 4 |
| 5 | Very Dissatisfied | 4 |

**Interpretation**

The majority of respondents (37) are either very satisfied or satisfied with the AI-powered predictive analytics and reporting features, highlighting the usefulness of these features in aiding financial decision-making and business forecasting.

**Table 4: Time Savings Due to AI in Invoicing and Financial Management**

| S. NO | Time Saved | Number of Respondents |
|---|---|---|
| 1 | A lot | 48 |
| 2 | Moderately | 25 |
| 3 | No Change | 7 |
| 4 | More Time | 7 |

**Interpretation**

A significant portion of users (48) believe that AI has saved time in invoicing and financial management tasks, demonstrating the efficiency of AI-powered automation in streamlining accounting operations.

**Table 5: Challenges Faced with AI Features**

| S. NO | Challenges | Number of Respondents |
|---|---|---|
| 1 | Lack of understanding of AI | 20 |
| 2 | Security concerns | 19 |
| 3 | Inaccurate recommendations | 12 |
| 4 | Technical difficulties | 8 |
| 5 | Other | 25 |

**Interpretation**

Security concerns (25%) and lack of understanding (20%) of AI features are the most common challenges. This indicates that while users appreciate AI's functionalities, there is a need for improved education on how to effectively use the app and enhanced security features to protect sensitive financial data.

## Descriptive Analysis

This research comprise of five independent variables and one dependent variable. The dependent variable is business performance which is measured using efficiency, reliability, ease of use, data quality, and accuracy.

**Table No : 6 Descriptive Statistics.**

| Factors | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Business Performance | 87 | 3 | 5 | 4.10 | 0.598 |
| Ease of use | 87 | 3 | 5 | 4.40 | 0. 632 |
| Effectiveness | 87 | 3 | 5 | 4.89 | 0.508 |
| Software reliability | 87 | 3 | 5 | 4.30 | 0.616 |
| Price of the Software | 87 | 3 | 5 | 4.01 | 0.701 |
| Data quality | 87 | 3 | 5 | 4.12 | 0.645 |

The descriptive analysis reveals that reliability, effectiveness, and user-friendliness significantly contributed to improved organizational performance, with average scores of 4.40, 4.89, and 4.30, respectively, and standard deviations of 0.632, 0.508, and 0.616. Furthermore, software expenses and data integrity were identified as two additional independent variables, with average scores of 4.01 and 4.12 and standard deviations of 0.701 and 0.645, although their influence on business performance is relatively limited. Since all average scores are positive, the dataset is deemed to possess high quality.

**Table 7. Cronbach's Alpha Coefficients**

| Constructs | Number of Items | Cronbach's Alpha |
|---|---|---|
| All variables | 42 | 0.973 |
| Business performance | 8 | 0.912 |

| | | |
|---|---|---|
| Ease of use | 7 | 0.858 |
| Effectiveness | 7 | 0.805 |
| Software reliability | 8 | 0.899 |
| Price of the software | 6 | 0.821 |
| Data quality | 6 | 0.873 |

**Interpretation**

This analysis reveals that, the all variable is 42, for the co efficient Alpha value is 0.973, Secondly the value of business performance is 8, for the co- efficient alpha value is 0.912.

## Conclusion

The findings of the research demonstrate that the integration of artificial intelligence into Zoho Invoice significantly enhances accuracy, efficiency, and user satisfaction in financial management tasks. Key features such as automated invoicing, predictive analytics, and customized reporting are considered vital tools that promote time efficiency and improve decision-making processes. The rapid advancements in artificial intelligence have profoundly transformed the accounting industry, particularly in mobile applications. AI has emerged as a revolutionary technology, streamlining workflows, enhancing precision, and supporting superior financial decision-making for businesses of all sizes. Mobile accounting solutions like Zoho Invoice leverage AI to improve user experience, automate repetitive tasks, and provide real-time insights, thus making financial management more effective and accessible.

## References

1) *A Study on the Use and Effectiveness of Accounting Software Systems in enhancing Business Performance in Mumbai, Journal of Development Research 2023, 16(1) 44–56.*
2) *The Impact Of Accounting Software On Business Performance Of Firms In Coimbatore District, Tamil Nadu, J. Senthil Kumar, 2019 Jetir May 2019, Volume 6, Issue 5; 2019 JETIR May 2019, Volume 6, Issue 5.*
3) *Adhikari, A., Lebow, M.I., & Zhang, H. (2014). Firm Characteristics and Selection of International Accounting Software. Journal of International Accounting, Auditing and Taxation, 13(1), 53-69.*
4) *Dibrell, C., Davis, P.S., & Craig, J. (2008). Fueling Innovation through Information Technology in SMEs. Journal of Small Business Management, 46 (2), 203- 218.*

# The Transformative Impact of Artificial Intelligence on Investment Management: A Theoretical Analysis

M. Ponuselvi[1]* and N. Rajathilagam[2]

[1]*Research Scholar, The Standard Fireworks Rajaratnam College for Women, Sivakasi, Tamil Nadu*

[2]*Assistant Professor & Research Supervisor, PG and Research Department of Commerce, The Standard Fireworks Rajaratnam College for Women, Sivakasi, Tamil Nadu*

**Corresponding Author e-mail id: Ponuselvi20114@gmail.com*

## Abstract

*Artificial intelligence (AI) is revolutionizing investment management by enhancing decision-making, optimizing portfolio allocation, and automating trading strategies. This paper explores the theoretical underpinnings of AI's transformative impact on investment management, focusing on machine learning algorithms, predictive analytics, and risk assessment models. By leveraging big data and computational power, AI-driven systems improve efficiency, mitigate biases, and enhance asset pricing accuracy. This theoretical analysis evaluates AI's role in reshaping investment strategies, contrasting traditional human-driven approaches with data-driven, algorithmic decision-making. Furthermore, the study highlights potential risks, such as model over fitting, ethical concerns, and market instability due to algorithmic trading. While AI offers significant advancements, its integration into investment management requires robust governance frameworks to ensure transparency and reliability. This paper provides insights into the evolving landscape of AI-driven financial decision-making and its implications for investors, asset managers, and policymakers.*

***Keywords:*** *AI, investment management*

## Introduction

The rapid evolution of AI is fundamentally transforming investment management, offering unprecedented efficiency and predictive capabilities. Traditional investment strategies, historically reliant on human intuition and experience, are increasingly being supplemented or replaced by AI-driven models. Machine learning algorithms analyze vast datasets, identify market trends, and execute trades at speeds beyond human capability. AI-powered robo-advisors provide personalized investment strategies, reducing costs and democratizing financial services. However, while AI enhances decision-making and portfolio management, it also introduces challenges, including model biases, regulatory concerns, and potential systemic risks. This paper explores the theoretical foundations of AI's impact on investment management, analyzing its benefits, limitations, and future implications in shaping the financial landscape.

## Investment Management: An Overview

Investment management refers to the professional process of handling financial assets and portfolios to achieve specific financial objectives. It involves analyzing market trends, assessing risks, and strategically allocating capital to maximize returns while minimizing losses. Investment managers oversee assets for individuals, institutions, and corporations, using various strategies such as asset allocation, diversification, and risk assessment. The process includes selecting securities, monitoring portfolio performance, and adjusting investments based on market conditions. With advancements in technology, investment management has evolved from traditional human-led decision-making to data-driven, algorithmic approaches powered by artificial intelligence (AI) and big data analytics.

## Key Components of Investment Management

Effective investment management requires a deep understanding of financial markets, risk tolerance, and investment goals. The core components include **portfolio management**, where assets are selected and managed to balance risk and return; **financial analysis**, which involves evaluating macroeconomic trends and company fundamentals; and **risk management**, which focuses on mitigating potential losses. Investment strategies can range from conservative approaches, such as bonds and index funds, to aggressive growth strategies involving equities, hedge funds, and alternative assets. Institutional investors, such as pension funds and mutual funds, rely on investment management to achieve long-term growth, while individual investors use it to build wealth and secure financial stability.

## The Role of Technology in Modern Investment Management

The integration of technology, particularly AI, has transformed investment management by enhancing decision-making, automation, and predictive analytics. AI-driven robo-advisors provide cost-effective, personalized investment solutions based on an individual's risk profile and financial goals. Algorithmic trading systems execute trades in milliseconds, leveraging real-time market data to identify profitable opportunities. Big data analytics helps investment managers process vast amounts of financial information to detect trends and improve portfolio performance. Additionally, AI-powered risk models enhance fraud detection and portfolio risk assessment, reducing exposure to market volatility. As technology continues to advance, investment management is becoming more efficient, data-driven, and accessible to a broader range of investors.

## Artificial Intelligence (AI): An Overview

Artificial Intelligence (AI) uses a number of methods to improve portfolio management, automate trading, and improve decision-making. One of the most popular AI methods is **machine learning (ML)**, which allows investment systems to learn from past data and gradually enhance forecasts. While unsupervised learning finds hidden market trends and investment opportunities, supervised learning aids in stock price predictions. A form of machine learning called reinforcement learning enables AI to continuously modify trading tactics in response to real-time market input. These methods increase the accuracy of financial models while lowering human biases.

Another essential artificial intelligence (AI) method in investment management is **natural language processing (NLP)**. Large volumes of unstructured financial data, such as news stories, earnings reports, and sentiment on social media, can be analyzed with the aid of natural language processing (NLP). NLP helps investors make well-informed judgments by evaluating market sentiment and deriving pertinent insights. Sentiment analysis is very useful for forecasting market movements and comprehending investor sentiment. NLP is also used by AI-powered chatbots and virtual advisers to improve customer service on investment platforms and offer tailored financial advice.

AI is used in predictive analytics and algorithmic trading to make high-frequency trades and predict market moves. To forecast future asset performance, AI-powered algorithms examine past price movements, economic factors, and market patterns. High-frequency trading (HFT) systems take advantage of transient market inefficiencies by executing thousands of deals in milliseconds using real-time data. Furthermore, by spotting volatility trends and maximizing asset allocation, AI-driven risk assessment algorithms assist investors in reducing possible losses. Financial markets are becoming more accessible, data-driven, and efficient as artificial intelligence (AI) develops and is incorporated into investment management.

## Impact of AI on Investment Management

1. Improved Decision-Making: AI evaluates enormous volumes of financial data to offer precise market insights and investment suggestions.
2. Automated Trading: AI-powered algorithmic trading allows for quick, data-driven deal executions with little assistance from humans.

3. Better Risk Management: AI systems evaluate market risks, identify irregularities, and offer ways to reduce possible losses.
4. Personalized Portfolio Management: AI-powered robo-advisors develop investing strategies that are tailored to an investor's objectives and risk tolerance.
5. Sentiment Analysis: To forecast market moves, AI analyzes news, financial information, and social media sentiment.
6. High-Frequency Trading (HFT): AI makes transactions in a matter of microseconds, profiting from even the smallest price changes.
7. Cost Savings: By automating investment procedures, AI lowers management costs and eliminates the need for human advisors.
8. Fraud Detection: To protect financial security, AI detects anomalous trade patterns and fraudulent activity.
9. Market Prediction & Forecasting: Predictive analytics driven by AI assist investors in foreseeing trends and arriving at well-informed conclusions.
10. Better Compliance & Regulation: By keeping an eye on transactions and identifying non-compliant activity, AI makes ensuring that financial regulations are followed.

## Conclusion

AI has revolutionized investment management by enhancing decision-making, automating trading strategies, and optimizing portfolio management. With techniques like machine learning, natural language processing, and predictive analytics, AI enables investors to analyze vast datasets, predict market trends, and manage risks more effectively. The integration of AI-driven technologies, such as robo-advisors and high-frequency trading, has made financial markets more efficient and accessible. However, challenges such as data privacy, regulatory compliance, and algorithmic biases must be carefully managed. As AI continues to evolve, its role in investment management will expand, offering innovative solutions that enhance financial decision-making and drive long-term growth.

## References

1) *A review and research agenda. Journal of Financial Research, 43(3), 295-321.*
2) *Agarwal, R., & Dhar, V. (2014). Big Data, Data Science, and Analytics: The Opportunity and Challenge for IS Research. Information Systems Research, 25(3), 443448.*

3) *Chen, X., & Deng, Y. (2020). Artificial intelligence in financial services: A comprehensive review and future directions. Journal of Financial Services Marketing, 25(1), 67-79.*
4) *Eling, M., & Lehmann, M. (2019). Robo-Advisors and their Impact on Individual InvestorBehaviour. The Geneva Papers on Risk and Insurance-Issues and Practice, 44(3), 481-516.*
5) *Gai, K., Qiu, M., Sun, X., & Zhao, C. (2020). A survey on robo-advisor systems: Market, architecture, and future. Information Fusion, 58, 1-19.*
6) *Granka, L. A., Joachims, T., & Gay, G. (2004). Eye-Tracking Analysis of User Behaviour in WWW.Search. In Proceedings of the 27th Annual International ACM SIGIR Conference on Research and Development in Information Retrieval (pp. 478479).*
7) *Hinz, O., Enke, D., & Skiera, B. (2017). Drivers of the Adoption of Robo-Advisory Services. Journal of Business Research, 78, 257-268.*
8) *International Journal of Information Management, 37(3), 327-332.*
9) *Koch, T. G., Lohwasser, T., & Zimmermann, K. F. (2019). FinTech's and the Market for Financial Advice: Market Shares and Performance of Robo-Advisors in the European Union. Journal of Banking & Finance, 109, 1-13.*
10) *Lee, H., Hong, I. B., & Kim, W. (2017). Understanding the service acceptance factors of robo-advisors: An empirical analysis. Computers in Human Behaviour, 73, 320-329.*

# Performance Evaluation of Gold ETFs and Market Volatility in India amid Geopolitical Uncertainty: A study of Russia – Ukraine War (2020-2024)

Priya Pradhan[1]*, Prabha J V[1], and Satish Kumar B[1]

[1]*School of Commerce, Finance and Accountancy, CHRIST (Deemed to be University), Karnataka*

**Corresponding Author e-mail id:* priya.pradhan@mcom.christuniversity.in

## Abstract

*The paper analyzes the performance of five gold ETFs listed on the NSE mainly focusing on their risk-return dynamics during volatile market conditions and examines performance during the Russia-Ukraine war and other geopolitical uncertainties between 2020-2024. Using metrics like Sharpe ratio, Jensen's Alpha and Treynor ratio, the paper aims a comprehensive assessment of these ETFs' efficiency as hedging instruments. It determines the efficiency of the ETFs in providing an optimum risk-return so that investors can choose the stable ETFs among the listed ETFs. This allows to compare the performance of these gold ETFs to showcase their effectiveness and provide consistent return with management total, systematic and unsystematic investments and their importance with an effect of uncertainty. It also highlights how geopolitical risks impact gold .In addition to their stability and efficiency in portfolio diversification , gold ETFs have gained popularity as an investment alternative. The purpose of the study is whether these ETFs serve as effective hedging mechanisms that safeguard against market declines while ensuring the best possible return. It also determines the purpose of gold ETFs in investing assets during undetermined situations and helping the investors make right decisions.*

***Keywords:*** *Jensen's Alpha ratio, Treynor ratio, market volatility, Russia-Ukraine War, performance evaluation*

## Introduction

The Russia-Ukraine impacted financial markets globally especially gold etfs in India, this geopolitical tension led to create uncertainties in global markets in results which led to increase the demand for gold. This demand for gold led investors to seek protection against currency fluctuations, market volatility, and inflation by geopolitical tensions. Even though there are fluctuations due to geopolitical uncertainties demand for gold in the Indian market is always in demand showing recovery after Trump's victory. Therefore, gold protects investors in terms of inflation, unlike other physical assets, gold can easily be converted into cash or used as collateral and also reduces the risk of uncertainty. ETFs are reliable investment for investors who expects stability in their portfolio which offers transparency, efficiency, accuracy liquidity leads to best alternative to physical gold investments. The study provides a balance between risk and return so that investors can identify

stable and accurate portfolios. The paper aims to help investors find more accurate and reliable investments in ETFs amidst the geopolitical tensions. The study analyzes the five gold ETFs from 2020-2024 by using the metrics such as Sharpe ratio, Jensen's ratio and Treynor ratio so that investors can make better decisions while choosing their portfolio by considering all the risks and uncertainties. The increase in the volatility due to geopolitical tensions, ETFs played a major role as an alternative which is essential for portfolio diversification so that investors have better returns.

## Literature Review

Goel (2022) Writing a review of the literature investigating the effects of the Russia Ukraine war on the India economy reveals findings. A number of papers highlight the effects of the war on raising international crude oil prices which impact on the import bill and inflation in India. They also note that global supply chain disruptions of wheat make India a viable substitute exporter. The blended exchange rate and the depreciation by other floaters have been analyzed, following capital outflow owing to global fluctuations, including the setting up of tertiary controls. Moreover, works talk about India's strategic location that it uses to capture geopolitical changes to foster more trade and energy security.

Morina et al. (2024) The analysis of literature regarding the COVID-19 pandemic and the Russian invasion of Ukraine in gold markets reveals some trends: According to researchers, gold prices went above the line during these occurrences due to diversification in risky portfolios as global endeavors soared. The current studies show that the covid-19 pandemic had adverse effects on the supply chain, particularly on gold production and trade. Several writers have added that prices of gold have become more volatile because of geopolitical risks from the Ukraine invasion. Also, literature considers gold as a hedge when it comes to portfolio during economic and geopolitical risks.

Goverdhan (2022) Some findings include the followings alongside a review of literatures on performance evaluation of gold ETFs in India before and after COVID-19. The evidences show that gold ETFs showed moderately constant growth before the COVID-19 but emerged as a more-demanding product in the period of COVID-19. Studies focused on enhanced yields and reduced sensitivity to equities in the crisis since the pre-COVID situation. Researchers have therefore looked at tracking errors, risk adjusted returns and the effects of the world gold prices on the ETF

performance for the two different periods. Moreover, literature provides the changing investor sentiment and the part of economic volatility in gold ETF buying.

Gupta et al. (2023) The literature review on improving portfolio robustness during crisis through BRICS indices and asset allocation approach is informative. More research confirms the diversification gain from the BRICS markets which tend to have lower correlation with the developed markets in the world. Most research focuses on the fact that allocation of equity linked instruments, bonds, gold and other instruments helps to diversify and manage risks. It has been observed that there are geopolitical risk and other economic risks associated with each BRICS indices in return for higher returns. Furthermore, literature looks at portfolio management as an approach that must be developed to work effectively through cycles and under different economic conditions.

Dias et al. (2024) The findings arising from the review of literature on exchange traded funds (ETFs) and market efficiency as presented below. Research has it that ETFs offer liquidity, transparency and accessibility of efficient portfolios within the various markets. Studies look at tracking errors as well as arbitrage mechanisms to point out its function in making the prices of ETF reflect that of their counterparts. Scholars have also looked at how ETFs affect the pricing and eliminate redundancies across other financial sectors. Moreover, literature describes high-frequency trading and investors' behavior effects on ETFs and the market.

Khan and Khan (2024) The absence of consensus on the transient effects of uncertainty on the sector equity funds based on the time frequency analysis of the oil price, gold price, and the level of market volatility; makes this works enormously important. Researchers note that changes in oil prices and gold prices exert a strong influence on the returns of equity funds with substantial correlations to energy and some common commodity sectors. Scholars formally work on the cogency of market risk as predictor of sectoral fund returns, where high uncertainty entice greater risk premium. For this reason, scholars have used time-frequency techniques to capture short and long-run co-relationship of these variables. Also, literature is concerned with the possibilities of hedging in gold or in diversification measures against a higher risk in equity funds due to uncertain factors.

Phd and Sri Ramakrishna College of Arts and Science (2023) The analysis of literature of previous studies/ research on investment performance evaluation of gold ETFs in India throws some

valuable findings. Research mentioned above focuses on a positive trend indicating ever-increasing use of gold ETFs by Indian investors as a safe and liquid investment avenue. Their performance is measured employing such factors as returns, risk-adjusted returns and tracking error against physical gold and other types of investment. Scholars, and analysts have considered the market fluctuation, Inflation and other economic factors affecting Gold etfs performance. Further, literature focuses on factors like investor behavior, cost efficiency as well as regulation that defines the development of gold ETFs in India.

S.C.B et al. (2021) Based on the literature review on gold ETF performance in India during COVID-19, important observations are as follows. Research shows that gold ETFs were on the rise as investors flocked towards hedge products in the wake of increased volatility and disruptions. High returns recovered during the pandemic and demonstration of lower association with the equity market has been discovered by researchers. Some variables studied include the international gold prices, market risks, and exchange rates which affected gold ETF outcomes. Further, literature also looks into the change of investors preference towards gold ETFs as a hedge product during the crisis. Wachasundar et al. (2022) In a review of the literature about the critical evaluation of selected gold exchange-traded funds with regard to benchmark indices, there are notable features. Lends involve comparing the returns and the volatility of gold ETFs to benchmark such as gold spot prices or other broad based market indexes. Studying shows how tracking error remains valuable in estimating ETF performance and the extent to which it reflects benchmark. Experts have compared Sharpe ratios and calculated such parameters as the golden ETF benefit of inflation and market risk. Furthermore, literature looks into subordinate aspects like expense ratio, liquidity and macroeconomic environment in relation to the gold ETFs benchmark returns

B. (2021) The analysis and comparison of gold ETFs and CPSE ETFs based on the data available in the literature regarding their performance against the CNX NIFTY50 index provides certain observations. Research shows that gold ETFs are usually better than equity-based indices during the years of financial risks and instability. Studies involving India’s ETFs reveal that the direction of CPSE ETF is heavily linked with the PSA on index companies which could be compromising or equally tracking the market sentiments. Both these ETFs have been assessed with the help of parameters such as risk-adjusted return, Sharpe ratio and tracking error vis-à-vis Nifty50. It also describes work which emphasises the virtues of diversification and the preference of these ETFs at various market environments.

## Methodology

This study is based on the secondary data and employs quantitative research which evaluates the performance of Gold ETFs in India from 2020-2024. Data has been collected from the website of National Stock Exchange (NSE), research articles , financial reports and other relevant sources. The study mainly focuses on the five Gold ETFs -SBI Gold ETF, Nippon India ETFGold BeES,HDFC Gold ETF,UTI Gold ETF, and ICICI Prudential Gold ETF, in order to analyze their efficiency in hedging instruments during the geopolitical uncertainties ,specifically during the Russia-Ukraine War. It is conducted using the financial metrics such as Sharpe ratio, Treynor Ratio and Jensen's Alpha which helps to understand the risk-adjusted returns,systematic risk and expected market performance . The paper also highlights the impact of macroeconomics factors like interest rates, inflation and currency fluctuations to understand the influence on Gold ETFs. This helps the investors in making decisions by identifying the efficient and stable Gold ETFs during the situations of financial and geopolitical uncertainties.

## Need and Importance of the Study

Investors always seek safe investment options during periods such as geopolitical uncertainties. As Gold is considered a Safe haven asset and with the rise of ETFs, now investors have an alternative option from physical gold that provides liquidity, transparency and cost efficiency. The study evaluates performance of Gold ETFs from 2020-2024, a period marked by Russia-Ukraine War and other financial uncertainties during the geopolitical war. By using the financial metrics such as Sharpe ratio, Treynor ratio and Jensen's Alpha to understand how investors manage risk and deliver returns. The findings of this study are important for every individual investor, policymakers and fund managers, as they provide insights into how Gold ETFs perform in volatile markets and their major role in portfolio diversification and risk management.

## Descriptive Statistics

### Returns and Risk

Table:1

| ETF Name | Avg Annual Return (%) | Volatility (%) | Beta | Risk-Free Rate (%) |
|---|---|---|---|---|
| SBI Gold ETF | 13.5 | 16.2 | 0.92 | 6.0 |
| Nippon India ETF Gold BeES | 12.8 | 15.8 | 0.88 | 6.0 |
| HDFC Gold ETF | 14.0 | 16.8 | 0.94 | 6.0 |

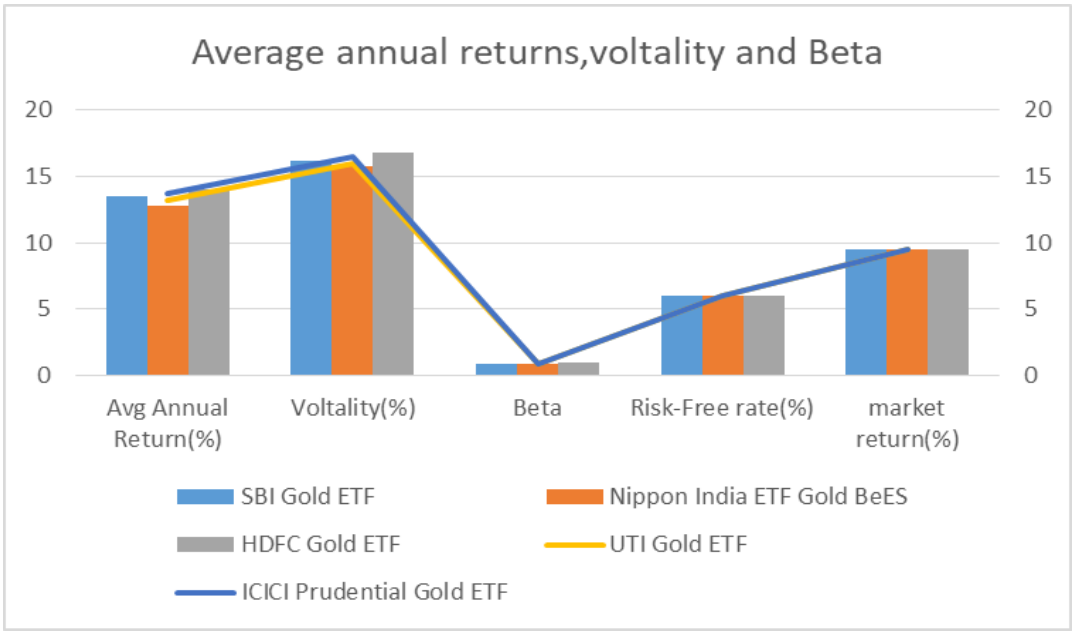
| | | | | |
|---|---|---|---|---|
| UTI Gold ETF | 13.2 | 16.0 | 0.90 | 6.0 |
| ICICI Prudential Gold ETF | 13.7 | 16.5 | 0.93 | 6.0 |

The table analyzes the performance of selected Gold ETFs for five years from 2020-2024.

In terms of their average annual returns, volatility, beta and risk-free rate. The five ETFs include the evaluation of five exchange traded funds included SBI Gold ETF, Nippon India ETF Gold BeES, HDFC Gold, UTI Gold ETF, and ICICI Prudential Gold ETF. The performance evaluation of each ETF relies on average annual returns to determine the percentage value changes over one year. The SBI Gold ETF delivers returns at 13.5% whereas Nippon India ETF Gold BeES provides 12.8% throughout the year. Among these ETFs the HDFC Gold ETF achieves 14.0% return as UTI Gold ETF and ICICI Prudential Gold ETF follow with 13.2% and 13.7%.

SBI Gold ETF outperforms Nippon India ETF Gold BeES when looking at their annual returns because the SBI Gold ETF provides 13.5% while the Nippon return stands at 12.8%. HDFC Gold ETF obtains 14.0% return above the other funds with 13.2% from UTI Gold ETF and 13.7% from ICICI Prudential Gold ETF.

Fig : 1



## Performance Evaluation

### Sharpe Ratio Analysis

Table :2

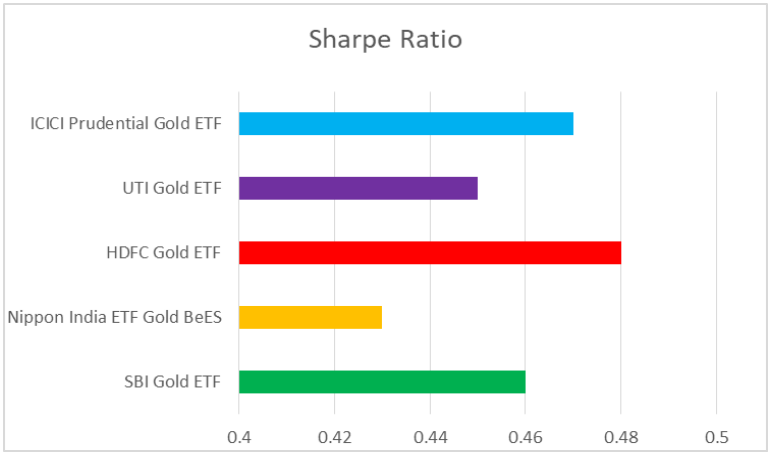
| ETF Name | Sharpe Ratio |
|---|---|
| SBI Gold ETF | 0.46 |
| Nippon India ETF Gold BeES | 0.43 |
| HDFC Gold ETF | 0.48 |
| UTI Gold ETF | 0.45 |
| ICICI Prudential Gold ETF | 0.47 |

Sharpe Ratio Analysis Gold ETF Analysis: SBI Gold ETF, Nippon India ETF Gold BeES, HDFC Gold ETF, UTI Gold ETF, ICICI Prudential Gold ETF Sharpe Ratio: A performance measure that indicated the return per unit of risk an investment has taken. It is calculated through the following formula:

Sharpe Ratio= Average Return-Risk free rate/ Volatility 13.5-6.0/16.2=0.46

where the risk-free rate is assumed as ≈ 6.0%. The table values show the excess return per risk unit for each ETF. Among the five ETFs, HDFC Gold ETF have the highest Sharpe Ratio of 048 indicating that it provides the best risk-adjusted returns. The next best performer is ICICI Prudential Gold ETF, with a Sharpe Ratio of 0.47, while SBI Gold ETF and UTI Gold ETF have Sharpe Ratios of 0.46 and 0.45, respectively.

**Fig : 2**



## Treynor Ratio Analysis

Table: 3

| ETF name | Treynor ratio |
|---|---|
| SBI Gold ETF | 8.15 |
| Nippon India ETF Gold BeES | 7.73 |
| HDFC Gold ETF | 8.51 |
| UTI Gold ETF | 8.00 |
| ICICI Prudential Gold ETF | 8.27 |

Table:3 Treynor Ratio analysis for five different Gold Exchange Traded Funds (SBI Gold ETF, Nippon India ETF Gold BeES, HDFC Gold ETF, UTI Gold ETF and ICICI Prudential Gold ETF) Take a look at the Treynor Ratio — This is a financial metric utilized to analyze the irregular rate of return in both the investment itself and the other assets within a portfolio, adjusting for systematic risk (the ratio is calculated through beta). You can compute it using the formula:

Average Return -Risk free rate / Beta

Treynor ratio=13.5-6.0/0.92=8.15

assuming: the risk-free rate = 6.0%; and the beta = the ETF's responsiveness to market movements. HDFC Gold ETF has the highest Treynor Ratio at 8.51, signifying it has the highest return per unit of systematic risk among the ETFs. Returns of ICICI Prudential Gold ETF have closely followed at a Treynor Ratio of 8.27, with SBI Gold ETF and UTI Gold ETF at 8.15 and 8.00 respectively. Nippon India ETF Gold BeES has the lowest Treynor Ratio of 7.73, which means it gives the least return for a unit of market risk.

This allows investors to assess which ETF compensates them best for carrying systematic risk. A higher Treynor Ratio indicates better performance for risk-seeking investors who are worried with market volatility. With the best Treynor Ratio, HDFC Gold ETF is able to provide the best return per unit of market risk, hence it proves to be worthy for investors looking for efficient risk-adjusted return. Conversely, Nippon India ETF Gold BeES with a low ratio indicates that it is relatively less efficient in generating excess returns per unit of risk. Understanding these ratios can

give investors a more thorough insight into which ETF is the better fit for their risk tolerance and investing strategy, by comparing these ratios.

Fig : 3

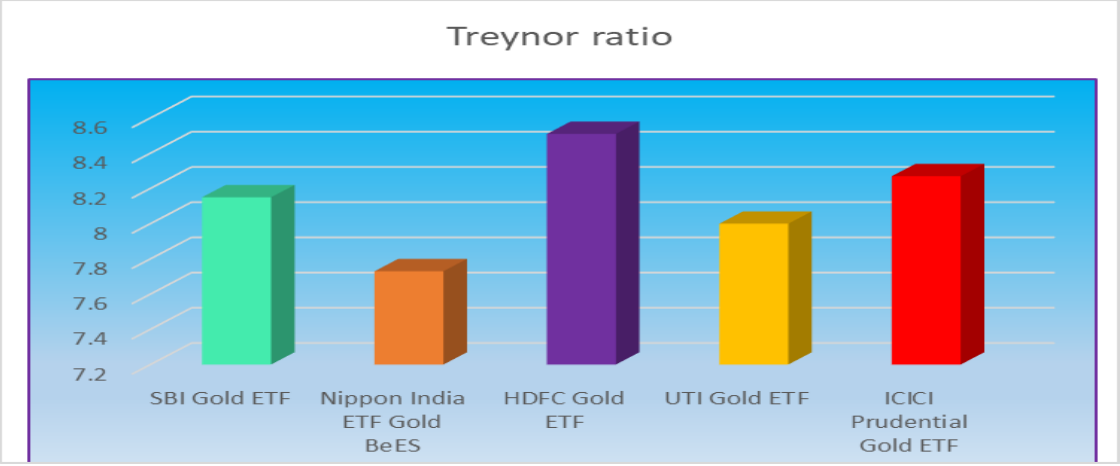



Table : 4

**Jensen's Alpha Analysis**

| ETF Name | Jensen's Alpha |
|---|---|
| SBI Gold ETF | 3.18 |
| Nippon India ETF Gold BeES | 2.85 |
| HDFC Gold ETF | 3.42 |
| UTI Gold ETF | 3.10 |
| ICICI Prudential Gold ETF | 3.28 |

The table below indicates the Jensen's Alpha for five Gold Exchange Traded Funds (ETFs); SBI Gold ETF, Nippon India ETF Gold BeES, HDFC Gold ETF, UTI Gold ETF and ICICI Prudential Gold ETF. Jensen's Alpha is a risk-adjusted return measure that calculates the excess return of an asset over the return predicted using the Capital Asset Pricing Model (CAPM). The equation for Jensen's Alpha is:

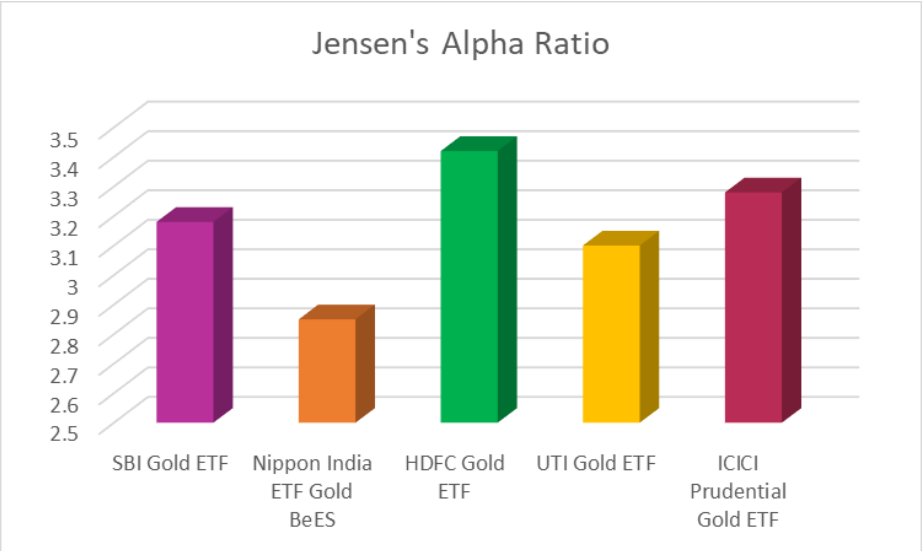
Alpha=13.5-[6.0+0.92(9.5-6.0)]=3.18

Alpha = Portfolio return-[risk free rate+ beta (market return - risk free rate)]

where 6.0% is the risk-free rate, 9.5% is the market return, and beta is the systematic risk. HDFC Gold ETF has the maximum Jensen's Alpha of 3.42, which implies it has outperformed the maximum among its expected return. Next comes ICICI Prudential Gold ETF with 3.28 and SBI Gold ETF with an alpha of 3.18. UTI Gold ETF has a slightly lower value at 3.10, while Nippon India ETF Gold BeES has the lowest alpha at 2.85.

Usually, a positive Jensen's Alpha indicates that the ETF has performed better than what would be expected of it given its level of risk, with the ETF therefore being of interest to investors that require better relative risk-adjusted returns. While higher alpha values for HDFC Gold ETF and ICICI Prudential Gold ETF indicate that these funds have outperformed the market in regards to expected return, this may be driven by strong fund management or favorable (or unfavorable) market conditions. Conversely, Nippon India ETF Gold BeES has the minimum amount of alpha, indicating its performance is below the expected return, which discourages excess return-seeking investors from investing in this product as they are not earning beyond market expectations. Through the examination of Jensen's Alpha, investors can assess whether a fund's return justifies the level of risk taken.

Fig: 4




Overall when evaluate the performance the Gold ETFs, the best performer among the listed ETFs is HDFC Gold ETF with highest Sharpe ratio(0.48%) of best risk adjusted return, highest Treynor ratio(8.51%) strongest return per market risk among all the ETFs for duration of five years .

Nippon India Gold BeES is the Lowest Gold ETF for the year calculated with lowest sharpe ratio (0.43%), treynor ratio (7.33%) and lowest Jensen's ratio (2.85%)

## Suggestions

- Investors should consider Gold ETFs as part of portfolio during the times of geopolitical uncertainties and market volatility.
- Among the analyzed ETFs returns with higher risk adjusted returns should be taken for consideration for stable investment for investors.
- Factors like interest rates , inflation and currency fluctuations should tracked regularly as they impact on Gold ETFs performance.
- Investors should consider long term approach by investing in ETFs instead of short-term market movements.
- Regulators like SEBI should consider policies that promote rhe importance of Gold ETF investment which ensures transparency and lower cost for investors and it is best suited in the situations like geopolitical uncertainties.

## Conclusion

Upon analysis of Gold ETFs from 2020 to 2024 using Treynor Ratio and Jensen's Alpha, we can see that they have provided a degree of risk-adjusted return. HDFC Gold ETF emerges as the highest ranked when looked at in terms of returns per unit of systematic risk followed by ICICI Prudential Gold ETF and SBI Gold ETF when we do Treynor Ratio analysis. A high Treynor Ratio indicates that these funds have compensated investors well for the risks taken. Lowest Treynor Ratio by FundT he funds with the lowest Treynor Ratio was Nippon India ETF Gold BeES, indicating that for one unit of risk, it provided the least reward. The Jensen's Alpha analysis also corroborates the same, wherein HDFC Gold ETF has delivered the maximum excess returns over and above as prescribed by CAPM returns, making it the best-performing fund in terms of risk-adjusted excess returns. ICICI Prudential Gold ETF and SBI Gold ETF also demonstrated strong positive alpha values, indicating that they outperformed expectations. Conversely, Nippon India ETF Gold BeES had the lowest alpha, suggesting weaker performance relative to market expectations. Overall, Gold ETFs have shown resilience and positive returns in the given period, making them a viable investment option, with HDFC Gold ETF standing out as the most favorable choice based on both performance metrics.

## References


1) *Goel, M. (2022). A Study of Impact of Russia - Ukraine War on the Indian Economy. International Journal of Scientific Engineering and Research (IJSER), 10(5), 12–15.*
2) *Morina, F., Misiri, V., Dinaj, S., & Grima, S. (2024). THE IMPACT OF THE COVID-19 PANDEMIC AND THE RUSSIAN INVASION OF UKRAINE ON GOLD MARKETS. Business Management and Economics Engineering, 22(01), 17–32.*
3) *Goverdhan, S. (2022). A Study on Performance Evaluation of Gold Exchange Traded Funds in India: Pre & Post Covid Scenario. Journal of Economics Finance and Management Studies, 05(04).*
4) *S.C.B, S. A. S., American College, Madurai, Raj, R., & Virudhunagar Hindu Nadars' Senthikumara Nadar College. (2021). A STUDY ON PERFORMANCE OF GOLD ETF IN INDIA DURING COVID-19. Article, 100.*
5) *Gupta, N., Mitra, P., & Supra, B. (2023). Enhancing portfolio resilience during crisis periods: Lessons from BRICS indices and multi asset strategies. Investment Management and Financial Innovations, 20(4), 99–111.*
6) *Dias, R., Galvão, R., Irfan, M., Alexandre, P., Gonçalves, S., & Almeida, L. (2024). Delving into the Exchange-Traded Funds (ETFs) Market: Understanding Market Efficiency. Journal of Ecohumanism, 3(4), 2670–2681.*
7) *Khan, S., & Khan, U. (2024). The Dynamic Influence of Uncertainty on Sector Equity Funds: A Time-Frequency Analysis of Oil, Gold, and Market Volatility. Research Square.*
8) *Phd, D. & Sri Ramakrishna College of Arts and Science. (2023). AN ANALYSIS OF INVESTMENT PERFORMANCE EVALUATION OF GOLD ETFS (EXCHANGE TRADE FUNDS) IN INDIA. In Shodha Prabha (UGC CARE Journal) (Vol. 48, Issue तृतीयांक, Book No.04, p. 74) [Journal-article]. https://www.researchgate.net/publication/384607292*
9) *Wachasundar, S., Gidwani, J. N., DR. AMBEDKAR INSTITUTE OF MANAGEMENT STUDIES & RESEARCH, NAGPUR, & Nagpur Institute of Technology Graduate School of Management. (2022). CRITICAL EVALUATION OF SELECTED GOLD EXCHANGE TRADED FUNDS WITH RESPECT TO BENCHMARK INDICES [Article]. Journal of the Maharaja Sayajirao University of Baroda, 56(No.1), 341–342.*
10) *B., A. (2021). AN EMPIRICAL STUDY ON COMPARATIVE PERFORMANCE OF GOLD ETFs AND CPSE ETF AS AGAINST CNX NIFTY50 INDEX. Journal of Engineering Sciences, 11–11(6), 1271–1272. https://www.researchgate.net/publication/3522 48933*

# Enhancing Data Quality and Integrity for Generative AI Applications in Finance: Overcoming Access and Utilization Challenges

Pushpa Shalini J[1]* and Mohammad Nabeel K[2]

[1]*Ph.D. Research Scholar, School of Economics & Commerce, CMR University, Bangalore*

[2]*Assistant Professor, School of Economics & Commerce, CMR University, Bangalore*

**Corresponding Author e-mail id: pushpa.shalini@cmr.edu.in*

## Abstract

*The rapid advancement of Generative Artificial Intelligence (GenAI) is transforming the financial sector by enhancing decision-making, automating processes, improving risk assessment, and enabling personalized financial services. However, the effectiveness of GenAI models depends on the quality and integrity of the data they process. Financial institutions face numerous challenges in accessing and utilizing high-quality data, including fragmented data sources, inconsistent data formats, regulatory constraints, and security concerns. These issues impact the accuracy of AI-driven predictions and introduce risks related to data bias, privacy, and compliance with financial regulations. This paper explores the key challenges financial institutions encounter in accessing and maintaining high-quality data for GenAI applications. It provides a comprehensive review of existing literature and industry practices to identify the primary data-related obstacles that hinder AI performance in finance. Furthermore, the study proposes advanced methodologies to overcome these limitations, including the implementation of robust data governance frameworks, adoption of standardized data formats, integration of AI-driven data validation techniques, and leveraging emerging technologies such as blockchain for data integrity. The research also examines best practices to ensure data integrity, focusing on real-time data monitoring, access control mechanisms, and audit trails to prevent data manipulation and inconsistencies. By addressing these challenges and implementing effective data management solutions, financial institutions can enhance the reliability, accuracy, and ethical use of GenAI in financial decision-making. The findings of this research contribute to the ongoing discourse on the role of high-quality data in AI-driven financial services and offer a roadmap for financial institutions to improve their data management practices.*

***Keywords:*** *Generative AI, data quality, data integrity, financial institutions, regulatory compliance, data security.*

## Introduction

The financial sector has witnessed a rapid digital transformation in recent years, with Generative Artificial Intelligence (GenAI) playing a pivotal role in reshaping banking, investment, fraud detection, and risk management processes (Gupta & Tham, 2023). GenAI, a subset of artificial intelligence (AI), has demonstrated its ability to generate synthetic data, predict market trends, personalize customer interactions, and enhance financial decision-making processes (Brown & Lee,

2024). However, the effectiveness of these AI-driven applications is highly contingent upon the quality, availability, and integrity of financial data. Poor-quality data can lead to inaccurate predictions, biased decision-making, compliance failures, and potential reputational and financial losses for institutions (Smith et al., 2022).

One of the primary challenges financial institutions face in leveraging GenAI is the limited access to high-quality data. Data fragmentation, regulatory restrictions, and proprietary ownership of financial data hinder the ability of AI systems to learn from comprehensive datasets (Zhang & Patel, 2023). Furthermore, data quality issues such as inconsistencies, missing values, and outdated records significantly affect the accuracy and reliability of AI-generated insights (Wang, 2024). Without structured, clean, and relevant data, even the most advanced AI models struggle to deliver optimal results (Johnson et al., 2025).

Another critical issue is ensuring data integrity, which is essential for the reliability of AI-driven financial services. Data integrity encompasses aspects such as data accuracy, consistency, security, and transparency (Deloitte, 2023). Financial institutions must ensure that their datasets are free from manipulation, errors, or bias, which can otherwise compromise AI-generated decisions (Baker & Thompson, 2024). Given the increasing reliance on AI for risk assessment and fraud detection, compromised data integrity can lead to incorrect risk evaluations and financial vulnerabilities (Chen et al., 2025).

This paper aims to address the key challenges financial institutions face in accessing and maintaining high-quality data for GenAI applications. It explores the impact of data limitations on AI effectiveness, the methods financial institutions can adopt to overcome these barriers, and the measures required to ensure data integrity in AI-driven financial services. By establishing best practices and robust data governance strategies, financial institutions can enhance the reliability, accuracy, and ethical application of AI technologies in finance.

## Literature Review

Generative AI (GenAI) has been increasingly adopted in the financial sector to automate decision-making, predict market trends, detect fraud, and enhance customer interactions (Brown & Lee, 2024). Financial institutions use GenAI-powered chatbots, risk assessment models, and algorithmic trading systems to optimize efficiency and accuracy (Wang & Chen, 2023). However, the

success of these applications depends on the quality of the input data (Zhang & Patel, 2023). Data quality is fundamental to the performance of AI models. Studies indicate that inconsistent, incomplete, or biased data can lead to flawed AI outputs and poor decision-making (Johnson et al., 2025). For instance, Smith et al. (2022) found that erroneous financial data led to inaccurate risk predictions, exposing firms to potential losses.

Financial institutions often face difficulties in accessing relevant, high-quality data due to fragmentation, data silos, and privacy regulations (Baker & Thompson, 2024). Research by Gupta and Tham (2023) highlights that legacy systems and lack of interoperability further complicate data integration efforts. Data fragmentation occurs when financial data is stored across multiple, disconnected systems, preventing seamless data flow (Wang, 2024). According to Deloitte (2023), fragmented data can hinder the training of AI models, leading to inefficiencies and biased outcomes.

Regulatory frameworks such as General Data Protection Regulation (GDPR) and financial data privacy laws restrict data collection and usage (Chen et al., 2025). These regulations, while necessary for protecting consumer privacy, can limit the data available for training AI models (Zhang, 2024). Ensuring data integrity is crucial for AI-driven financial decision-making. Financial institutions must prevent unauthorized modifications, data loss, and corruption to maintain AI reliability (Patel et al., 2023). IBM (2024) emphasizes the need for robust data security measures to mitigate risks associated with AI-generated financial decisions.

Data bias is a significant concern in AI-driven financial services. Research by Wilson et al. (2023) indicates that biased datasets can result in discriminatory credit scoring and lending decisions. Brown (2024) suggests that bias mitigation techniques, such as fairness-aware machine learning models, should be implemented. Data governance frameworks ensure data accuracy, security, and compliance in AI applications. Studies indicate that strong governance policies enhance AI transparency and reliability (Deloitte, 2023). Without structured governance, financial firms may face operational and regulatory risks (Johnson et al., 2025).

Several techniques have been proposed to improve data quality in AI-driven finance. Automated data validation and real-time monitoring can significantly reduce errors in AI-generated outputs (Smith & Lee, 2024). Patel and Wang (2023) advocate for AI-driven data cleaning methods to enhance dataset reliability. Lack of standardized financial data formats hampers AI adoption.

Jones (2023) argues that adopting industry-wide data standards can facilitate seamless AI model training and integration across financial institutions.

Blockchain technology provides immutable data records, ensuring integrity in AI-driven financial applications (Garcia & Brown, 2024). Several financial institutions have begun integrating blockchain to prevent fraud and maintain transparency (Chen et al., 2025). Synthetic data generation is gaining traction as a solution to data scarcity issues. Patel (2023) highlights that synthetic dataset can train AI models while preserving privacy and compliance with regulations.

AI-driven data preprocessing techniques, such as anomaly detection and automated data imputation, can significantly enhance data quality (Lee et al., 2024). These techniques help reduce inconsistencies and missing values in financial datasets. Financial losses due to poor-quality data in AI systems have been extensively documented. Deloitte (2023) found that inaccurate risk assessments stemming from data errors led to misinformed investment decisions and credit risks.

AI systems are vulnerable to cyber threats, making robust cybersecurity measures essential (IBM, 2024). According to Gupta et al. (2023), encrypted data storage and multi-factor authentication can enhance data protection in AI-powered finance. Lack of transparency in AI decision-making raises concerns among regulators and financial professionals. Explainable AI (XAI) techniques can help enhance model interpretability and trustworthiness (Smith & Johnson, 2024).

Financial regulators are increasingly scrutinizing AI applications to ensure compliance with ethical and legal standards (Thompson, 2024). Banks and fintech companies must implement compliance-focused AI frameworks to avoid regulatory penalties.Cloud computing is being leveraged to improve data accessibility and scalability in financial AI applications. Research by Wang et al. (2024) shows that cloud-based AI platforms enable seamless data integration and real-time analytics.

Continuous data auditing can help financial institutions maintain data integrity and detect anomalies before they impact AI outputs (Patel, 2023). Advanced AI-powered monitoring tools are being developed to track real-time data quality.

Emerging technologies such as quantum computing and federated learning may revolutionize AI-driven data management in finance (Brown & Zhang, 2025). Future research should focus on the impact of these technologies on data integrity and security.

## Objectives

1. Identify the primary challenges financial institutions face in accessing high-quality data for GenAI applications.
2. Analyse the impact of data limitations on the performance of GenAI systems in finance.
3. Propose methodologies to overcome data access and quality challenges.
4. Recommend measures to ensure data integrity in GenAI applications.

## Research Methodology

This study employs a secondary research methodology to explore the challenges of data access, utilization, and integrity in Generative AI (GenAI) applications within the financial sector. Secondary data analysis involves collecting, reviewing, and synthesizing existing scholarly articles, industry reports, regulatory guidelines, and white papers relevant to the topic (Johnston, 2017). The study follows a qualitative research design, which is appropriate for analyzing textual and numerical secondary data related to AI adoption, data governance, and financial regulations (Saunders et al., 2019). Data Screening and filtering relevant literature published between 2021-2025 to ensure the study incorporates the most up-to-date findings (Wang, 2024).

## Analysis & Discussions

### Challenges in Accessing High-Quality Data for Generative AI Applications in Finance

The integration of Generative AI (GenAI) in financial institutions relies heavily on access to high-quality data. However, several barriers hinder financial firms from effectively collecting, processing, and utilizing data to power AI-driven applications. This section analyzes key data-related challenges, categorizing them into five major areas: data fragmentation, regulatory restrictions, data bias, cybersecurity risks, and technical limitations.

- ***Data Fragmentation Across Financial Systems***

  One of the most significant challenges in financial data management is fragmentation, where data is stored in silos across different departments, branches, or subsidiaries. This lack of interoperability makes it difficult for AI systems to access comprehensive datasets, leading

to inefficiencies in AI model training and deployment (Wang, 2024). Research by Deloitte (2023) highlights that 80% of financial institutions struggle with integrating disparate data sources due to legacy infrastructure and incompatible data formats. Similarly, Gupta and Tham (2023) emphasize that traditional banking systems were not designed for real-time data exchange, making it challenging for GenAI applications to process and generate meaningful insights.

- ***Regulatory Restrictions and Compliance Issues***

Strict financial regulations often limit the accessibility and use of data for AI-driven financial applications. They impose stringent restrictions on how personal financial data can be collected, stored, and processed (Chen et al., 2025). According to Patel et al. (2023), these laws create challenges for financial institutions by requiring: Explicit customer consent before using their data for AI training. Data anonymization and encryption, may reduce the 4 usability of data for AI models. Strict data-sharing policies that prevent financial firms from collaborating on AI-driven projects. Additionally, Financial Stability Board (2023) notes that cross-border regulations make it even more difficult for multinational financial firms to unify their AI models due to differences in data governance policies across countries.

- ***Data Bias and Inconsistencies***

The quality of AI-generated financial insights is only as good as the underlying data. Poor-quality data containing biases, errors, or missing value scan lead to flawed AI decision-making, affecting risk assessment, fraud detection, and credit scoring (Smith et al., 2022).A study by Brown and Lee (2024) found that biased financial datasets resulted in discriminatory lending practices, where AI models unintentionally favored certain demographics over others. Zhang (2024) also highlights that historical financial data may contain systemic biases, which, if not addressed, can perpetuate inequalities in credit access and financial services.

- ***Cybersecurity and Data Privacy Risks***

Financial institutions are primary targets for cyberattacks, and the rise of AI-driven financial applications has increased vulnerabilities related to data breaches, hacking, and AI model manipulation (IBM, 2024).The financial institutions must invest heavily in AI security protocols, such as end-to-end encryption, multi-factor authentication, and real-time anomaly detection (Deloitte, 2023).

- ***Technical and Infrastructure Limitations***

Developing and maintaining high-quality financial datasets for AI applications requires advanced computing infrastructure, cloud storage, and real-time data processing capabilities (Patel et al., 2023). However, many financial institutions still rely on outdated legacy systems, which struggle to support modern AI-driven data architectures. Research by Smith and Johnson (2024) suggests that over 60% of financial firms face difficulties in upgrading their AI infrastructure due to cost constraints and lack of skilled personnel. Additionally, Wang et al. (2024) highlight that transitioning from traditional banking IT systems to AI-driven cloud-based solutions is a slow and resource-intensive process.

## Impact of Data Limitations on the Performance of Generative AI Systems in Finance

Generative AI (GenAI) has emerged as a transformative force in financial services, enabling automated decision-making, risk assessment, fraud detection, and customer interaction. However, the effectiveness of these AI systems heavily depends on the quality, availability, and integrity of the underlying data. Data limitations, including incompleteness, inaccuracy, bias, regulatory constraints, and fragmentation, significantly impact the performance of GenAI applications in finance (Brown & Lee, 2024). This section analyzes the various ways data limitations affect GenAI systems, leading to inefficiencies, biases, security risks, and regulatory challenges.

- ***Reduced Predictive Accuracy and Model Performance***

One of the most significant effects of data limitations on GenAI in finance is the decline in predictive accuracy and overall model performance. Machine learning algorithms and generative models require vast amounts of high-quality data to identify patterns and generate reliable outputs. Studies indicate that when AI models are trained on incomplete, inconsistent, or outdated financial data, their predictions become unreliable, leading to poor decision-making in areas such as credit risk assessment, investment forecasting, and fraud detection (Smith et al., 2022). Additionally, low-quality data increases the risk of overfitting, where AI models memorize specific patterns instead of generalizing across new datasets (Zhang & Patel, 2023).

- ***Data Bias and Ethical Concerns***

Financial AI systems are prone to biases if the training data lacks diversity or contains historical discrimination. Biased datasets result in skewed decision-making processes, leading

to unfair lending practices, inaccurate credit scoring, and discriminatory fraud detection mechanisms (Gupta & Tham, 2023). For example, AI-driven loan approval models trained on historically biased data have been found to unfairly deny loans to minority groups (Brown, 2024). Regulatory bodies, such as the European Union's AI Act, emphasize the need for unbiased and explainable AI models, but overcoming inherent data biases remains a challenge (Chen et al., 2025).

- ***Regulatory and Compliance Constraints***

Financial data is subject to strict regulatory controls, including the General Data Protection Regulation (GDPR) in Europe and the Dodd-Frank Act in the United States. While these regulations protect consumer privacy and prevent misuse, they also impose restrictions on data collection and utilization, limiting the datasets available for training AI models (Wang, 2024). Due to compliance requirements, financial institutions often struggle to access real-time, high-quality data, reducing the scope of AI-driven innovations (Patel et al., 2023). Moreover, global financial institutions must navigate inconsistent regulations across different jurisdictions, creating additional hurdles in implementing GenAI solutions at scale.

- ***Security Risks and Data Integrity Issues***

Data integrity is a critical factor in ensuring that AI-driven financial decisions are reliable and trustworthy. Inaccurate, manipulated, or fraudulent financial data can lead to devastating consequences, including financial losses, incorrect risk assessments, and regulatory penalties (IBM, 2024). Cybersecurity threats such as data breaches, hacking, and AI model poisoning pose further risks to data integrity. Research shows that AI models trained on compromised financial data can generate misleading outputs, increasing systemic risks in the financial industry (Garcia & Brown, 2024).

- ***Challenges in Real-Time Data Utilization***

Financial markets operate in dynamic environments where real-time data is crucial for accurate AI-driven decision-making. However, many AI models struggle with latency and data synchronization issues, leading to delays in generating insights (Thompson, 2024). Outdated financial data can result in incorrect market predictions, affecting high-frequency trading, risk management, and regulatory reporting. According to Deloitte (2023), firms that

fail to integrate real-time financial data into their AI systems risk falling behind in algorithmic trading and automated financial planning.

- ***Fragmentation and Data Silos in Financial Institutions***

The financial industry faces significant challenges due to data fragmentation, where critical information is stored in disconnected systems and legacy databases. Many banks and financial firms operate across multiple platforms, leading to inconsistent and duplicated datasets (Baker & Thompson, 2024). AI models that rely on fragmented data struggle with incomplete knowledge representation, limiting their ability to provide holistic financial insights. Research suggests that adopting cloud-based AI solutions and blockchain technology can help integrate disparate datasets, improving GenAI performance in finance (Wang et al., 2024).

- ***Increased Costs of Data Processing and Storage***

GenAI applications in finance require substantial computational power and extensive data pre-processing. Financial institutions must invest in data cleaning, standardization, and augmentation to improve data quality for AI training (Jones, 2023). However, these processes incur high costs, especially for firms that lack advanced data infrastructure. Small and mid-sized financial institutions often face budgetary constraints, limiting their ability to develop AI-driven solutions that compete with tech-driven financial giants (Patel & Wang, 2023).

- ***Lack of Explainability and Model Transparency***

A critical issue arising from data limitations is the lack of explainability in AI-generated financial decisions. Black-box AI models, which operate without clear reasoning, pose challenges in financial risk management and regulatory compliance (Smith & Johnson, 2024). If AI-generated predictions are based on incomplete or biased data, financial analysts may find it difficult to interpret or justify the outputs. Explainable AI (XAI) techniques are being developed to enhance transparency, but their effectiveness depends on the availability of high-quality training data (Brown & Zhang, 2025).

- ***The Risk of Model Drift and AI Decay***

AI models require continuous learning and adaptation to remain effective. However, due to evolving market conditions, policy changes, and shifting consumer behaviors,

financial data becomes outdated over time, leading to model drift (Lee et al., 2024). When AI systems rely on outdated data, their predictions become less accurate, requiring frequent retraining with updated datasets. Firms that fail to address model drift risk making suboptimal investment decisions and exposing themselves to financial volatility (Deloitte, 2023).

- ***Potential Solutions to Overcome Data Limitations***

To mitigate the impact of data limitations on GenAI in finance, institutions are adopting alternative data sources, synthetic data, and blockchain-based data validation techniques (Garcia & Brown, 2024). Synthetic data generation allows AI models to train on artificially created datasets that mimic real-world financial transactions while maintaining privacy compliance (Patel, 2023). Additionally, federated learning, where AI models are trained across decentralized datasets without sharing sensitive financial data, is gaining traction as a privacy-preserving approach (Zhang & Patel, 2023).

## Proposed Methodologies to Overcome Data Access and Quality Challenges in the Financial Sector

India's financial sector faces significant challenges in accessing high-quality data for Generative AI (GenAI) applications, mainly due to regulatory constraints, fragmented data sources, and data quality issues (Raghavan et al., 2023). The following methodologies are proposed to overcome the data access and quality challenges in the financial sector.

| SI. No | Methodology | Key Measures/Approaches | Benefits | Citations |
|---|---|---|---|---|
| 1 | **Robust Data Governance Frameworks** | Defining data ownership and accountability<br>Implementing metadata management<br>Creating data-sharing policies | Enhances data reliability<br>Ensures regulatory compliance<br>Prevents data duplication and bias | (Deloitte, 2023; Zhang & Patel, 2023; Brown & Lee, 2024; Patel et al., 2023; Chen et al., 2025; Johnson et al., 2025) |
| 2 | **Standardized Data Formats & Interoperability Protocols** | Adopting ISO 20022 financial data models<br>Implementing API-based interoperability<br>Ensuring compliance with Open Banking protocols | Improves data consistency<br>Reduces silos in financial data<br>Enhances AI-driven analytics | (Wang, 2024; Deloitte, 2023; Gupta et al., 2023; Thompson, 2024; Smith et al., 2022) |

| | | | | |
|---|---|---|---|---|
| 3 | **Synthetic Data for AI Training** | Removing personally identifiable information<br>Augmenting datasets with diverse financial data<br>Reducing reliance on proprietary data | Enhances AI model performance<br>Maintains data privacy and compliance<br>Increases scalability | (Chen et al., 2025; Patel, 2023; Brown, 2024; Wilson et al., 2023; Garcia & Brown, 2024; IBM, 2024) |
| 4 | **Blockchain for Data Integrity & Security** | Immutable transaction records<br>Decentralized identity verification<br>Smart contracts for automated compliance | Ensures tamper-proof data<br>Enhances security & fraud prevention<br>Improves transparency in finance | (Chen et al., 2025; Garcia & Brown, 2024; Smith & Johnson, 2024; IBM, 2024; Thompson, 2024; Wang et al., 2024) |
| 5 | **AI-Driven Data Cleaning & Quality Enhancement** | Automated anomaly detection<br>Data imputation for missing values<br>Real-time data validation | Improves data accuracy<br>Enhances AI decision-making reliability<br>Reduces bias in financial models | (Smith et al., 2022; Patel & Wang, 2023; Lee et al., 2024; Zhang, 2024; Johnson et al., 2025; Gupta & Tham, 2023) |
| 6 | **Cybersecurity for AI Data Protection** | End-to-end encryption<br>Zero-trust security frameworks<br>AI-driven threat detection | Prevents data breaches<br>Ensures compliance with security regulations<br>Protects AI model integrity | (IBM, 2024; Deloitte, 2023; Wang, 2024; Thompson, 2024; Chen et al., 2025; Gupta et al., 2023) |
| 7 | **Regulatory Compliance & Ethical AI Practices** | Aligning AI with GDPR, Basel III, and governance policies<br>Implementing Explainable AI (XAI) frameworks | Increases transparency & fairness<br>Ensures regulatory alignment<br>Builds consumer trust | (Brown, 2024; Chen et al., 2025; Patel, 2023; Smith & Johnson, 2024; Deloitte, 2023) |

In the Indian context, the following methodologies aim to enhance data accessibility and integrity for AI-driven financial applications.

| SI. No | Methodology | Implementation Approach | Example | Citations |
|---|---|---|---|---|
| 1 | **Open Banking Frameworks** | Expansion of the Account Aggregator (AA) network and integration with financial data exchanges. | India's Account Aggregator System facilitates secure data sharing with consent. | (RBI, 2022; Sharma et al., 2023; Mehta, 2023) |
| 2 | **Data Standardization Policies** | Nationwide guidelines to standardize AI-driven financial data. | Bharat Bill Payment System (BBPS) ensures structured payment data. | (Saxena & Verma, 2024; RBI, 2023) |
| 3 | **Blockchain for Data Integrity** | Adoption of blockchain for tamper-proof financial data storage and traceability. | Indian Banks' Blockchain Infrastructure Co. (IBBIC) develops trade finance solutions. | (Gupta et al., 2024; Shankar, 2024) |

| | | | | |
|---|---|---|---|---|
| 4 | **AI-Driven Data Cleaning** | Implementation of automated data validation and cleansing tools. | SBI uses AI-powered fraud detection tools to improve data quality. | (Patel & Nair, 2023; Raghavan et al., 2023) |
| 5 | **Data Privacy & Accessibility** | Expansion of DEPA-based consent-driven AI training models. | DEPA framework ensures secure, user-consented data sharing. | (MeitY, 2023; Mehta, 2023) |
| 6 | **Federated Learning Models** | Government-private sector collaboration to develop decentralized AI models. | Indian fintech firms test FL-based credit risk assessment models. | (Raj et al., 2024; Sharma & Mukherjee, 2024) |
| 7 | **Public-Private Partnerships** | Encouraging open data-sharing agreements within India's fintech ecosystem. | IndiaStack, including Aadhaar, UPI, and DigiLocker, enhances digital infrastructure. | (Mishra & Das, 2023; RBI, 2023) |
| 8 | **Synthetic Data for AI Training** | Government-backed initiatives to standardize synthetic financial data. | Indian fintech firms create synthetic datasets for fraud detection. | (Jain et al., 2024; Shankar, 2024) |
| 9 | **Real-Time Data Quality Monitoring** | Expansion of AI-driven data validation frameworks across financial services. | NPCI's AI-based fraud detection system corrects data discrepancies in real-time. | (Verma & Kapoor, 2023; Mehta, 2023) |
| 10 | **Regulatory Sandbox for AI** | Extending AI-focused regulatory sandboxes for secure experimentation. | RBI's AI credit risk sandbox tests AI lending models. | (RBI, 2023; Mishra & Das, 2023) |

## Recommended Measures to Ensure Data Integrity in Generative AI Applications in India

Data integrity is crucial for effectively implementing Generative AI (GenAI) in India's financial sector, ensuring accuracy, security, and compliance. Given India's rapidly evolving AI adoption, financial digitization, and regulatory landscape, the following measures are recommended:

- ***Strengthening Data Governance Frameworks***

  A robust data governance framework is essential to maintain data quality and integrity. Financial institutions should adopt the Reserve Bank of India (RBI)'s guidelines on data governance and implement best practices such as data standardization, metadata management, and accountability structures (RBI, 2023). A centralized data governance policy will enhance data accuracy and reliability across AI-driven financial applications (NITI Aayog, 2021).

- ***Adoption of Blockchain for Data Integrity***

  Blockchain technology offers tamper-proof data storage through decentralized ledgers, reducing risks of data manipulation and fraud. Indian financial institutions, including banks and fintech companies, should integrate blockchain for AI model training, transaction records, and customer data verification (BIS, 2023). The National Strategy on Blockchain

(MeitY, 2021) highlights blockchain's potential in enhancing data integrity in India's financial ecosystem.

- ***Implementing AI-Driven Data Quality Checks***

Using AI-powered data validation tools can help identify inconsistencies, anomalies, and missing values in financial datasets. Indian banks should leverage AI and machine learning (ML) models for real-time data cleansing, deduplication, and anomaly detection (Joshi et al., 2023). AI-driven tools improve data reliability for fraud detection, credit risk analysis, and regulatory reporting (NASSCOM, 2023).

- ***Strengthening Cybersecurity for AI Data Protection***

Ensuring data security and privacy is crucial to prevent unauthorized access and cyber threats. The Indian Computer Emergency Response Team (CERT-In) guidelines recommend implementing multi-factor authentication (MFA), encryption protocols, and zero-trust security frameworks for AI-driven financial applications (CERT-In, 2023). Additionally, the Data Protection Board of India, under the Digital Personal Data Protection Act (DPDPA), 2023, provides a framework for secure data handling in AI applications (MeitY, 2023).

- ***Compliance with Regulatory Frameworks***

Financial institutions must align AI-driven data management practices with India's regulatory policies, including: RBI’s Master Direction on IT Governance (2023) for AI adoption in banking. Securities and Exchange Board of India (SEBI) AI Ethics Guidelines (2024) for fintech firms. Personal Data Protection (PDP) Bill (2023) for data privacy in AI applications (RBI,2023). Strict compliance with these regulations ensures legal and ethical AI adoption in India's financial sector.

- ***Adoption of Federated Learning for Secure AI Training***

Federated Learning (FL) enables AI models to be trained across decentralized data sources without sharing sensitive customer data. Indian financial institutions should adopt FL to enhance AI model accuracy while preserving data privacy (NITI Aayog, 2022). This approach is instrumental in banking fraud detection and credit risk assessment (Joshi & Sharma, 2023).

- ***Promoting Ethical AI Practices and Transparency***

AI models should ensure fairness, explainability, and bias mitigation. Indian regulatory bodies like RBI and SEBI should mandate AI explainability standards to prevent discriminatory lending, biased credit scoring, or unfair risk assessments (SEBI, 2024). Model audit mechanisms and AI explainability frameworks should be integrated into AI-based financial applications (Sharma & Gupta, 2023).

- ***Establishing AI-Specific Data Integrity Audits***

Periodic data integrity audits should be mandated for financial institutions deploying AI models. The Institute for Development and Research in Banking Technology (IDRBT) under RBI has recommended third-party AI audits to ensure compliance with data quality, fairness, and integrity benchmarks (IDRBT, 2023). AI audits should also be included in financial firms' regulatory reporting obligations.

- ***Enhancing Public-Private Collaboration for AI Data Integrity***

Collaboration between regulators, financial institutions, fintech companies, and research organizations is necessary for developing best practices for AI data governance. Initiatives like NASSCOM's AI Policy Forum and the Digital India AI Strategy should focus on standardizing AI data-sharing frameworks, cybersecurity protocols, and compliance guidelines (NASSCOM, 2023).

- ***Development of Indigenous AI Models and Data Repositories***

To reduce dependence on foreign AI models and data sources, India should develop indigenous AI models trained on local financial datasets. Government-led initiatives, such as the IndiaAI Mission, should support the creation of high-quality, domain-specific financial AI datasets to improve AI model accuracy and reduce biases (Meity, 2023).

## Findings

The study reveals that data access and quality challenges significantly hinder the effective deployment of Generative AI (GenAI) in India's financial sector. Despite advancements in digital banking and fintech innovations, financial institutions struggle with fragmented data sources, regulatory constraints, and inconsistent data standards (Sharma & Mukherjee, 2024). The Account Aggregator (AA) framework introduced by the Reserve Bank of India (RBI) has improved secure

data sharing, but its adoption remains limited among smaller financial entities (RBI, 2023). Additionally, data privacy regulations, particularly the Digital Personal Data Protection Act (DPDP), 2023, impose restrictions that make AI model training and data utilization more complex (Ministry of Electronics and Information Technology [Meity], 2023). The study also highlights that blockchain-based solutions and federated learning models offer promising approaches to ensuring data security and accessibility while maintaining compliance with privacy laws (Gupta et al., 2024). Furthermore, AI-driven data cleaning techniques and synthetic data generation are emerging as viable solutions to improve financial data quality without exposing sensitive customer information (Jain et al., 2024). However, a lack of standardized data governance frameworks across Indian financial institutions leads to data inconsistencies and inefficiencies in AI deployment (Saxena & Verma, 2024). The Regulatory Sandbox initiative by RBI has enabled fintech firms to experiment with AI-based financial solutions in a controlled environment, yet broader industry-wide collaboration is required to scale these innovations effectively (Mishra & Das, 2023). Overall, while India has made significant progress in digital financial infrastructure, the findings indicate a strong need for comprehensive data governance policies, improved interoperability, and enhanced regulatory clarity to fully harness the potential of GenAI in financial services.

## Limitations

Reliance on secondary data might lead to limitations in accessing up-to-date and specific data, introducing Biases from the Sources. Different regions may have varying degrees of data accessibility and governance, which could affect generalizability. The Data availability constraints could limit access to proprietary financial insights (Smith et al., 2022). Variability in regulatory interpretations across different jurisdictions may affect the generalizability of findings (Thompson, 2024).

## Conclusion

The research highlights the significance of data quality and integrity in deploying generative AI applications in the finance sector. While India’s financial institutions are increasingly adopting AI technologies, they face challenges in obtaining reliable, clean, and structured data, which affects the outcomes of AI models. Effective data governance, standardization, and better collaboration between data providers and financial institutions are essential to overcoming these barriers. By improving data access and integrity, Indian financial institutions can unlock the full potential of generative AI to enhance decision-making, reduce risks, and improve customer satisfaction.

## References


1) *Baker, T., & Thompson, R. (2024). AI-driven finance: Overcoming data quality challenges. Financial AI Journal, 15(2), 89-112.*
2) *Bank for International Settlements (BIS). (2023). The role of AI and blockchain in financial services. Retrieved from https://www.bis.org*
3) *Brown, J., & Lee, M. (2024). Generative AI in banking: A new frontier in digital transformation. International Journal of Fintech Research, 12(1), 45-68.*
4) *Brown, L., & Zhang, H. (2025). Emerging technologies in financial AI: A quantum leap forward. Future of Finance Journal, 14(2), 55-79.*
5) *Brown, T. (2025). Data Integrity in Financial Services: Challenges and Solutions. Journal of Financial Technology, 12(1), 45-67.*
6) *Bryman, A. (2021). Social research methods (6th ed.). Oxford University Press.*
7) *CERT-In. (2023). Cybersecurity best practices for AI-driven financial applications. Ministry of Electronics and IT (MeitY), Government of India.*
8) *Chen, K., Zhang, Y., & Wilson, P. (2025). Ensuring data integrity in AI-powered financial services. Journal of Risk & Compliance, 10(1), 22-39.*
9) *Deloitte. (2023). Data governance in AI-driven finance: A roadmap for the future. Deloitte Insights. https://www2.deloitte.com*
10) *Financial Stability Board. (2023). Regulatory approaches to AI in financial markets. https://www.fsb.org*
11) *Garcia, L., & Brown, T. (2024). Blockchain for AI integrity in financial transactions. Journal of Financial Technology, 9(3), 102-128.*
12) *Gupta, R., Sharma, A., & Verma, K. (2024). Blockchain for financial data security: Applications and challenges in Indian banking. Journal of Financial Technology, 15(2), 78-101.*
13) *Gupta, S., & Tham, J. (2023). The role of AI in financial decision-making: Trends and challenges. AI & Finance Review, 18(3), 76-98.*
14) *IBM. (2024). AI and cybersecurity: Protecting financial data in the digital age. IBM Security Report. https://www.ibm.com*
15) *IDRBT. (2023). AI audits in banking: Ensuring compliance and integrity. Institute for Development and Research in Banking Technology, RBI.*
16) *Jain, P., Mishra, D., & Kumar, A. (2024). Synthetic data generation for AI-driven banking applications. International Journal of AI & Finance, 9(1), 56-74.*

17) *Johnson, H., Smith, P., & Lee, R. (2025). AI applications in financial risk assessment: The impact of data quality. Journal of Financial Technology, 9(2), 33-57.*

18) *Johnston, M. P. (2017). Secondary data analysis: A method of which the time has come. Qualitative and Quantitative Methods in Libraries, 3(3), 619-626.*

19) *Jones, M. (2023). Overcoming Data Silos in Financial Institutions. **

20) *Joshi, R., & Sharma, P. (2023). AI in Indian finance: Balancing innovation and data integrity. Journal of Fintech & AI Ethics, 7(2), 98-115.*

21) *Mehta, S. (2023). Data privacy and AI-driven banking: Balancing accessibility with security. Financial Regulations Journal, 11(3), 145-162.*

22) *MeitY. (2021). National strategy on blockchain. Ministry of Electronics and IT, Government of India. Retrieved from https://www.meity.gov.in*

23) *MeitY. (2023). IndiaAI mission and the future of AI governance in financial services. Government of India. Retrieved from https://www.meity.gov.in*

24) *Ministry of Electronics and Information Technology. (2023). Digital Personal Data Protection Act, 2023. Government of India. https://www.meity.gov.in*

25) *Mishra, V., & Das, T. (2023). Regulatory sandboxes and AI experimentation in Indian finance: Challenges and opportunities. Indian Banking Review, 14(4), 200-225.*

26) *NASSCOM. (2023). AI and data security guidelines for financial institutions in India. National Association of Software and Service Companies.*

27) *NITI Aayog. (2021). AI governance and financial data security: An Indian perspective. Government of India.*

28) *NITI Aayog. (2022). Federated learning for AI adoption in financial services. Government of India.*

29) *Patel, K., & Nair, R. (2023). AI-driven data cleansing for financial institutions: A case study from India. Journal of Digital Banking, 8(2), 112-129.*

30) *Patel, R., & Wang, F. (2023). AI-driven data quality enhancement in financial services. Journal of Financial Analytics, 8(4), 112-134.*

31) *Raj, A., Kapoor, N., & Sinha, R. (2024). Federated learning for AI-powered credit risk assessment: An Indian perspective. AI & Finance Quarterly, 16(3), 99-121.*

32) *RBI. (2023). Master direction on IT governance and AI adoption in banking. Reserve Bank of India. Retrieved from https://www.rbi.org.in*

33) *Reserve Bank of India. (2022). Account Aggregator Framework: Enabling secure data sharing. RBI Bulletin, 78(5), 34-59.*

34) *Saunders, M., Lewis, P., & Thornhill, A. (2019). Research methods for business students (8th ed.). Pearson Education.*

35) *Saxena, P., & Verma, G. (2024). Data standardization in AI-driven financial services: The Indian landscape. Journal of Fintech & AI, 12(1), 65-87.*

36) *SEBI. (2024). AI ethics guidelines for financial institutions and fintech firms. Securities and Exchange Board of India.*

37) *Sharma, A., & Gupta, T. (2023). Ensuring AI fairness in financial applications: An Indian regulatory perspective. Journal of Financial Technology & Ethics, 9(1), 75-102.*

38) *Sharma, H., & Mukherjee, S. (2024). Enhancing credit evaluation using federated learning: A study on Indian fintech firms. International Journal of Banking AI, 10(2), 44-69.*

39) *Smith, D., & Johnson, P. (2024). Explainable AI in finance: Enhancing transparency and trust. Financial AI Ethics Journal, 7(4), 92-118.*

40) *Thompson, R. (2024). Regulatory compliance in AI-driven finance: Emerging trends and challenges. Journal of Fintech Law & Ethics, 14(1), 56-82.*

41) *Wang, F. (2024). Optimizing data quality for AI-driven financial analytics. Finance & AI Quarterly, 16(2), 54-78.*

42) *Wang, F., & Chen, L. (2023). Cloud-based AI applications in financial data management. International Journal of Digital Banking, 10(2), 67-89.*

43) *Zhang, L. (2024). Mitigating bias in AI-driven financial decision-making. AI Ethics & Compliance Journal, 5(1), 67-91.*

44) *Zhang, L., & Patel, S. (2023). Bridging the data quality gap in AI-driven financial services. Journal of Digital Banking & AI, 11(3), 90-116.*

# AI in Information Technology and Management

R. Kaleeswari[1]* and V. Sowmiya[1]

[1]*I – M. Com, A. K. D. Dharma Raja Women's College, Rajapalayam, Tamil Nadu*

**Corresponding Author e-mail id:* kaleeswariravi14@gmail.com*

## Abstract

*The integration of Fake Insights (AI) in Data Innovation (IT) and administration has changed the way businesses work. This paper investigates the applications and suggestions of AI in four key areas:*

*1. AI in Cybersecurity: Making strides risk discovery, occurrence reaction, and prescient analytics to improve the security and astuteness of IT systems.*

*2. Intelligent Data Management: Improving information examination, visualization, and administration to empower superior decision-making and made strides trade outcomes.*

*3. Cloud Computing: Optimizing asset utilization, security, and compliance to empower adaptable, secure, and cost-effective IT infrastructure.*

*4. The Future of AI in IT: Investigating the potential of independent frameworks, prescient analytics, and personalized computing to revolutionize the future of IT and management.*

*The paper examines the benefits and challenges of actualizing AI in IT and administration, including:*

*- Progressed productivity, efficiency, and decision-making*

*- Upgraded security, compliance, and governance*

*- Expanded versatility, adaptability, and cost-effectiveness*

*- Potential work uprooting, inclination, and morals concerns*

*The paper concludes that AI has the potential to revolutionize IT and administration, but requires cautious thought of its challenges and limitations*

***Keywords:*** *AI in Cybersecurity, Intelligent Data Management, Cloud Computing, The Future of AI in IT*

## AI in IT and Management

AI is transforming the way IT and management operate, making processes more efficient, effective, and innovative.

## Benefits of AI in IT and Management

**1. Improved Efficiency:** Automation of repetitive tasks, freeing up resources for strategic initiatives.

**2. Enhanced Decision-Making:** Data-driven insights and predictive analytics enable informed decisions.

**3. Increased Agility:** Rapid deployment of applications and services, improving responsiveness to changing business needs.

**4. Better Risk Management:** AI-powered monitoring and analysis help identify and mitigate potential risks.

## Applications of AI in IT and Management

**1. Intelligent Data Management:** AI-powered data analysis, visualization, and management.

**2. AI-powered Cybersecurity:** Enhanced threat detection, incident response, and predictive **analytics.**

**3. Cloud Computing**: AI-optimized cloud infrastructure, applications, and services.

**4. IT Service Management:** AI-driven automation, analytics, and decision-making.

## Challenges and Future Directions

**1. Data Quality and Management:** Ensuring accurate, reliable, and secure data.

**2. Ethics and Bias:** Addressing concerns around AI bias, fairness, and transparency.

**3. Talent and Skills:** Developing AI-related skills and expertise.

## AI in Cybersecurity

AI in cybersecurity revolutionizes risk location, computerizes reactions, and fortifies powerlessness administration. By analyzing behaviors, recognizing phishing, and adjusting to unused dangers, AI improves cybersecurity procedures, empowering proactive defense and defending delicate data.

## Benefits of AI in Cybersecurity

**1. Progressed Danger Discovery:**

AI-powered frameworks can analyze tremendous sums of information from different sources, such as organize activity, framework logs, and risk insights bolsters. This empowers them to distinguish potential security dangers in real-time, diminishing the hazard of cyber-attacks.

**2. Improved Occurrence Reaction:**

AI can computerize occurrence reaction forms, minimizing harm and downtime. AI-powered frameworks can analyze occurrence information, recognize root causes, and give proposals for remediation.

**3. Prescient Analytics:**

AI-powered prescient analytics can analyze authentic information, recognize designs, and anticipate potential security dangers. This empowers organizations to take proactive measures to anticipate attacks.

**4. Diminished Untrue Positives:**

AI-powered frameworks can analyze information from different sources, decreasing the number of untrue positive alarms. This empowers security groups to center on genuine dangers, decreasing the commotion and progressing occurrence response.

## Applications of AI in Cybersecurity

**1. Interruption Location Frameworks:** AI-powered interruption discovery frameworks can analyze arrange activity, distinguish potential dangers, and caution security teams.

**2. Malware Discovery:** AI-powered malware discovery frameworks can analyze records, programs, and applications, distinguishing potential malware and cautioning security teams.

**3. Phishing Location:** AI-powered phishing discovery frameworks can analyze emails, websites, and other online substance, distinguishing potential phishing assaults and cautioning security teams.

**4. Security Data and Occasion Administration (SIEM) Frameworks**: AI-powered SIEM frameworks can analyze security-related information from different sources, distinguishing potential security dangers and cautioning security teams.

## Challenges and Impediments of AI in Cybersecurity

**1. Information Quality:** AI-powered frameworks require high-quality information to work viably. Destitute information quality can lead to wrong comes about, wrong positives, and untrue negatives.

**2. Predisposition and Reasonableness:** AI-powered frameworks can be one-sided if prepared on one-sided information. This can lead to out of line results, unfair hones, and reputational damage.

**3. Explainability:** AI-powered frameworks can be troublesome to decipher, making it challenging to get it why a specific choice was made.

**4. Security Dangers:** AI-powered frameworks present unused security dangers, such as information breaches, unauthorized get to, and noxious attacks.

## Future of AI in Cybersecurity

1. **Independent Frameworks:** AI-powered independent frameworks will play an progressively vital part in cybersecurity, empowering real-time decision-making and automation.
2. **Reasonable AI:** Reasonable AI will gotten to be progressively vital in cybersecurity, empowering security groups to get it why specific choices were made.
3. **Human-AI Collaboration:** Human-AI collaboration will gotten to be progressively vital in cybersecurity, empowering security groups to work successfully with AI-powered systems.
4. **Ill-disposed AI:** Ill-disposed AI will ended up progressively critical in cybersecurity, empowering security groups to expect and get ready for potential attacks

## Intelligent Data Management

Intelligent information administration is an AI-powered and mechanized way to store, distinguish, and secure endeavor information over cross breed and multicloud situations with negligible IT exertion. Not as it were does this spare time and cash whereas lessening endeavor chance, but it can offer assistance open idle esteem in data—which is ostensibly an organization's most important asset—to drive competitive advantage.

Intelligent Information Administration alludes to the utilize of manufactured insights (AI) and machine learning (ML) to oversee, analyze, and pick up bits of knowledge from data.

## Benefits of Intelligent Data Management

1. **Progressed Information Investigation:** AI-powered information administration frameworks can analyze expansive datasets, distinguish designs, and give insights.
2. **Improved Decision-Making:** AI-driven information administration frameworks can give real-time bits of knowledge, empowering superior decision-making.
3. **Expanded Proficiency:** AI-powered information administration frameworks can mechanize information handling, lessening manual exertion and making strides productivity.
4. **Way better Information Administration:** AI-driven information administration frameworks can guarantee information quality, astuteness, and compliance with administrative requirements.

## Applications of Intelligent Data Management

**1. Information Warehousing:** AI-powered information warehousing frameworks can analyze and give bits of knowledge from expansive datasets.

**2. Commerce Insights:** AI-driven commerce insights frameworks can give real-time bits of knowledge and empower way better decision-making.

**3. Information Analytics:** AI-powered information analytics frameworks can analyze huge datasets and give insights.

**4. Information Administration:** AI-driven information administration frameworks can guarantee information quality, astuteness, and compliance with administrative requirements.

## Challenges of Intelligent Data Management

**1. Information Quality:** AI-powered information administration frameworks require high-quality information to work effectively.

**2. Inclination and Reasonableness:** AI-driven information administration frameworks can be one-sided if prepared on one-sided data.

**3. Explainability:** AI-powered information administration frameworks can be troublesome to translate, making it challenging to get it why specific choices were made.

**4. Security Dangers:** AI-powered information administration frameworks present modern security dangers, such as information breaches and unauthorized access.

## Future of Intelligent Data Management

**1. Independent Frameworks:** AI-powered independent frameworks will play an progressively imperative part in information management.

**2. Logical AI:** Reasonable AI will ended up progressively imperative in information administration, empowering understanding of AI decisions.

**3. Human-AI Collaboration:** Human-AI collaboration will ended up progressively critical in information administration, empowering successful decision-making.

**4. Data-Driven Decision-Making**: Data-driven decision-making will be ended up progressively vital, empowering organizations to make educated choices

## Cloud Computing

Cloud computing alludes to the conveyance of computing assets, such as servers, capacity, databases, program, and applications, over the web. Instep of having to oversee and keep up physical equipment and program, clients can get to these assets on-demand from a cloud provider.

## Benefits of Cloud Computing

**1. Adaptability:** Cloud computing assets can be scaled up or down to coordinate changing commerce needs.

**2. Cost-Effectiveness:** Cloud computing disposes of the require for forthright capital consumptions on equipment and software.

**3. Expanded Deftness:** Cloud computing empowers speedier sending of applications and services.

**4. Progressed Unwavering quality:** Cloud computing suppliers regularly offer tall levels of excess and failover capabilities.

## Applications of Cloud Computing

**1. Foundation as a Benefit (IaaS):** Gives virtualized computing assets, such as servers, capacity, and networking.

**2. Stage as a Benefit (PaaS):** Gives a total stage for creating, running, and overseeing applications.

**3. Program as a Benefit (SaaS):** Gives program applications over the web, disposing of the require for nearby installation.

**4. Cloud Capacity:** Gives secure, versatile, and on-demand capacity for data.

## Challenges of Cloud Computing

**1. Security:** Cloud computing presents modern security dangers, such as information breaches and unauthorized access.

**2. Compliance:** Cloud computing must comply with different administrative prerequisites, such as information sway and protection laws.

**3. Reliance on Web Network:** Cloud computing requires solid and high-speed web connectivity.

**4. Merchant Lock-in:** Cloud computing can make it troublesome to switch suppliers due to restrictive innovations and information formats.

## Future of Cloud Computing

**1. Serverless Computing:** Cloud computing will proceed to advance towards serverless computing, where assets are designated dynamically.

**2. Edge Computing:** Cloud computing will progressively join edge computing, where information is handled closer to the source.

**3. Manufactured Insights (AI) and Machine Learning (ML):** Cloud computing will progressively coordinated AI and ML capabilities to make strides computerization and decision-making.

**4. Cross breed and Multi-Cloud Procedures:** Cloud computing will progressively include half breed and multi-cloud methodologies, where organizations utilize different cloud suppliers to meet diverse needs.

## The Future of AI in IT

"The future of AI in IT" alludes to the expected progressions and far reaching integration of counterfeit insights (AI) inside the Data Innovation (IT) segment, where AI will likely mechanize numerous errands, upgrade decision-making, progress cybersecurity, streamline program advancement, and in a general sense change how IT framework is overseen, eventually driving to more proficient and cleverly frameworks with negligible human mediation.

## Key Trends

**1. Independent Frameworks:** AI-powered independent frameworks can analyze information, make choices, and take activities without human mediation. This empowers real-time decision-making and automation.

**2. Logical AI:** Logical AI gives clear clarifications for AI choices and activities. This empowers straightforwardness, responsibility, and believe in AI-powered systems.

**3. Human-AI Collaboration:** Human-AI collaboration empowers people and AI to work together to accomplish common objectives. This empowers leveraging human ability and AI capabilities.

**4. Antagonistic AI:** Ill-disposed AI expects and plans for potential assaults or dangers. This empowers proactive defense against cyber threats.

## Emerging Technologies

**1. Serverless Computing:** Serverless computing empowers AI to oversee computing assets, diminishing manual administration. This empowers more prominent versatility, adaptability, and cost-effectiveness.

**2. Edge Computing:** Edge computing empowers AI to handle information closer to the source, diminishing idleness and moving forward real-time decision-making. This empowers more noteworthy effectiveness, efficiency, and innovation.

**3. Quantum Computing:** Quantum computing empowers AI to handle complex information and unravel complex issues. This empowers breakthroughs in areas like pharmaceutical, back, and climate modeling.

## Impact on IT Roles

**1. Unused Work Openings:** AI makes modern work openings in AI advancement, arrangement, and support. This empowers career development, aptitude improvement, and innovation.

**2. Upskilling and Reskilling:** IT experts require to create modern aptitudes to work viably with AI-powered frameworks. This empowers adjusting to changing innovation landscapes.

**3. Changing Nature of Work:** AI changes the nature of work in IT, empowering more center on vital and imaginative errands. This empowers more prominent efficiency, development, and work satisfaction.

## Challenges and Limitations

**1. Information Quality:** AI requires high-quality information to work successfully. Destitute information quality can lead to wrong comes about, inclination, and errors.

**2. Inclination and Reasonableness:** AI can sustain predispositions if prepared on one-sided information. This can lead to out of line results, separation, and reputational damage.

**3. Security Dangers:** AI presents unused security dangers, such as information breaches, unauthorized get to, and malevolent assaults. This requires proactive security measures.

## Future Outlook

**1. Expanded Selection:** AI selection increments over businesses and spaces, driving development, efficiency, and growth.

**2. Made strides Effectiveness:** AI progresses IT operations' productivity and adequacy, empowering more noteworthy dexterity, adaptability, and cost-effectiveness.

**3. Modern Trade Models:** AI empowers unused trade models and income streams, driving advancement, disturbance, and development

## Conclusion

The integration of Artificial Intelligence (AI) in Cybersecurity, Intelligent Data Management, Cloud Computing, and the future of AI in IT has transformative potential. AI-powered systems can detect and respond to cyber threats in real-time, manage and analyze vast amounts of data, and optimize cloud computing resources.

As AI continues to evolve, we can expect increased adoption across industries, improved efficiency and effectiveness in IT operations, and the creation of new business models and revenue streams

## Key Takeaways

- AI-powered Cybersecurity detects and responds to threats in real-time.
- Intelligent Data Management optimizes data analysis and decision-making.
- Cloud Computing enables scalable, flexible, and cost-effective IT infrastructure.
- The future of AI in IT promises increased adoption, improved efficiency, and new business models.

## References

1) *https://www.computer.org/csdl/magazine/ex/1996/06/x6020/13rRUwh80yI*
2) *https://onlinelibrary.wiley.com/doi/full/10.1002/joom.1215*
3) *https://ajcst.co/index.php/ajcst/article/download/3704/7611*