Original Article
ISSN (Online): 2582-7472

ShodhKosh: Journal of Visual and Performing Arts
June 2024 5(6), 3224–3239

AI & NLP IN BANKING MARKETING: ENGAGEMENT, PERSONALIZATION, AND COMPLIANCE

Dr. Suwarna Vinay Shidore [1], Dr. Aparna Tembulkar [2], Dr. Rupali Surendra Gupte [1]

[1] Assistant Professor, Indsearch Institute of Management Studies and Research, Pune, India
[2] Director, Indsearch Institute of Management Studies & Research, Pune, India

ABSTRACT

Artificial Intelligence (AI) and Natural Language Processing (NLP) have become essential technologies in the banking sector, reshaping marketing strategies, enhancing customer engagement, and refining compliance frameworks. This investigation examined the impact of AI-driven personalization and NLP-enhanced customer interactions on engagement and trust in banking services. A structured questionnaire was administered to 150 participants from various demographic backgrounds, concentrating on customer experiences with AI-powered chatbots, recommendation systems, and compliance-related communications in the banking industry. The results indicated that AI and NLP techniques notably improved personalization, bolstered customer trust via compliance-focused communication, and elevated overall engagement. Nonetheless, apprehensions surrounding data privacy and the clarity of regulations remained evident. This study investigates the impact of AI and NLP on banking marketing, emphasizing their ability to enhance customer satisfaction while also addressing ethical considerations.

Keywords: Artificial Intelligence, Natural Language Processing, Banking Marketing, Customer Engagement, Customer Trust, Data Privacy

Corresponding Author

Dr. Suwarna Vinay Shidore,
drsuwarnashidore@indsearch.org

DOI
10.29121/shodhkosh.v5.i6.2024.6228

Funding: This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

1. INTRODUCTION

The banking industry has experienced significant changes in the last decade, mainly due to progress in digital technologies. Artificial Intelligence (AI) and Natural Language Processing (NLP) are important equipment in the banking sector, which affect customers interactions, marketing strategy compliance with development and regulatory requirements. Historically, banks used standardized marketing strategies including large-scale emails, advertisements and in-bache propagals. While these methods demonstrated some effectiveness, they often lacking privatization and did not attach customers to a great extent. Artificial Intelligence and Natural Language processing addresses the processing marketing by enabling the data-operated, real-time and consumer-focused and addressed the issue. This increases customer interest and promoting trusts between banks and their customers.

Artificial intelligence denotes the capacity of robots and systems to replicate human intelligence through data analysis, pattern recognition, and predictive modeling. Artificial intelligence is widely used in the banking sector to

increase customer relationship management, explore fraud activities, assess credibility and distribute automated financial advisory services. The incorporation of AI in marketing operations enables banks to customize communications, predict customer preferences, and offer personalized recommendations, thus improving customer engagement opportunities. Artificial intelligence-driven recommendation systems evaluate an individual's financial behavior and transaction history to propose appropriate credit cards, loans, or investment opportunities.. The ability to significantly customize services represents a notable shift from the traditional one-size-fits-all approach in banking marketing.

Natural Language Processing, as a branch of artificial intelligence, significantly improves customer communication. NLP allows machines to understand, interpret, and respond to human language in multiple formats, including text and speech. NLP is predominantly utilized in banking through chatbots, virtual assistants, and automated voice systems. These tools decrease response time and enhance the naturalness and customer-friendliness of interactions. When a customer inquires about loan eligibility via a chatbot, the NLP system can deliver an immediate and precise response while concurrently analyzing the dialogue for marketing insights.

The integration of AI and NLP in banking marketing presents several challenges, despite their advantages. Data privacy concerns, customer hesitance to trust automated systems, and the risk of over-reliance on technology constitute significant challenges. Customers may question the ethical implications of the use of their personal and financial data, as well as whether AI-driven personalization violates privacy boundaries. These concerns underscore the necessity of balancing technological efficiency, customer engagement, and ethical responsibility.

This study examines the synergistic effects of artificial intelligence and natural language processing on engagement, personalization, and compliance in banking marketing. This study analyzes customer perceptions, satisfaction, and concerns regarding AI-driven banking experiences, based on data collected from 150 respondents with diverse demographic backgrounds. The aim is to evaluate if AI and NLP enhance marketing effectiveness and promote enduring trust and loyalty among customers. This research enhances the understanding of how emerging technologies are transforming banking dynamics in the digital era.

2. REVIEW OF LITERATURE

Artificial intelligence (AI) and natural language processing (NLP) are transforming the methods by which banks attract, engage, and retain customers, all while adhering to strict regulatory standards. Research on customer engagement in services marketing defines engagement as a multidimensional psychological state that encompasses cognitive, emotional, and behavioral investment in interactions with a firm, extending beyond mere satisfaction and participation (Brodie, Hollebeek, Jurić, & Ilić, 2010). This lens elucidates how interactive AI touchpoints, including chatbots and virtual assistants, can impact downstream outcomes such as loyalty and advocacy by providing value during service interactions.

A parallel stream in digital marketing identifies "customer brand engagement" as a crucial element in fostering loyalty, emphasizing the significance of interactive and value-driven exchanges (Holback, 2011). The conjunctive AI in banking provides continuous, low-storing communication, allegedly increases utility and convenience-usually high engagement factors. Initial empirical studies on chatbots recognized "productivity" (i.e., speed and efficiency) as the primary motivation for usage, in addition to curiosity and social influences (Brandtzaeg & Følstad, 2017). The motivations align closely with the value propositions that banks promote regarding digital self-service: expedited resolution, reduced branch visits, and tailored advice. The engagement and chatbot literatures indicate that AI interfaces can enhance involvement and increase contact frequency, which are essential factors in strengthening relationships within retail banking.

Progress in NLP that supports contemporary banking chatbots and marketing analytics, mainly from the transformer architecture, is known for its effectiveness in modeling of long distance dependence in the text (Vaswani et al., 2017). Domain-specific model developed from general-purpose language model has improved efficacy in analysis of financial texts. Finbert is a modified version of the burt sewn for classification of financial sentiment, which improves precision on finance-specific dataset (Araci, 2019). Pre-funded literature contributed to progress. Loughran and McDonald enhanced polarity biases by utilizing their domain lexicon alongside standard emotion dictionaries for financial disclosures, while the financial phrase set offered labeled phrases for emotion analysis targeted at investors (Loughran & McDonald, 2011; Malo et al., 2014). These advancements allow banks to analyze unstructured data such as

emails, chats, statements, and news, facilitating the customization of messages, categorization of customers, and optimization of offer timing—key components of effective personalization.

Research on extended personalization beyond the banking sector demonstrates strong functioning foundations in recommended systems that connect users to relevant products through analysis of preferences and behaviors (RICCI, Rokach, and Shapira, 2011). In financial services, individual product suggestions, such as savings scheme, credit card and micro investment, are based on equal logic, as is the priority of information by relevance. The integration of conversational interfaces allows for the contextual communication of recommendation outputs (e.g., "based on your spending pattern…") in real time, thereby enhancing both engagement and conversion rates.From the perspective of a technology acceptance, perceived utility and effort expectation - essential elements of adoption models such as UTAUT - to explain why customers are attracted to AI features that reduce friction by offering unique, personal benefits (Venkatesh et al, 2003).

Financial applications of Artificial Intelligence are important compliance and trust issues. General Data Protection Regulation of European Union (GDPR) specifies guidelines for automated decision making and profiles. It specifies the conditions under which individuals can opt out of solely automated decisions that have legal or similarly significant consequences (Article 22) and outlines the necessary safeguards for the use of automation, such as meaningful human review and contestability (Article 29 Data Protection Working Party, 2018; GDPR, 2016). These provisions for banks relate to AI-enabled targeting, risk scoring, and real-time messaging, necessitating explainability and governance. Model-agnostic techniques, including LIME and SHAP, enhances the interpretation of complex classifier. They facilitate auditability, fairness assessment and customer-affiliated clarification, which are necessary to ensure reliable privatization and obedient marketing communication (Ribeiro, Singh, & Guestrin, 2016; Lundberg & Lee, 2017). Regulatory and policy institutions emphasize the significance of governance and fairness throughout the AI lifecycle in financial services, stressing the need for explainability and appropriate human oversight (OECD, 2021; Bank of England & FCA, 2021).

3. RESEARCH OBJECTIVES

The primary objectives of the paper are:

1) To assess the impact of AI and NLP tools on customer engagement within banking marketing.
2) To examine the impact of AI-driven personalization on customer trust and loyalty in the banking sector.
3) To examine the effects of compliance-oriented communication via AI and NLP on customer perceptions regarding security and transparency.
4) To analyze demographic variations in the adoption and perception of AI and NLP-driven banking marketing strategies.

4. RESEARCH METHODOLOGY

This research used a cross-sectional survey method to evaluate the impacts of AI and NLP in banking marketing on engagement, privatization and compliance. This design effectively enabled the simultaneous collection of varied user perceptions, accurately reflecting the current experiences of banking customers engaging with AI-driven services.

A sample size of 150 respondents was chosen to ensure adequate representation of diverse customer segments. Participants were chosen from metropolitan and semi-urban regions, where the prevalence of AI-driven banking products, such as chatbots, voice assistants, and customized marketing communications, is increasing.

A stratified random sampling method was employed to classify the population based on demographic characteristics such as age, gender, and income levels. This ensures proportional representation of diverse groups, minimizes sample bias, and encompasses a wide range of methodologies. Employing random selection within each stratum enhanced the reliability of the conclusions and facilitated meaningful comparisons across demographic divisions.

Data were primarily collected via an online-administered structured questionnaire survey. All inquiries employed closed-ended formats, predominantly based on a five-point Likert scale, which ranged from "Strongly Agree" to "Strongly Disagree." This format facilitated consistent responses and improved quantitative data analysis through the application of statistical tools.

The hypotheses of the study were as follows:

Hypothesis 1:

H_0: "There is no significant correlation between AI/NLP tools and improved customer engagement in banking marketing."

H_1: "A significant correlation exists between AI/NLP tools and improved customer engagement in banking marketing."

Hypothesis 2:

H_0: "No significant relationship exists between AI-driven personalization and customer trust in banks."

H_1: "A significant correlation exists between AI-driven personalization and customer trust in banking institutions."

Hypothesis 3:

H_0: "Compliance-oriented communication via AI/NLP does not significantly influence customer perceptions of security and transparency."

H_1: "Compliance-oriented communication via AI/NLP significantly influences customer perceptions of security and transparency."

Hypothesis 4:

H_0: "There exists no significant disparity in perceptions of AI/NLP-driven banking marketing strategies among various demographic groups."

H_1: "A significant disparity exists in the perceptions of AI/NLP-based banking marketing strategies among various demographic groups."

5. EMPIRICAL RESULTS

1) Section A: Demographic Questions

Table 1 Age Group of Respondents

Age Group	Frequency	Percentage	Valid Percentage	Cumulative Percentage
18–25 years	37	24.67%	24.67%	24.67%
26–35 years	46	30.67%	30.67%	55.34%
36–45 years	32	21.33%	21.33%	76.67%
46–55 years	21	14.00%	14.00%	90.67%
56 years and above	14	9.33%	9.33%	100.00%
Total	150	100.00%	100.00%	

Interpretation:

The largest proportion of respondents belonged to the age group 26–35 years (30.67%), followed by 18–25 years (24.67%). This shows that younger and middle-aged individuals were more likely to respond, reflecting that they are the primary users of AI-enabled banking tools. Older age groups (46 years and above) contributed only 23.33%, indicating comparatively less involvement with digital banking technologies.

Table 2 Gender of Respondents

Gender	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Male	82	54.67%	54.67%	54.67%
Female	68	45.33%	45.33%	100.00%
Other	0	0.00%	0.00%	100.00%
Total	150	100.00%	100.00%	

Interpretation:

Male respondents accounted for 54.67% of the total sample, while females made up 45.33%. No respondents identified as "Other." This indicates a fairly balanced gender distribution, allowing for meaningful comparisons between male and female perspectives regarding AI and NLP-based banking services.

Table 3 Highest Educational Qualification

Qualification	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Undergraduate	29	19.33%	19.33%	19.33%
Graduate	46	30.67%	30.67%	50.00%
Postgraduate	37	24.67%	24.67%	74.67%
Doctorate	18	12.00%	12.00%	86.67%
Professional/Technical Certification	20	13.33%	13.33%	100.00%
Total	150	100.00%	100.00%	

Interpretation:

Graduates (30.67%) and postgraduates (24.67%) formed the majority of respondents, suggesting that individuals with higher education levels are more engaged with AI-driven banking tools. The presence of doctorate holders (12.00%) and those with professional/technical certifications (13.33%) highlights the diversity of educational backgrounds in the sample.

Table 4 Primary Occupation

Occupation	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Student	28	18.67%	18.67%	18.67%
Employed (Private)	46	30.67%	30.67%	49.34%
Employed (Government)	32	21.33%	21.33%	70.67%
Self-Employed	24	16.00%	16.00%	86.67%
Retired	20	13.33%	13.33%	100.00%
Total	150	100.00%	100.00%	

Interpretation:

The private sector employees formed the largest share of respondents (30.67%), followed by government employees (21.33%) and students (18.67%). The presence of self-employed individuals (16.00%) and retired respondents (13.33%) highlights that AI and NLP banking tools are used by both active professionals and older customers.

Table 5 Monthly Household Income

Monthly Income Level	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Below ₹25,000	34	22.67%	22.67%	22.67%
₹25,000–₹50,000	42	28.00%	28.00%	50.67%
₹50,001–₹1,00,000	36	24.00%	24.00%	74.67%
₹1,00,001–₹2,00,000	22	14.67%	14.67%	89.34%
Above ₹2,00,000	16	10.67%	10.67%	100.00%
Total	150	100.00%	100.00%	

Interpretation:

The majority of respondents earned between ₹25,000 and ₹50,000 (28.00%), followed by those earning ₹50,001–₹1,00,000 (24.00%). Respondents with incomes above ₹2,00,000 formed the smallest group (10.67%). This suggests that middle-income groups are the primary users of AI and NLP-based banking services, while higher-income individuals are less represented.

2) Section B: Quantitative Questions

Category 1: Customer Engagement with AI & NLP

Table 6 How frequently do you interact with AI-based banking tools (chatbots, virtual assistants)?

Response Option	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Very Frequently	28	18.67%	18.67%	18.67%
Frequently	37	24.67%	24.67%	43.34%
Occasionally	46	30.67%	30.67%	74.01%
Rarely	26	17.33%	17.33%	91.34%
Never	13	8.67%	8.67%	100.00%
Total	150	100.00%	100.00%	

Interpretation:

The largest group of respondents (30.67%) interacted with AI-based banking tools occasionally, while 24.67% used them frequently and 18.67% very frequently. Only 8.67% reported never using such tools, showing that AI and NLP are widely adopted, but frequency of use varies across customers.

Table 7 AI-driven chatbots in banking provide quick and useful responses

Response Option	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Strongly Agree	33	22.00%	22.00%	22.00%
Agree	52	34.67%	34.67%	56.67%
Neutral	36	24.00%	24.00%	80.67%
Disagree	18	12.00%	12.00%	92.67%
Strongly Disagree	11	7.33%	7.33%	100.00%
Total	150	100.00%	100.00%	

Interpretation:

A majority of respondents agreed (34.67%) or strongly agreed (22.00%) that AI-driven chatbots provide quick and useful responses, while 24.00% remained neutral. A smaller segment (19.33%) expressed dissatisfaction, indicating that while chatbots are effective for most, a portion of users still experience gaps in responsiveness or quality of service.

Table 8 AI-based services (chatbots, voice assistants) save my time compared to traditional methods.

Response Option	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Strongly Agree	34	22.67%	22.67%	22.67%
Agree	48	32.00%	32.00%	54.67%
Neutral	36	24.00%	24.00%	78.67%
Disagree	20	13.33%	13.33%	92.00%
Strongly Disagree	12	8.00%	8.00%	100.00%
Total	150	100.00%	100.00%	

Interpretation:

More than half of the respondents either agreed (32.00%) or strongly agreed (22.67%) that AI-based services save time compared to traditional banking. Around 24.00% remained neutral, and only 21.33% disagreed or strongly disagreed, indicating that AI is largely seen as an efficient alternative to conventional methods.

Table 9 I feel more connected with banks that use AI/NLP tools for customer service

Response Option	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Strongly Agree	29	19.33%	19.33%	19.33%
Agree	47	31.33%	31.33%	50.67%
Neutral	38	25.33%	25.33%	76.00%
Disagree	22	14.67%	14.67%	90.67%
Strongly Disagree	14	9.33%	9.33%	100.00%
Total	150	100.00%	100.00%	

Interpretation:

A majority of respondents felt connected with banks using AI/NLP tools, with 50.66% agreeing or strongly agreeing. About a quarter (25.33%) took a neutral stance, while 24.00% disagreed to some extent. This highlights that although AI is improving customer relationships, a considerable proportion still prefer traditional interactions.

Table 10 AI/NLP Tools Enhance My Satisfaction with Banking Interaction

Response Option	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Strongly Agree	31	20.67%	20.67%	20.67%
Agree	49	32.67%	32.67%	53.34%
Neutral	37	24.67%	24.67%	78.01%
Disagree	21	14.00%	14.00%	92.01%
Strongly Disagree	12	8.00%	8.00%	100.00%
Total	150	100.00%	100.00%	

Interpretation:

The largest share of respondents (32.67%) agreed that AI/NLP tools enhance satisfaction, and 20.67% strongly agreed. Meanwhile, 24.67% stayed neutral, suggesting cautious acceptance. Only 22.00% expressed dissatisfaction, reflecting a generally positive perception of AI in enhancing banking experiences.

Category 2: Personalization in Banking Marketing

Table 11 AI-driven recommendations (offers, investment suggestions) are relevant to my needs

Response Option	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Strongly Agree	33	22.00%	22.00%	22.00%
Agree	51	34.00%	34.00%	56.00%
Neutral	35	23.33%	23.33%	79.33%
Disagree	19	12.67%	12.67%	92.00%
Strongly Disagree	12	8.00%	8.00%	100.00%
Total	150	100.00%	100.00%	

Interpretation:

A majority of respondents (56.00%) agreed or strongly agreed that AI-driven recommendations were relevant to their needs. About 23.33% remained neutral, while 20.67% felt the recommendations were not relevant, showing that while personalization is largely effective, it is not yet universal.

Table 12 AI tools personalize communication better than traditional banking methods

Response Option	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Strongly Agree	30	20.00%	20.00%	20.00%
Agree	50	33.33%	33.33%	53.33%
Neutral	36	24.00%	24.00%	77.33%
Disagree	22	14.67%	14.67%	92.00%
Strongly Disagree	12	8.00%	8.00%	100.00%
Total	150	100.00%	100.00%	

Interpretation:

More than half of the respondents (53.33%) agreed or strongly agreed that AI tools personalize communication better than traditional banking, reflecting growing appreciation for data-driven personalization. However, nearly a quarter (24.00%) remained neutral, and 22.67% disagreed, indicating that some customers still prefer conventional modes of interaction.

Table 13 Personalized product recommendations make me more likely to use new banking services

Response Option	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Strongly Agree	32	21.33%	21.33%	21.33%
Agree	48	32.00%	32.00%	53.33%
Neutral	39	26.00%	26.00%	79.33%
Disagree	20	13.33%	13.33%	92.67%
Strongly Disagree	11	7.33%	7.33%	100.00%
Total	150	100.00%	100.00%	

Interpretation:

A majority (53.33%) of respondents expressed that personalized recommendations make them more likely to adopt new banking services. About 26.00% remained neutral, while 20.66% disagreed, showing that personalization positively influences behavior but is not equally persuasive for all customers.

Table 14 I appreciate receiving personalized banking alerts through AI systems (e.g., fraud detection)

Response Option	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Strongly Agree	41	27.33%	27.33%	27.33%
Agree	52	34.67%	34.67%	62.00%
Neutral	31	20.67%	20.67%	82.67%
Disagree	16	10.67%	10.67%	93.34%
Strongly Disagree	10	6.67%	6.67%	100.00%
Total	150	100.00%	100.00%	

Interpretation:

A significant 62.00% of respondents agreed or strongly agreed that they appreciate receiving AI-based personalized alerts such as fraud detection, indicating trust in AI's role in security. Around 20.67% were neutral, while only 17.34% disagreed, suggesting strong acceptance of AI in enhancing banking safety and awareness.

Table 15 Personalized marketing via AI encourages me to remain loyal to my bank

Response Option	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Strongly Agree	35	23.33%	23.33%	23.33%
Agree	50	33.33%	33.33%	56.66%
Neutral	34	22.67%	22.67%	79.33%
Disagree	19	12.67%	12.67%	92.00%
Strongly Disagree	12	8.00%	8.00%	100.00%
Total	150	100.00%	100.00%	

Interpretation:

Most respondents (56.66%) agreed or strongly agreed that personalized AI marketing increased their loyalty to their banks. A considerable 22.67% stayed neutral, while 20.67% disagreed to varying extents, suggesting that personalization is effective but not the sole factor in maintaining customer loyalty.

Table 16 AI-driven personalization improves my overall trust in the bank's services

Response Option	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Strongly Agree	36	24.00%	24.00%	24.00%
Agree	49	32.67%	32.67%	56.67%
Neutral	35	23.33%	23.33%	80.00%
Disagree	20	13.33%	13.33%	93.33%
Strongly Disagree	10	6.67%	6.67%	100.00%
Total	150	100.00%	100.00%	

Interpretation:

A majority of respondents (56.67%) agreed or strongly agreed that personalization through AI improves their trust in banking services. About 23.33% remained neutral, whereas 20.00% expressed skepticism. This highlights that personalization fosters trust for many but trust-building still requires transparency and reliability beyond AI tools.

Category 3: Compliance & Trust

Table 17 AI/NLP systems in banking clearly explain regulatory and compliance-related information

Response Option	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Strongly Agree	28	18.67%	18.67%	18.67%
Agree	47	31.33%	31.33%	50.00%
Neutral	42	28.00%	28.00%	78.00%
Disagree	21	14.00%	14.00%	92.00%
Strongly Disagree	12	8.00%	8.00%	100.00%
Total	150	100.00%	100.00%	

Interpretation:

Half of the respondents (50.00%) agreed or strongly agreed that AI/NLP systems provide clarity on compliance matters. Still, 28.00% stayed neutral, while 22.00% disagreed, which indicates that while AI tools are perceived as informative, their clarity may still not meet the expectations of all customers.

Table 18 I trust banks more when AI-driven tools follow clear compliance guidelines

Response Option	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Strongly Agree	33	22.00%	22.00%	22.00%
Agree	52	34.67%	34.67%	56.67%
Neutral	37	24.67%	24.67%	81.34%
Disagree	17	11.33%	11.33%	92.67%
Strongly Disagree	11	7.33%	7.33%	100.00%
Total	150	100.00%	100.00%	

Interpretation:

Nearly 56.67% of respondents trusted banks more when AI systems adhered to compliance guidelines, showing the importance of regulatory alignment in customer trust. A neutral share of 24.67% suggested uncertainty, while only 18.66% distrusted such assurances.

Table 19 AI/NLP messaging helps me understand policies like KYC, AML, and data security better

Response Option	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Strongly Agree	31	20.67%	20.67%	20.67%
Agree	48	32.00%	32.00%	52.67%
Neutral	38	25.33%	25.33%	78.00%
Disagree	21	14.00%	14.00%	92.00%
Strongly Disagree	12	8.00%	8.00%	100.00%
Total	150	100.00%	100.00%	

Interpretation:

A total of 52.67% of respondents found AI messaging useful in understanding compliance-related policies. However, 25.33% stayed neutral, and 22.00% disagreed, suggesting that AI explanations, while beneficial, still leave room for improvement in clarity and accessibility.

Table 20 Compliance-driven AI notifications make me feel secure in financial transactions

Response Option	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Strongly Agree	34	22.67%	22.67%	22.67%
Agree	50	33.33%	33.33%	56.00%
Neutral	36	24.00%	24.00%	80.00%
Disagree	19	12.67%	12.67%	92.67%
Strongly Disagree	11	7.33%	7.33%	100.00%
Total	150	100.00%	100.00%	

Interpretation:

About 56.00% of respondents felt secure when receiving compliance-driven AI notifications, reflecting trust in automated alerts for safety. Around 24.00% were neutral, and 20.00% disagreed, pointing to the need for reinforcing reliability in AI-driven compliance systems.

Table 21 I am concerned that AI/NLP tools may misuse my personal data despite compliance claims

Response Option	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Strongly Agree	39	26.00%	26.00%	26.00%
Agree	46	30.67%	30.67%	56.67%
Neutral	32	21.33%	21.33%	78.00%
Disagree	21	14.00%	14.00%	92.00%
Strongly Disagree	12	8.00%	8.00%	100.00%
Total	150	100.00%	100.00%	

Interpretation:

A significant proportion (56.67%) of respondents expressed concern about misuse of personal data by AI/NLP systems despite compliance assurances. About 21.33% were neutral, while only 22.00% disagreed. This indicates that while AI improves efficiency, data privacy remains a major trust challenge.

Category 4: Data Privacy & Security Concerns

Table 22 I worry about the security of my financial data when interacting with AI-based tools

Response Option	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Strongly Agree	38	25.33%	25.33%	25.33%
Agree	44	29.33%	29.33%	54.66%
Neutral	33	22.00%	22.00%	76.66%
Disagree	21	14.00%	14.00%	90.66%
Strongly Disagree	14	9.33%	9.33%	100.00%
Total	150	100.00%	100.00%	

Interpretation:

Over half the respondents (54.66%) expressed concern about the security of their financial data when using AI tools. A further 22.00% were neutral, while 23.33% disagreed, indicating that while anxiety around data protection is prevalent, a notable group remains confident in AI-based security.

Table 23 Banks provide sufficient transparency about how AI/NLP tools use my data

Response Option	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Strongly Agree	29	19.33%	19.33%	19.33%
Agree	41	27.33%	27.33%	46.66%
Neutral	40	26.67%	26.67%	73.33%
Disagree	25	16.67%	16.67%	90.00%
Strongly Disagree	15	10.00%	10.00%	100.00%
Total	150	100.00%	100.00%	

Interpretation:

Only 46.66% of respondents felt that banks are transparent about AI/NLP data usage, while 26.67% were neutral and 26.67% disagreed. This suggests that transparency remains a key challenge for building confidence in AI-driven banking.

Table 24 I feel comfortable sharing personal and financial information with AI systems in banking

Response Option	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Strongly Agree	27	18.00%	18.00%	18.00%
Agree	43	28.67%	28.67%	46.67%
Neutral	34	22.67%	22.67%	69.34%
Disagree	28	18.67%	18.67%	88.01%
Strongly Disagree	18	12.00%	12.00%	100.00%
Total	150	100.00%	100.00%	

Interpretation:

A modest majority (46.67%) felt comfortable sharing information with AI banking systems, while 22.67% remained neutral. However, 30.67% expressed discomfort, indicating a significant trust barrier regarding sensitive data sharing.

Table 25 Security and compliance measures influence my willingness to use AI/NLP banking services

Response Option	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Strongly Agree	39	26.00%	26.00%	26.00%
Agree	48	32.00%	32.00%	58.00%
Neutral	35	23.33%	23.33%	81.33%
Disagree	19	12.67%	12.67%	94.00%
Strongly Disagree	9	6.00%	6.00%	100.00%
Total	150	100.00%	100.00%	

Interpretation:

A large majority (58.00%) acknowledged that compliance and security measures strongly influence their willingness to adopt AI/NLP banking services. With only 18.67% in disagreement, this reinforces the role of transparent governance in AI adoption.

Category 5: Future Adoption & Perception

Table 26 AI/NLP will dominate banking marketing strategies in the near future

Response Option	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Strongly Agree	37	24.67%	24.67%	24.67%
Agree	45	30.00%	30.00%	54.67%
Neutral	36	24.00%	24.00%	78.67%
Disagree	20	13.33%	13.33%	92.00%
Strongly Disagree	12	8.00%	8.00%	100.00%
Total	150	100.00%	100.00%	

Interpretation:

Over half (54.67%) believed that AI/NLP would dominate banking marketing strategies soon, while 24.00% were neutral and only 21.33% disagreed, indicating strong optimism toward future adoption of AI in marketing.

Table 27 I am open to using more AI-powered services (e.g., robo-advisors, smart investment tools)

Response Option	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Strongly Agree	40	26.67%	26.67%	26.67%

Agree	47	31.33%	31.33%	58.00%
Neutral	35	23.33%	23.33%	81.33%
Disagree	18	12.00%	12.00%	93.33%
Strongly Disagree	10	6.67%	6.67%	100.00%
Total	150	100.00%	100.00%	

Interpretation:

A majority (58.00%) expressed willingness to adopt more AI-driven banking services, while 23.33% were undecided and 18.67% opposed. This reflects growing acceptance, though some skepticism persists.

Table 28 AI/NLP innovations will make banking more customer-friendly and efficient

Response Option	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Strongly Agree	42	28.00%	28.00%	28.00%
Agree	48	32.00%	32.00%	60.00%
Neutral	34	22.67%	22.67%	82.67%
Disagree	16	10.67%	10.67%	93.34%
Strongly Disagree	10	6.67%	6.67%	100.00%
Total	150	100.00%	100.00%	

Interpretation:

A clear 60.00% of respondents agreed that AI/NLP innovations would enhance customer-friendliness and efficiency in banking, while 22.67% were neutral and only 17.34% disagreed. This highlights widespread optimism about AI's role in improving customer experience.

6. HYPOTHESIS TESTING

Hypothesis 1

Table 29 Chi-Square Test for Association Between AI/NLP Tools and Enhanced Customer Engagement

Value	df	Asymp. Sig.
Pearson Chi-Square	21.482	4
Likelihood Ratio	22.695	4
N of Valid Cases	150	

Interpretation:

The relationship between AI/NLP tools and customer engagement was examined using the Chi-Square Test for Independence. With four degrees of freedom, the Pearson Chi-Square value is 21.482, and the significance level is p = 0.000, which is less than 0.05. This result confirms a statistically significant association. Thus, the null hypothesis (H_0) is rejected, and the alternative hypothesis (H_1) is accepted, establishing that AI/NLP tools significantly enhance customer engagement in banking marketing.

Hypothesis 2

Table 30 Chi-Square Test for Relationship Between AI-Driven Personalization and Customer Trust

Value	df	Asymp. Sig.
Pearson Chi-Square	18.936	4

Likelihood Ratio	19.824	4
N of Valid Cases	150	

Interpretation:

The Chi-Square Test for Independence was used to examine the relationship between AI-driven personalization and customer trust. With four degrees of freedom, the Pearson Chi-Square value is 18.936 and the significance value is p = 0.001, which is below the 0.05 threshold. Therefore, the null hypothesis (H_0) is rejected. The results indicate that AI-driven personalization has a significant positive relationship with customer trust in banks.

Hypothesis 3

Table 31 Chi-Square Test for Impact of Compliance-Oriented AI/NLP Communication on Security and Transparency Perceptions

Value	df	Asymp. Sig.
Pearson Chi-Square	20.577	4
Likelihood Ratio	21.644	4
N of Valid Cases	150	

Interpretation:

The Chi-Square Test assessed the impact of compliance-focused AI/NLP communication on perceptions of security and transparency. With four degrees of freedom, the Pearson Chi-Square value is 20.577, and the significance level is p = 0.000, which is less than 0.05. This confirms a significant impact. Hence, the null hypothesis (H_0) is rejected, and the alternative hypothesis (H_1) is accepted. Compliance-driven AI/NLP communication strengthens customer perceptions of security and transparency in banking.

Hypothesis 4

Table 32 Chi-Square Test for Differences in Perceptions of AI/NLP Strategies Across Demographic Groups

Value	df	Asymp. Sig.
Pearson Chi-Square	16.842	6
Likelihood Ratio	17.953	6
N of Valid Cases	150	

Interpretation:

The Chi-Square Test was applied to investigate differences in perceptions of AI/NLP banking marketing strategies across demographic groups (age, gender, education, income). With six degrees of freedom, the Pearson Chi-Square value is 16.842, and the significance value is p = 0.010, which is less than 0.05. This indicates statistically significant demographic variations. Therefore, the null hypothesis (H_0) is rejected, and the alternative hypothesis (H_1) is accepted, meaning perceptions of AI/NLP-based banking marketing strategies differ significantly across demographic groups.

7. CONCLUSION

The research indicates that AI and NLP technologies are crucial for enhancing compliance, personalization, and customer engagement in banking marketing. The findings demonstrate that AI-powered tools, including chatbots, virtual assistants, and recommendation engines, improve customer satisfaction, expedite communication, and strengthen relationships between banks and their clients. AI-based solutions are recognized for their effectiveness in providing customized communication and services that meet individual customer needs, thus positioning personalization as a crucial element in building customer trust and loyalty.

Furthermore, research indicates that compliance-focused AI communication enhances customer perceptions of banking security and transparency, thereby increasing trust in financial institutions. The findings indicated that various demographic groups held distinct opinions on AI/NLP banking strategies, suggesting that diverse customer segments require tailored approaches. The study confirmed that AI and NLP are influencing trust-building methods in the financial industry and altering banks' interactions with customers.

The study is limited by its reliance on self-reported survey data from 150 participants, which may introduce personal biases and reflect insufficient comprehension of AI technologies. The research focused on urban and semi-urban banking customers, potentially failing to represent the perspectives of rural populations or individuals with limited technical skills.

Future research should improve the comprehension of customer behavior by utilizing larger and more diverse samples from different regions. The evolution of perceptions regarding AI and NLP in banking will elucidate the progression of actions as informed by longitudinal research. Furthermore, to ensure that privatization and engagement uphold customer rights and trust, subsequent research should investigate the ethical dimensions of AI in banking, particularly concerning data privacy and algorithmic fairness.

CONFLICT OF INTERESTS

None.

ACKNOWLEDGMENTS

None.

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