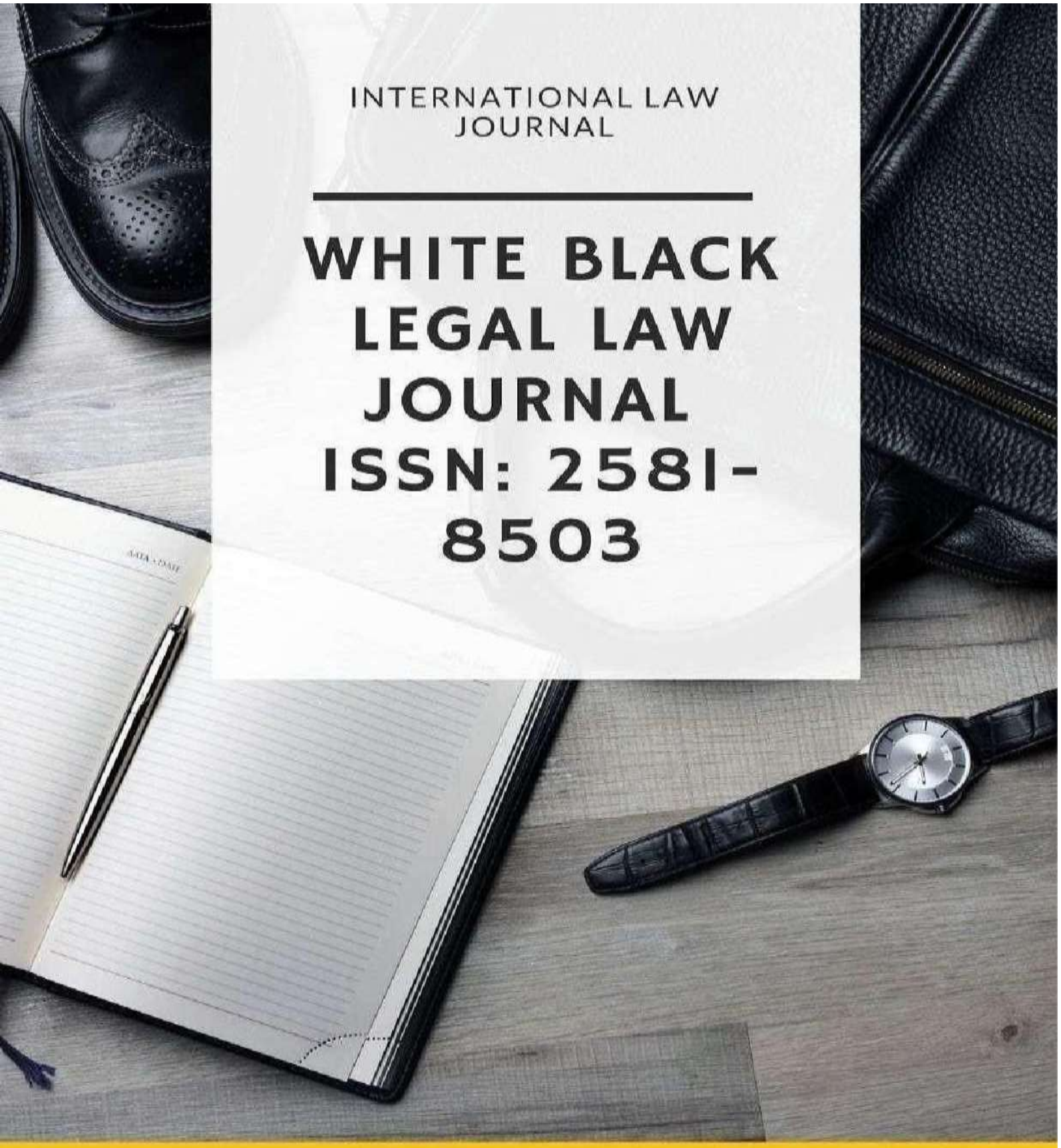

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ARTIFICIAL INTELLIGENCE IN BANKING INDUSTRIES OF NEPAL AND INDIA: COMPARATIVE STUDY OF STATUTORY REGULATION

AUTHORED BY - DR. RAMESH PARAJULI[1]

Abstract

The present paper evaluates the state of affairs and the regulatory environment for Artificial Intelligence (AI) adoption in the banking industries of Nepal and India. It aims to identify important opportunities, challenges, and areas of future development. AI is a tool to transform the world of banking by automating tasks, conducting fraud recognition in real-time, improving credit scoring with alternative data, and offering personalised services to customers. India stands out in the region as one of the nations that successfully used its stable digital infrastructure and the extensive fintech ecosystem, as well as supportive regulatory regimes by the Reserve Bank of India (RBI) to integrate AI on a large scale. On the other hand, the AI development in Nepal can be described as a young state with innovative and contextually specific applications that target infrastructural and socio-economic needs. Banks in Nepal, are deploying AI-powered chatbots, locally adaptable credit scores based on alternative rural data, as well as real-time anomaly detection on fraud across a rural and multilingual focus and with restrained digital infrastructure and regulators' maturity. The risks faced by both countries include algorithmic bias, data privacy risks, vulnerability to cyberattack, workforce discontinuity and uncertainty of regulation. The paper suggests integration of AI-targeted clauses into banking and financial policies, reduction of the digital divide, investment in human capital development, making AI applications more transparent and ethical, engaging in cross-border cooperation, and ensuring data sovereignty. Finally, AI can bring countervailing effects to balance operational efficiency, balance financial inclusion, and even inclusive economic development in South Asia when the technological change is accompanied by responsive governance and capacity building tailored to local needs.

Keywords: Artificial Intelligence, Banking Regulations, Digital Governance, Nepal, India

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1. Introduction

Artificial intelligence (AI) recently became widely acknowledged as a novel solution to the banking sector amid a worldwide surge and reforming the banking industry, restructuring the relationships between the banking institutions and their customers, as well as the processes of risk management.[2] Due to the ongoing development of AI technologies, including Machine Learning (ML), Natural Language Processing (NLP), predictive analytics, robotics, and others, these are being implemented to automate complicated procedures, detect fraud, evaluate credit performance, and personalise customer service. In such emerging economies as Nepal and India, AI applications in banking can provide a new horizon with possibilities to speed up the process of financial inclusion, reduce the service gaps, and improve the robustness and efficiency of financial systems.[3] The conventional banking rules were developed in a time when data-driven decision-making and self-guided algorithmic systems did not exist. Consequently, the policymakers of Nepal and India are facing considerable pressure to update the obsolete regulations used to implement and manage the extraordinary risks and opportunities that AI offers.[4] These are the issues related to data privacy and protection, the accountability and transparency of automated decisions, possible algorithmic discrimination, cybersecurity, and systemic risks that may appear as a result of the broad integration of technology.

One area where AI in Nepal is yet to kick off fully is in the banking sector. Bank and Financial institutions have started testing AI-powered applications of credit evaluation and anti-money-laundering, and chatbots, to handle customers. Yet, due to a lack of digital infrastructure, the human resources, and the absence of specialised guidance advice, such endeavours remain limited to trials.[5] In juxtaposition, India, with its strong digital programs and invigorated by the positive energy of its exalted fintech ecosystem, is more advanced in the process of employing AI in the banking sector, but continues to grapple with obstacles of regulatory convergence, data control, and consumer confidence.[6] Here, Artificial Intelligence (AI) is not just being

[2] Crisanto, J. C., Leuterio, C. B., Prenio, J., & Yong, J. (2024). *Regulating AI in the financial sector: Recentdevelopments and main challenges*. Bank for International Settlements, Financial Stability Institute.
[3] Polireddi, N. S. A. (2024). An effective role of artificial intelligence and machine learning in banking sector. *Measurement: Sensors*, *33*, 101135. https://doi.org/10.1016/j.measen.2024.101135
[4] Baffour Gyau, E., Appiah, M., Gyamfi, B. A., Achie, T., & Naeem, M. A. (2024). Transforming banking: Examining the role of AI technology innovation in boosting banks financial performance. *International Review of Financial Analysis*, *96*, 103700. https://doi.org/10.1016/j.irfa.2024.103700
[5] Sthapit, A., & Vaidya, R. (2025). Artificial intelligence and the transformation of the nepalese business environment. *Journal of Business and Social Sciences Research*, *10*(1). https://doi.org/10.3126/jbssr.v10i1.80327
[5]
[6] Bharati, R. (2024). Navigating the legal landscape of artificial intelligence: Emerging challenges and regulatory framework in india. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.4898536

upgraded in the technology level of the banking industry, but it is a strategic, organisational and cultural revolution. Consulting giants expect AI to bring an increase of 15.7 trillion to the global economy by 2030.[7] In the banking sector, McKinsey has projected that AI will bring annual benefits of 1 trillion through operational efficiency, risk management and personal customer experience in the industry.[8] Yet, business digitalisation comes in layers, so it is a necessity to upgrade IT infrastructure, introduce new customer-centred strategies, raise the talent potential within an organisation, and enhance cybersecurity.[9] This model of pillars, much referenced by experts, also illustrates why effective AI adoption in banking is not only about technology and how well it is built, but also how well it can be institutionalised and how its use can be made ready to be embraced by regulation.[10] Here, the stakes are high since banking plays the primary problematic role because it is the backbone of economic growth. Regulation should be done well to foster responsible innovation while preventing new risks.[11] Such dual imperative points out why banking regulation has to be rethought to keep pace with the rapid development of AI, and at the same time guarantee the fulfilment of the values of fairness, stability, and protection of the consumer.[12] In light of these developments, this paper is structured around several key objectives. This paper aims to provide a detailed analysis of the current state of AI adoption within the banking sectors of Nepal and India and to critically examine the core regulatory and legal challenges presented by AI integration in banking.[13] In addition, this paper intends to compare and contrast the approaches taken by Nepal and India in adapting their respective banking regulations to the advent of AI.[14] Furthermore, this aims to offer well-researched, evidence-based recommendations for policy reforms and regulatory innovation that balance the mandates of technological progress, competitive growth, and consumer protection.

[7] Bose, J. (2025). Artificial intelligence in financial services: Navigating legal frameworks in india and international jurisdictions. *LawArchive*. https://ideas.repec.org//p/osf/lawarc/2my9a_v1.html
[8] Ibid.
[9] Niroula, A., & Adhikari, S. (2024). Machine learning, banking, industry, digitalization, innovation. *American Journal of Finance and Business Management*, *3*(1), 62–72. https://doi.org/10.58425/ajfbm.v3i1.286
[10] Moharrak, M., & Mogaji, E. (2024). Generative AI in banking: Empirical insights on integration, challenges and opportunities in a regulated industry. *International Journal of Bank Marketing*, *43*(4), 871–896. https://doi.org/10.1108/IJBM-08-2024-0490
[11] Ibid.
[12] Polireddi (n 2)
[13] Truby, J., Brown, R., & Dahdal, A. (2020). Banking on AI: Mandating a proactive approach to AI regulation in the financial sector. *Law and Financial Markets Review*, *14*(2), 110–120. https://doi.org/10.1080/17521440.2020.1760454
[14] Ikhsan, R. B., Fernando, Y., Prabowo, H., Yuniarty, Gui, A., & Kuncoro, E. A. (2025). An empirical study on the use of artificial intelligence in the banking sector of Indonesia by extending the TAM model and the moderating effect of perceived trust. *Digital Business*, *5*(1), 100103. https://doi.org/10.1016/j.digbus.2024.100103

The paper is based on the Doctrinal of qualitative research method. Relevant literature was studied, including scholarly articles, industry white papers, regulatory reports, industry policy drafts, case examples, and high-quality websites about Nepal and India's adoption of Artificial Intelligence in their banking industries. Key themes, opportunities, challenges and regulatory frameworks of the two countries were synthesised using methods of comparative analysis. The use of secondary data enabled the paper to have a comprehensive overview of existing knowledge and to identify areas of knowledge gaps without the collection of primary data.

To ensure a precise and logical flow of the research, it has been divided into seven primary sections. The paper starts with an Introduction, where the importance of artificial intelligence in banking and the primary objectives are mentioned. A global context and definition are given in an overview of AI in banking. In Section 2 following two parts deal with AI Adoption in the Banking Sector of India and AI in the banking Sector of Nepal, and discuss the state of the art, its regulation, case studies and outlook. Then, a comparative analysis is carried out to reveal the comparisons and differences in adoption, challenges, regulatory frameworks, and effects in Nepal and India. In section 3, the crucial opportunities and constraints encountered in both countries are critically evaluated, the way forward have been combined. The section 6 assesses the role of AI on financial Inclusion in banking. The paper concludes with recommendations on the policy changes, regulatory innovation, and collaborative strategies going forward.

2. AI in Banking: An Overview

Artificial Intelligence (AI) in the banking sphere involves the implementation of such advanced tools as machine learning (ML), natural language processing (NLP), robotics process automation (RPA), and predictive analytics to streamline and automate banking activities.[15] AI does not rely on explicit programming like in conventional systems based on rules; it uses large data sets to produce insights regarding the patterns and then makes informed decisions, and then learn and develops capabilities based on the data.[16] Banking is one area where AI is used; automation of back-office duties, automated fraud detection, faster credit assessment, and personalised customer services via chatbots and virtual assistants.[17] The power to process big

[15] Noguer I Alonso, M., & Samara Chatzianastasiou, F. (2024). The case for artificial intelligence regulation in the financial industry. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.4831147
[16] The American College, Madurai, Sundareswaran, R., Justin Manohar, J., & The American College, Madurai. (2025). The role of artificial intelligence in transforming the banking sector in india. *International Conference on Artificial Intelligence in Commerce and Management*, 30–35. https://doi.org/10.34293/ICAICM-25.ch005
[17] Ibid.

data in real time has transformed how decisions are made and enabled financial institutions to enhance efficiency and bring down their operational costs, as well as address the need to provide a more customised banking experience.[18] Such versatility helps banks automate their credit scoring, quickly identify fraud, and scale individually adjustable interaction channels, making modern AI much more unique than prior AI-related sport innovations that relied on IT-first waves of innovation.[19] To give an example, credit scoring models can be AI-generated now, using proprietary data beyond standard financial statistics, like patterns of phone usage of users and social behaviour, increasing the accessibility of loan opportunities to underserved clients in particular.[20] Meanwhile, AI can also improve compliance monitoring as the technology can be used to automate the process of identifying money laundering and suspicious transactions, so that it can support banks in meeting more strict regulations.[21] In the banking industry, AI takes out back-office tasks effortlessly, improves fraud detection, offers a quick credit risk estimation, and personalises the services given to customers through chatbots, virtual assistants, etc.[22] This transition enables the banks to be more responsive and accurate in addressing the needs of customers and financial risks in the market, as banks transition their operations to be more data-driven with inclusivity.[23] In addition, the use of AI in banking has taken hold globally, with even Banks in remote geographical locations almost seeing the implementation of AI in at least one fundamental business operation, with even a higher percentage of banks using AI technologies in one or more core capabilities by early 2025, representing a fundamental shift in industries as opposed to experimental efforts.[24] It is estimated that investment in AI in the sector will be over 73 billion in 2025, a 17% increase over the last year, as the strategic importance of the integration of AI in the sector grows.[25] A study by Citigroup projects that the adoption of AI can potentially generate up to 2 trillion dollars in global bank revenue by 2028, equating to a 9% increment in industries through a combined reduction in operational costs and improvement of customer engagement, risk

[18] Guha, Dr. S., Savage-Mansary, B., & Samanta, D. N. (2023). The present and future of ai usage in the banking and financial decision-making processes within the developing indian economy. *Indian Journal of Law and Technology*, *18*(1). https://repository.nls.ac.in/ijlt/vol18/iss1/5
[19] Tian, X. (2024). The role of artificial intelligence in the digital transformation of commercial banks: Enhancing efficiency, customer experience, and risk management. *SHS Web of Conferences*, *208*, 01029. https://doi.org/10.1051/shsconf/202420801029
[20] Rodrigues, A. R. D., Ferreira, F. A. F., Teixeira, F. J. C. S. N., & Zopounidis, C. (2022). Artificial intelligence, digital transformation and cybersecurity in the banking sector: A multi-stakeholder cognition-driven framework. *Research in International Business and Finance*, *60*, 101616. https://doi.org/10.1016/j.ribaf.2022.101616
[21] Ibid.
[22] Ibid.
[23] Sthapit (n 4)
[24] Crisanto (n 1)
[25] Polireddi (n 2)

management, and product design.[26] Along with this, the most significant use of AI is to automate communications with customers through AI-driven chatbots that will respond to frequently asked questions and handle automated services.[27] Likewise, through predictive analytics models, alternative data, such as mobile phone use and social behaviour, are being used to determine creditworthiness, thus enabling the financially underserved to have access.[28] Meanwhile, one of the driving factors in AI adoption is the rapid digitalisation of human society that involves changes in human behaviour as more people embrace smooth digital interactions, like online banking and mobile applications. With the help of AI, these platforms can provide them with customised financial advice and predict their clients' needs, which will increase user retention and cross-selling capabilities.

Based on the comparative lessons learned in Turkey at the expense of the banking industry, where the rate of digital banking users rose by 368 % between 2017 and 2023, mainly owing to chatbot personalities induced by AI and video-call platforms, the same growth trajectories can be applied to South Asia, to Nepalese and Indian market players specifically.[29]Although AI is beneficial in many ways, there are still serious issues to be addressed. The leveraging of legacy IT infrastructures can be a major hitch towards implementing AI without much hitch, and we are seeing a growing concern about ethical issues like understanding how algorithms work, controlling bias, and the privacy of information.[30] One of the biggest obstacles experienced in the world today concerns regulatory uncertainty, which has made legislators find it difficult to craft a governance structure that embraces innovation and, at the same time, ensures the protection of consumers.[31] Nations such as Nepal are in the early stages of adopting AI due to the lack of digital infrastructure and workforce education. India is developing in AI-integration but struggles to harmonise regulatory policies and promote consumer trust with the guidance of strong fintech ecosystems, and regulation development efforts[32] by the Reserve

[26] Ibid.
[27] Dadhich, A. (2018). A critical view of laws and regulations of artificial intelligence in india and china. *Kathmandu School of Law Review*, 1–10. https://kslreview.org/index.php/kslr/article/view/202
[28] Go, E. J., Moon, J., & Kim, J. (2020). Analysis of the current and future of the artificial intelligence in financial industry with big data techniques. *GLOBAL BUSINESS FINANCE REVIEW*, *25*(1), 102–117. https://doi.org/10.17549/gbfr.2020.25.1.102
[29] Demirel, S., & Topcu, M. (2024). The impact of artificial intelligence applications on digital banking in turkish banking industry. *Advances in Human-Computer Interaction*, *2024*(1), 9921363. https://doi.org/10.1155/2024/9921363
[30] Ibid
[31] Fares, O. H., Butt, I., & Lee, S. H. M. (2023). Utilization of artificial intelligence in the banking sector: A systematic literature review. *Journal of Financial Services Marketing*, *28*(4), 835–852. https://doi.org/10.1057/s41264-022-00176-7
[32] Bharati (n 5)

Bank of India (RBI).

AI is reshaping the banking sector globally and regionally by automating processes, enhancing fraud detection, enabling inclusive credit assessment, and enriching customer engagement. Statistical projections, technology adoption trends, and case examples underline AI's role as a critical driver of banking innovation and competitive advantage.[33] However, maximising these gains demands overcoming regulatory, infrastructural, and ethical challenges to ensure secure, fair, and sustainable financial ecosystems worldwide.

3. AI Adoption in India's Banking Sector

A strong digital infrastructure and active fintech community have helped India become a leading country in Artificial Intelligence (AI) adoption across its banking sector.[34] Other commercial banks, including the HDFC, ICICI, Kotak Mahindra, Axis Bank, and SBI, have been more actively embracing AI in front, back, and middle-office processes to finance a shift toward less conventional people-oriented services to a significantly automated and AI-enhanced environment.[35] Illuminating AI-based uses are the high-level analytics, AI-powered chatbots, robotic process automation (RPA) and blockchain integration.[36] To understand that, one may consider the example of the AI chatbot Eva in HDFC Bank, which receives up to 3 million multilingual queries every day in conversations between the bank and its customers, thereby minimising human interaction and speeding up responses to queries.[37] Meanwhile, in credit risk measurement and fraud detection, AI likewise takes on a revolutionary position. In addition to the conventional financial information, the AI-enabled models of ICICI Bank consume alternative data sources, including mobile usage trends and social media mood oscillation, to increase loan disbursement rates and decrease the non-performing loans by approximately 15%. [38]To help prevent fraud, financial institutions use multi-level AI systems that synthesise behavioural analysis and real-time transaction analysis, limiting losses.[39] The

[33] Gyau (n 3)
[34] Prutha Arvind Jadhao, 'Legal Implications of Artificial Intelligence in the Indian Banking Sector - A Business Law Perspective' International Journal of Research Publication and Reviews, ISSN 2582-7421, www.ijrpr.com.
[35] Ibid.
[36] Bose (n 6)
[37] Jadhao (n 35)
[38] Karan Kumar, Nikita Kuhar and Manu Sharma, 'Artificial Intelligence in the Indian Banking System: A Systematic Literature Review' (November 15, 2024) Proceedings of the 3rd International Conference on Optimization Techniques in the Field of Engineering (ICOFE-2024), SSRN, available at https://ssrn.com/abstract=5088937 or http://dx.doi.org/10.2139/ssrn.5088937 accessed 12 August 2025.
[39] Ibid.

operational efficiencies also extend through automation of operations like report generation, asset-liability management, and transaction monitoring using AI—Anti-money laundering (AML) and suspect transactions by banks such as Kotak Mahindra.[40] A cross-sectional study conducted in January 2021 by Kotak Mahindra, on a sample of 358 customers in one of its cities, found that it reduced fraud losses by a quarter through the use of AI.[41] This is because the pandemic stimulated the pace of AI implementation; it compelled Indian banks to increase the use of 24/7 digital channels and virtual financial advice and set AI-enabled wealth management tools.[42] This growth situates AI as a strategic imperative rather than a mere technological upgrade, helping banks enhance customer personalisation, operational productivity, and competitive differentiation.

3.1 Regulatory Landscape and the Role of the Reserve Bank of India (RBI)

India has one of the most extensive regulatory backgrounds that support the growth of AI in the world, keeping the consumer rights and the integrity of the system intact. The RBI plays the leading role. Programs such as the 2019 FinTech Regulatory Sandbox present a limited environment in which banks and fintechs can conduct pilot AI-based products with regular supervision but less initial burden of compliance, thus encouraging fast adoption of deep innovation.[43] As part of its AI and Machine Learning (ML) Framework, RBI requires transparency, explainability and risk assessment of AI models. The banks have to keep audit trails and preserve cybersecurity resilience to counter AI-related threats such as adversarial attacks or data poisoning.[44] In addition to the RBI requirements, Indian laws like the Information Technology Act and the soon-to-be-launched Digital Personal Data Protection (DPDP) Act require severe measures on data privacy, consent, localisation, and data breach notification, which are needed to ensure compliance with AI systems that deal with large amounts of sensitive personal data.[45] Along with this, RBI's regulatory suite further includes Digital Lending Guidelines (2019), which focus on the transparency of AI-driven credit

[40] Vikram Kumar Sharma and Dr Saumya Singh, 'Determinants of AI Adoption in Banking Services in India: An Empirical Investigation' (2024) Journal of Informatics Education and Research, Vol 4 Issue 2, ISSN 1526-4726, available at http://jier.org accessed 12 August 2025.
[41] Suma S.R and Anupama S, 'Banking 4.0: Artificial Intelligence and its applications in Indian Commercial Banks' (December 2021) MDIM Business Review, vol II, issue II, pp 50-58, ISSN (Online) 2582-7774, available at https://www.mdim.ac.in/journal-issues accessed 12 August 2025.
[42] Jadhao (n 35)
[43] Anuradha Dwivedi and Khyati Kochhar, 'Employee's Attitude Towards Artificial Intelligence in the Indian Banking Sector' (2023) Intl Journal of Professional Business Review, vol 8, no 11, pp 1-13.
[44] Niroula (n 8)
[45] Sharma (n 42)

algorithms, consumer consent, disclosure, and grievance redressal mechanisms to safeguard borrowers in this digital lending business.[46] Similarly, the cybersecurity framework requires institutions to carry out thorough risk management of AI-induced cybersecurity in the form of incident response, continuous security evaluation, and observation.[47] In addition, the AI Governance and Ethics Advocacy promotes responsible AI principles that address bias, fairness, explainability, and accountability of customers in AI decisions. At last, the collaborative innovation enables bank-fintech hubs, academia, and government partnerships to develop AISure talent, research, and innovation diffusion.

For instance, HDFC Bank's Eva Chatbot uses advanced Natural Language Processing (NLP) to support various languages, including local dialects, and has cut query turnaround time by 80% and operational expenses by substantial proportions.[48] The ICICI Bank Credit Risk Models were artificial intelligence-driven credit-worthiness evaluations, leveraging different sets of information, including higher loan advances to MSMEs and reduced NPL percentages.[49] Kotak Mahindra's AML monitoring, which uses AI-powered systems to interpret millions of daily transactions, has reduced fraud by 25% since 2021.[50] Similarly, the RBI FinTech Innovation Hub advocates for the piloting of applying AI to customer onboarding processes, using biometric authentication and AI-driven credit scoring, enhancing the customer experience and reducing lag time.[51] According to statistical results, there is a positive relationship between innovation in AI and the profitability of banks in India. The increased patent activity in AI indicates the level of measurable returns in AI investments, driven by an increase in Return on Assets (ROA). Between now and 2025, automation and risk optimisation AI has been estimated to bring cost savings of approximately 20 % to Indian bank operations.[52] Artificial intelligence-powered financial inclusion operations[53], especially in poor and rural areas, use alternative data to facilitate credit assessments and the launch of digital lending businesses, and to promote financial stability.

[46] Digital Lending Guidelines, 2019
[47] Amrit Raj and Ashna Puri, 'ADOPTION OF ARTIFICIAL INTELLIGENCE IN INDIAN BANKING INDUSTRY' (2024) 10 Innovative Research Thoughts 42 <https://irt.shodhsagar.com/index.php/j/article/view/1526> accessed 12 August 2025
[48] Guha (n 17)
[49] Ibid.
[50] Polireddi, N. S. A. (2024). An effective role of artificial intelligence and machine learning in banking sector. *Measurement: Sensors*, *33*, 101135. https://doi.org/10.1016/j.measen.2024.101135
[51] S.R (n 43)
[52] Gyau (n 3)
[53] Jadhao (n 35)

Cross-national research confirms that a one percentage point increase in AI patenting activity results in a 0.0009 gain in banking ROA, and this is constrained by ICT infrastructure, regulatory capital, and economic growth. Nevertheless, being over-regulated or too limiting can strangle the benefits of AI[54], and this implies that some degree of innovation-friendly governance is required.

3.2 Research Gaps and Stakeholders & Future Directions

Although there are encouraging patterns of adoption, there are still impediments. Skills shortages, cultural resistance, and legacy IT systems are setbacks to operations. Laws are not clear, and there is a fear of privacy, so adoption is hampered, and the customer base is sluggish. Social pressure and personal norms have a significant impact on the dynamics of AI acceptance among Indian users, and younger, well-educated, and higher-income users display greater openness, fairness, transparency, explainability, and human supervision. Ethical governance, namely all of the above, continues to be a policy requirement. Such absence of precise AI-related legislation poses some dilemma in terms of accountability and enforcement, which underscores the overwhelming necessity of statutory frameworks.[55] Also, the fast adoption of AI is a new form of cybersecurity risk that should be actively monitored and covered by legal protections.[56] As a result, the spread of AI is correlated with such government-wide programs as Digital India and India AI Mission (2024), with more than 1.3 billion invested to advance national AI potential.[57] The players in the industry suggest a refined regulatory framework that involves self-regulation in the overall uses of AI and binding legal rules over more risky domains of AI.[58] The perception of Indian banks towards using AI is shifting towards a mighty pillar of competition differentiation, efficient operations, and innovation that focuses on customer desires. The tendency towards the AI-driven banking model will also focus on upskilling employees on high-value activities, integrating advanced data visualisation, and maintaining joint R&D cultures.

[54] Gyau (n 3)
[55] Guha (n 17)
[56] Ibid.
[57] Kumar, K., Kuhar, N., & Sharma, M. (2025a). Artificial intelligence in the indian banking system: A systematic literature review. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.5088937
[58] Mohanty A and Sahu S, 'India's Advance on AI Regulation' (*Carnegie Endowment for International Peace*, 2024) <https://carnegieendowment.org/research/2024/11/indias-advance-on-ai-regulation?lang=en> accessed 12 August 2025

4. AI in Nepal's Banking Sector

Nepal's formal banking system began with the establishment of Nepal Bank Limited (NBL) in the year 1994 B.S (1937 A.D), a major milestone in the history of Nepal to be officially entering into the financial system.[59] From 1980s onwards, private and joint- venture banks entered broadening competition. Previously, the sector was not immune to various political conflict and instability, though it gradually liberalized.

For more than a decade, banking was cash driven. People waited in the queues for even smallest transactions. The introduction of ATMs, credit cards, and internet banking in the 1990s began to reshape the habits of customer. The cash dependency was gradually replaced by plastic money and digital services, especially in the urban areas. Nevertheless, most financial processes were still conducted manually. The record-keeping and loan approvals were primarily manual, the fraud **detection** was merely reactionary, and access to financial services in rural areas still remained limited. This hybrid stage laid the groundwork for the later introduction of AI-driven systems.[60] Meanwhile, the use of Artificial Intelligence (AI) in Nepal banking sector remains an upcoming trend, yet it is progressively gaining traction. The most obvious use of AI can be seen in fraud detection, risk assessment, and customer service, particularly in automated systems.[61] The first of these was a fully cashless branch opened in July 2016 by Nepal SBI Bank at Durbarmarg, together with Pari.[62] This humanoid robot combines AI and a robot body developed by Paaila Technology, which was founded in December 2016.[63] Since then, several banks and fintech start-ups, including eSewa (eVA chatbot), Nabil Bank, Global IME Bank, and Nepal Investment Bank, have unveiled these tools with AI enablers.[64] Government efforts to grow AI have only recently started lagging, after decades of innovation in the private sector spearheaded by firms such as Paaila Technology and Fusemachines Nepal.[65] Businesses that use speech recognition and automation competencies present a potential to use voice-based banking services in rural settings,

[59] Nepal Bank Limited, *About Us* (Nepal Bank Limited) https://www.nepalbank.com.np/ accessed 20 August 2025
[60] Nepal Economic Forum, 'Fintech Revolution in Nepal: Advancing toward Inclusive Finance' (NEF, 2020) https://nepaleconomicforum.org/fintech-revolution-in-nepal-advancing-toward-inclusive-finance/ accessed 20 August 2025.
[61] Sthapit (n 4)
[62] 'The Future of AI in Banking: Opportunities for Nepal's Financial Sector - Our Blogs' (*f1soft Group*) <https://f1soft.com/blogs/future-of-ai-in-banking-opportunities-nepal-financial-sector> accessed 12 August 2025
[63] Ibid.
[64] Ibid.
[65] Bhusal TP, 'The Use of Artificial Intelligence and Machine Learning in the Nepalese Financial Sector' (*NeBEU*, 12 January 2025) <https://nebeu.org.np/use-of-artificial-intelligence-and-machine-learning-in-nepalese-financial-sector/> accessed 12 August 2025

increasing access to Nepal, with its diverse linguistic community.

In the current context of Nepal, Nabil Bank AI Chatbot is used by Nabil Bank Limited to simplify frequently asked banking questions. It is available in many languages, which reduces operational workload and enhances customer responsiveness.[66] Another example is the AI Credit Scoring Pilot of Agricultural Development Bank, where AI-powered credit scoring leverages rural data not traditionally used in risk analysis to increase financial inclusion.[67] A similar instance is Nepal Investment Bank's Fraud Detection Model, which, in real-time, features anomaly detection that protects transactions and assists in compliance.[68] Himalayan Bank HR & Digital Onboarding utilises AI-based recruitment and Onboarding to ensure operations continue in the event of a crisis.[69] Along with this, the role of AI in the banking sector of Nepal will grow in the next decade. They are anticipated to undergo the following developments.

Humans and AI co-work, with AI performing routine tasks and humans making complex decisions. This collaboration provides High-level conversational banking using voice interfaces and multi-lingual, embedding credit, market, and operational risk predictive analytics. In addition, it will result in more rural penetration through the support of mobile-first, AI-enabled bank services and regulatory maturity, where there is greater clarity in norms of ethical AI, cyber security, and data governance. If infrastructure gaps, regulatory clarity, and data quality challenges are addressed, Nepal could emerge as a regional leader in AI-powered financial services, combining operational convenience with broader financial inclusion.

4.1 Applications and Policy Regulation

There are multiple domains of its business and strategy in which Nepalese banks can implement AI. For instance, the automation of customer services includes NLP programs (e.g., chatbots like the AI chatbot of Nabil Bank), which will offer multi-lingual support and reduce traffic in the branches, as well as reduce operational costs.[70] Similarly, the AI pilot of the Agricultural Development Bank leverages alternative data sources such as mobile purchases and

[66] Ibid.
[67] Niroula (n 8)
[68] Ibid.
[69] Ibid.
[70] Gautam J, 'Non-Performing Loans of Commercial Banks: How AI Can Revolutionise Their Management' (*The Himalayan Times*, 11 March 2025) <https://thehimalayantimes.com/opinion/non-performing-loans-of-commercial-banks-how-ai-can-revolutionise-their-management> accessed 12 August 2025

agricultural input purchases to expand rural access to credit and create balanced risk management.[71] The anomaly detection system that Nepal Investment Bank uses can detect fraudulent transactions within seconds, stopping financial crime and facilitating regulatory compliance.[72] Likewise, Himalayan Bank uses AI to hire remotely and onboard new employees and is more resilient to disturbances caused by the COVID-19 pandemic.

In addition, AI can handle the back office functions, including data entry, compliance checks, and loan processing, thereby minimising human error and shortening turnaround times.[73] Predictive analytics assists in predicting loan default, anomaly identification, and risk assessment of the investment.[74] Moreover, AI enables automation of the Know Your Customer (KYC) and Anti-Money Laundering (AML) verification procedures.[75] Furthermore, an AI-enhanced mobile solution can overcome the problem of geographical isolation, which is a major limiting factor in reaching out to rural villages and remote locations, especially when speaking the local language.[76] Here, the National AI Policy Draft 2081 identifies banking and finance as one of the major areas where AI is to be deployed, and its areas of concern will be fraud detection, streamlining efficiency, and compliance with ethical standards.[77] Nepal Rastra Bank (NRB) is leading a thrust into AI policy Draft 2081 concerns in banking with research studies, pilot projects and representing itself in the envisioned AI Regulatory Council.[78] In the key policy directions, there is setting up an AI research fund to develop fintech, inventing an AI Ethics Framework to ascertain fairness in lending and prevent bias, making investments in 5G and cloud solution infrastructure to analyse AI in real-time, and incentivising the development of AI models locally to lower reliance on foreign models and and putting up skills development programs to transfer employees to AI-era roles at banks.

4.2 Opportunities and Challenges

The continuous development brings great opportunities to Nepal in the context of banking using AI, such as cost savings and increased efficiency by automating repetitive procedures and using AI-driven personalisation/profiling of customers to provide personalised banking

[71] Niroula (n 8)
[72] TP (n 65)
[73] Ibid.
[74] Ibid.
[75] Sthapit (n 4)
[76] Ibid.
[77] National AI Policy Draft, 2081
[78] Ibid.

services, in line with fintech trends across the world. An AI-based mechanism has better control of fraud and cybersecurity, which reduces digital transaction risks, and an increase in the market through AI-enabled services to reach those in the rural and low-literacy sectors. Similarly, Foreign direct investment and public-private Partnerships promoted by the AI policy Draft of Nepal. The GDP of AI century economies in all countries around the world is predicted to improve by a maximum of 14 % by the 2030s, and this is something Nepal can strive for in its development.[79] Furthermore, connecting banks and government ID systems may simplify KYC, social welfare payments and virtual trust.

There is still a long way to go, even though significant improvements have been made. For instance, Low-speed internet and a lack of digital infrastructure hurt rural areas, and a shortage of skills of AI engineers and banking technologists is also an obstacle to scaling. In the current context, the Electronic Transactions Act 2063 and Banking and Financial Institution Act 2073 lack relevant AI-specific privacy, data security, or algorithmic accountability[80] Nepal does not have banking-specific AI security practices to prevent AI-based cyberattacks.[81] The lack of good quality, standardised data reduces the accuracy of model performance in credit scoring and fraud detection. There is a risk of depending on AI platforms of other tech giants, particularly in sensitive areas such as financial data, where the sovereignty of the data is still a problem. Likewise, AI in the banking sector has the potential to increase the financial inclusion barrier unless effort is made to curb it. There is a risk of job loss due to automation, where there were insufficient reskilling plans for the workforce.

5. Comparative Analysis of Nepal and India in AI Adoption in Banking

5.1 Market Readiness and Strategic Foundations

The banking environments in terms of AI application in India and Nepal are in significantly different phases of the journey. India has a strong digital infrastructure, high broadband penetration close to 100%, and a digital identity system across the country through Aadhaar

[79] Mahat D, Neupane D and Shrestha SK, 'A Critical Examination of Nepal's National AI Policy 2081(2025): SWOT Analysis and Strategic Recommendations for Sustainable AI Integration' (2025) 8 Nepal Journal of Multidisciplinary Research 71 <https://www.nepjol.info/index.php/njmr/article/view/76481> accessed 12 August 2025

[80] Srijana Khadka, Bharat Rai and Ajaya K Khadka, 'AI-Driven Customization in Financial Services: Implications for Social Innovation in Nepal' (December 2023) NCC Journal 8(1):1-11, available at https://www.researchgate.net/journal/NCC-Journal-2505-0788 accessed 12 August 2025.

[81] TP (n 65)

that can effectively synergise with the bank operations.[82] The existence of state-sponsored initiatives to promote AI use, such as numAIForAll and the specific skill-building campaigns (e.g., TIDE 2.0), has also boosted AI penetration, with about 90 % of the top Indian banks currently running at least one board-level AI activity.[83] The Indian banking industry is investing in AI differently each year (more than 40%), as cloud-based IT infrastructure, extensive talent base in deep technologies, and a well-established startup ecosystem have made Bengaluru and Hyderabad cities prominent waystations on the path to becoming India's AI.[84] Conversely, the use of AI in Nepal is at the latest stage, where access to broadband, especially in rural and mountainous areas, a lack of digital literacy, and a shortage of AI experts have limited its implementation.[85] The readiness of the Nepal banking industry in terms of AI is lacking, and the handful of actual services that are AI-empowered are majorly imports with negligible localisation, causing costs and data sovereignty issues. This is coupled with a lack of a holistic national law on AI, as India has platform-based regulations which are structured across borders, hence hindering ecosystem development.

One can situate India and Nepal's banking AI trajectories by looking at the leaders worldwide. For instance, in the US, JPMorgan Chase and Bank of America have transitioned AI from pilot to enterprise, with AI-driven fraud detection saving billions annually and virtual assistants like Erica serving over 1.5 billion customer interactions.[86] China, however, is the most ambitious AI-driven banking ecosystem, with Ant Group and Tencent integrating AI into payments, microcredit, and wealth management at a scale reaching hundreds of millions of consumers each day, backed by vast data availability and state sponsorship.[87] On the other hand, The European Union has followed a different path by prioritizing governance, with the proposed EU AI Act requiring explainability, bias testing, and stringent risk classification of AI systems

[82] Kumar, K., Kuhar, N., & Sharma, M. (2025a). Artificial intelligence in the indian banking system: A systematic literature review. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.5088937

[83] Deshpande, A. (2024). Regulatory compliance and ai: Navigating the legal and regulatory challenges of ai in finance. *2024 International Conference on Knowledge Engineering and Communication Systems (ICKECS)*, 1–5. https://doi.org/10.1109/ICKECS61492.2024.10616752

[84] Guha (n 17) https://figshare.le.ac.uk/articles/journal_contribution/The_Present_and_Future_of_AI_Usage_in_the_Banking_and_Financial_Decision-Making_Processes_within_the_Developing_Indian_Economy/24297595/2

[85] Sthapit (n 4)

[86] Bank of America, 'Erica Surpasses 1.5 Billion Interactions' (Press Release, 11 January 2023) https://newsroom.bankofamerica.com/content/newsroom/press-releases/2023/01/erica-surpasses-1-5-billion-interactions.html accessed 22 August 2025; JPMorgan Chase, 'AI and Machine Learning in Banking' (Annual Report 2022) https://www.jpmorganchase.com accessed 22 August 2025.

[87] Ant Group, 'Technology for Inclusive Finance' (Ant Annual Report 2022) https://www.antgroup.com/en/reports accessed 22 August 2025; Tencent Research Institute, 'AI in Financial Services' (White Paper, 2021) https://www.tencent.com/en-us/research accessed 22 August 2025.

deployed in financial services.[88] These three models of US pragmatism and scale, Chinese ecosystem-led expansion, and EU regulation-first caution are useful benchmarks. In comparison, India's AI banking ecosystem is more of a hybrid: ecosystem-driven like China but with the regulation in check, similar to Europe, and Nepal is more akin to early-stage adopters in smaller emerging markets, where experimentation and financial inclusion goals take precedence over systemic integration.

5.2 AI Implementations in Banking Sector

India is the leader in scaling AI applications in the areas of customer interaction, risk evaluation, and fraud prevention. HDFC Bank can handle more than 3 million requests per day through Eva chatbot, available in many different languages.[89] In contrast, ICICI Bank deploys AI-based credit scoring models to provide credit to micro, small, and medium enterprises (MSMEs) using both traditional and alternative data.[90] Fraud losses have been cut by up to 25 % among top banks by using machine-learning-driven anomaly detection. Robo-advisors are becoming commonplace by providing personalised financial planning.[91] Here, in Nepal, chatbots at Nabil Bank and real-time solutions to detect fraud at Nepal Investment Bank mostly revolve around the automation of routine requests and the warning approach to transactions that may come under scrutiny.[92] Here, the AI-enabled microcredit scoring system in the Agricultural Development Bank of Nepal, which adds the history of mobile transactions and the purchase of agricultural inputs, notably enhanced the ability of marginalised smallholder farmers to access financial services. Nevertheless, India, especially, has high technological lending platforms that serve tens of millions of users, unlike Nepal, which has a much smaller customer base that cannot match the network effects or scaling advantages.

Regarding regulatory and ethical frameworks, AI banking tools in India have more defined regulations within the legal framework directed through the Reserve Bank of India (RBI) guidelines and data protection laws (it will soon be reinforced with the Digital Personal Data

[88] European Commission, 'Proposal for a Regulation Laying Down Harmonised Rules on Artificial Intelligence (Artificial Intelligence Act)' COM (2021) 206 final; European Banking Authority, 'Report on Big Data and Advanced Analytics' (EBA Report, 2020) https://www.eba.europa.eu accessed 22 August 2025.
[89] Mohanty A (n 60)
[90] Kumar, K. (n 59)
[91] Dr Maneesha Kaushik and Mahima Sharma, 'A Study on Artificial Intelligence (AI) in Banking Services' International Journal for Multidisciplinary Research (IJFMR) E-ISSN: 2582-2160.
[92] TP (n 65)

Protection Act, 2023).[93] Policy-wise, however, Nepal lags, as its National AI Policy Draft 2081 has not been elevated to binding regulation standards to date--leaving some ambiguity to answer the question of who should be held to account regarding algorithmic decision-making and data sharing across borders.

In other words, it has been found that there is a positive relationship between an increase in AI patenting in banking and the increase in return on assets (ROA) (3.2 %, with 3 % being the most prominent effect in big Indian banks).[94] Automation of the process has reduced operational expenses to less than 10% of all operational costs. It has reduced the number of days required to release a loan to just a few minutes. The process has also made it possible to have 24-hour services with minimal marginal costs.[95] Although Nepal has not yet reached these efficiency rates, with banks being far below the trend, it has seen a 30% increase in throughput and shown that chatbots have dramatically reduced the number of manual queries being processed.[96] The future of productivity is visible, with risks including the lack of infrastructure, regulatory uncertainty, and a low level of interest in data analytics.[97] Both nations have to contend with the problem of declining marginal returns on AI innovation investment.

However, the inflexion point is reached later in India, given the larger and more diversified AI ecosystem in that country. Under the laws, India has more defined architectures of risk assignments to AI-based failures. In contrast, Nepal banking acts (e.g., the Electronic Transactions Act 2063 and Banking and Financial Institution Act 2073) do not mention a special responsibility to AI-related failures, the need to control biases in the algorithm, or explainability requirements, which again may impede its use and decrease the trustworthiness of the sector.[98] These factors include integration of policy, infrastructural preparedness, as well as cross-sector cooperation, all of which India enjoys in banking AI and which Nepal lacks. Nonetheless, Nepal still holds on to its first-mover status in experimentation in rural financial

[93] Priya Rao, Nidhi Srivastava and Andrés Fernando Mejía-Amaya, 'Effect of Artificial Intelligence on the Financial Performance of Indian Banking Sector'.
[94] Chandrima Bhattacharya and Dr Manish Sinha, 'The Role of Artificial Intelligence in Banking for Leveraging Customer Experience' (2022) 16(5) AABFJ 89.
[95] Sindhu J and Namratha R, 'Impact of Artificial Intelligence in Chosen Indian Commercial Bank-A Cost Benefit Analysis' (2019) 10 Asian Journal of Management 377 <http://www.indianjournals.com/ijor.aspx?target=ijor:ajm&volume=10&issue=4&article=015> accessed 12 August 2025
[96] 'The Future of AI in Banking: Opportunities for Nepal's Financial Sector - Our Blogs' (*f1soft Group*) <https://f1soft.com/blogs/future-of-ai-in-banking-opportunities-nepal-financial-sector> accessed 12 August 2025
[97] Ibid.
[98] Niroula (n 8)

inclusion, and the microcredit scoring pilot provides an expandable model to AI-catapulted inclusive finance. Devoid of legal protection in data privacy, equality in credit lending, and accountability of the AI systems, the two countries are potentially facing reputational and financial damage through algorithmic bias/ discrimination, data thefts, and algorithmic failures, with Nepal more exposed to ineffective governance.

An equitable, forward-looking Nepal plan ought to entail the regulation at the legislative level in the field of AI morality, responsibility, and data dominance and locally-developed AI models so as not to be dependent on foreign platforms. Similarly, Nepal should focus on the expansion of broadband in rural areas to decrease the urban-rural adoption gap and reward industry-academic partnerships that would develop talent pipelines. If such reforms are implemented, Nepal could follow India's path and adopt an inclusion-driven and context-specific AI banking system.

5.3 Regulatory Landscape and Governance Challenges

The level of India's AI regulatory framework in banking is much more competent, specific to sectors, and enforceable than that of Nepal. Reserve Bank of India (RBI) has come up with an Artificial Intelligence and Machine Learning Framework of Banks, which requires the explainability of risk assessment, frequent bias testing, and audit independence of algorithms.[99] The use of complementary tools like FinTech Regulatory Sandbox, where experiments can be controlled, is available, and specific regulations on data security, consent, and transfer across borders are provided in the Digital Personal Data Protection Act, 2023.[100] New schemes under the Digital India Act and the proposed Artificial Intelligence and Data Authority of India (AIDAI) plan to formalise accountability between developers, users, and regulators and place India on par with global best practice when it comes to AI governance.[101] The risk of overregulation, which might affect the pace of innovation, is the only systemic issue arising from the stakeholders in the industry.

In comparison, the regulatory framework of Nepal is in its infancy. The National AI Policy

[99] Kumar Singh A and Kasliwal S, 'How Artificial Intelligence Is Strategically Evolving the Customers Relationships: In Context to Indian Banking Sector' (2025) 14 Journal of Neonatal Surgery 236 <https://jneonatalsurg.com/index.php/jns/article/view/2340> accessed 12 August 2025

[100] Prisha Jain, 'Research Paper on Impact of Artificial Intelligence on Banking Sector' (27 January 2024) SSRN https://ssrn.com/abstract=4907776 accessed 12 August 2025

[101] Priti Kumari, 'Artificial Intelligence (AI) And Its Application On Banking Sector In India' International Journal of Novel Research and Development (IJNRD).

Draft 2081 (2024/25) indicates a political desire for digitalization, yet does not provide binding, sector-specific compliance requirements for the use of AI in banking sector.[102] Nepal has also taken a facilitative and not prescriptive approach with the launching of pilot projects and gradual integration of algorithms in the Nepal Rastra Bank (NRB), but without any binding regulation on the transparency of algorithms, data security, or mitigation of biases.[103] It is one of the policies that leads to legal uncertainty in liability in AI-powered decision-making in lending, consumer rights in automated banking, and jurisdiction over foreign providers of AI services. The two regulatory bodies are no different in terms of the structural conflict between innovation and consumer protection, algorithmic discrimination, and dynamic systemic risks.[104] Nevertheless, India has increased the pace of international harmonisation, using the multi-level and risk-based approach adopted by the European AI Act and transferring the world's best practices into national law.[105] Although Nepal is affected by such global frameworks, it has not yet been able to operationalize these into enforceable norms.

Here, in regards to managing AI in banking in an ethical manner means striking a balance between efficiency, fairness/privacy/and accountability, which is compounded by the magnitude and complexity of the Indian banking system.[106] The legal risks associated with massive information handled by Indian banks are especially the risks of privacy breach, biased decision-making, and opaque black-boxes models, the latter of which is also why the RBI sets requirements of explanability and auditability.[107] However, a shortage of talent remains, particularly in specialised areas such as AI ethicists, compliance auditors, and advanced data scientists, despite India having offered substantial upskilling initiatives in fintech and banking.[108] Nepal is in a sharper human capital constraint as the workforce reskilling rate is not at the pace with other similar economies, and the number of bankers who are proficient in AI is low, particularly within non-urban centres.[109] This problem is exacerbated by the urban-rural digital divide that restricts the expansion of AI-enabled services and deepens financial

[102] Mahat D (n 75)
[103] Ibid.
[104] Karki S and Karki RB, 'Implicit AI Adoption: Descriptive Insights into How Nepalese Use AI without Awareness' (2025) <https://www.ssrn.com/abstract=5159486> accessed 12 August 2025; Chandrima Bhattacharya and Dr Manish Sinha, 'The Role of Artificial Intelligence in Banking for Leveraging Customer Experience' (2022) 16(5) AABFJ 89.
[105] Dwivedi (n 45) 1-13.
[106] Jadhao (n 35)
[107] Ibid.
[108] Sharma (n 42)
[109] TP (n 65)

exclusion.

In the case of both nations, the question of ethical adoption of AI depends on reskilling and data literacy programs at all levels of the banking industry, the development of sustainable cultures of continuous innovation that are based on responsible adoption of technology, and insurance against algorithmic bias (including in marginalised groups being allocated credit). Both countries are at risk of becoming overdependent on imported AI models and foreign-based talent by failing to invest in domestic talent pipelines, which increases the risks of sovereignty and compliance.

5.4 Used Cases, Innovations, and Risks: Comparative Analysis

Financial sector applications of scalable AI have been demonstrated in India. The Eva chatbot integrated into HDFC Bank also serves more than three million queries per day in multiple languages, increasing customer engagement on a large scale. In a parallel manner, ICICI and Axis Bank have implemented a real-time artificial intelligence credit scoring and loan adjudication platform. In contrast, Kotak Mahindra implements superior anomaly detector applications that reduce its losses due to fraud to a sizable extent. Regulatory sandboxes enable fostering innovation within a controlled environment, which enables agile experimentation by fintechs. These technologies have an enormous potential, and the anti-smartphone, multi-channel, multilingual AI platforms operate to serve more than 400 million customers in the country.

Nepal: AI in the financial field is more situation-related and financial inclusion-oriented. Solutions such as microinsurance and microcredit are also available specifically for use in rural areas, including alternative data-based credit scoring by the Agricultural Development Bank. During the pandemic, remote verification and onboarding processes were introduced to ensure uninterrupted service delivery. Products and services are tailored in such a way that there is heavy emphasis on the smallholder farmers and underserved populations. Nonetheless, the majority of innovations in Nepal are at a pilot level, given the infrastructural constraints and absence of above-board regulations, limiting the extensive effect and scale.

The risks with AI in the sphere of finance are also comparable in both countries. Those consist of black-box decision-making that lacks sufficient explainability, algorithmic bias in credit assignment, which exposes the vulnerable groups to its brunt, issues in data security in the

context of an evolving global privacy regulatory landscape and the threat of job displacement without proportional workforce transitioning programs. India primarily handles these challenges through codified regulations and practices of implementation, whereas Nepal places a greater emphasis on policy rather than codified compliance requirements. This gives rise to an increased exposure to the systemic and reputation risks within the Nepal setting.

6. AI Adoption in Banking Sector in Nepal and India: Prospects and Constraints

6.1 Prospects in AI Adoption

Artificial Intelligence (AI) has been integrated with the banking sectors of Nepal and India, and, notwithstanding the disparity of the starting point and the level of functioning, its effect is genuinely transformative. The advanced digital environment and the large fintech market that has developed in India are an ample field of AI-driven innovation.[110] With these innovations, providing financial inclusion is improved in terms of access, loan processing time is faster, and fraud is detected almost in real-time, collectively serving to protect billions of dollars through a sophisticated multilateral financial system.[111] Most importantly, India has developed the entire regulatory environment that includes regulatory sandboxes, AI/ML Regulatory regimes and stringent data protection laws. This design model achieves the best of both worlds, that is, innovation in an ecosystem that is transparent, auditable, and fair, and thus safe to implement AI.[112] Moreover, the ongoing development of professional AI workers can be supported by the idea of new programs like the TIDE 2.0 talent incubation program, which is an essential element of continuing the swift industry growth.[113] Conversely, the situation in Nepal is still at an early stage of utilizing AI, but the technology is used to solve developmental problems. Even with the lack of resources, major banks such as Nabil Bank have still managed to enhance customer service efficiency by reporting 70% decreases in manual query processing through the AI chatbots, as well as ramped up security through AI-based predictive analytics.[114] It is important to note that Nepalese banks have gone an extra mile to offer their financial services to the rural population and have adapted the use of alternative sources of information, like their mobile usage, the input they can take on agriculture, as well as the weather patterns, into their

[110] Mohanty A (n 60)
[111] Crisanto (n 1)
[112] Fares (n 32) *28*(4), 835–852.
[113] Guha (n 17)
[114] 'The Future of AI in Banking: Opportunities for Nepal's Financial Sector - Our Blogs' (*f1soft Group*) <https://f1soft.com/blogs/future-of-ai-in-banking-opportunities-nepal-financial-sector> accessed 12 August 2025

credit risk models.

This context-specific innovation is reflected in the use of a microcredit scoring system in the Agricultural Development Bank, which contributed to the inclusion of underprivileged smallholder farmers.[115] In a positive regulatory attitude, which is reflected in the newly enacted National AI Policy Draft 2081, the Nepal Rastra Bank has been moving towards a new direction of focusing on the digital transformation, financial inclusion and maintaining operational resilience.[116] This is more so given the violations caused by COVID-19, which has resulted in disruptions and continued uncertainties about health risks.

India and Nepal will both benefit due to AI allowing them to automate default banking tasks, resulting in significant savings in operational costs, with India estimating up to 20% by 2025 and Nepali banks already seeing 30% increases in efficiency due to early adoption efforts.[117] Besides, AI allows achieving better customer experiences tailored to each customer and accessible 24/7, staying on top of compliance with regulatory regulations, and risk mitigation, eliminating non-performing loans and fraudulent payments.[118] Finally, the effect of AI goes beyond profit maximization. It provides one avenue to increased sectorial stabilization, financial inclusion and adaptive transformations that will see the banking sector in both India and Nepal, strong and flexible to proactively address the changing factors in both economic and social environments.

6.2 Constraints in AI Integration: A Comparative Perspective

Although it seems that the opportunities offered by AI are encouraging, the problems that Nepal and India encounter cannot be reduced to the straightforward, smooth integration of AI into banking in both countries. The most marked task in Nepal is the infrastructure shortages. Low broadband coverage and digital literacy distribution, particularly in geographically and socioeconomically diverse rural locations, limit the widespread use of AI-based services. The dire ethical talent deficiency, encompassing talented AI professionals and data scientists, significantly limits the execution, and disproportionately, in smaller banks.[119] Even though the

[115] Khadka (n 76)
[116] National AI Policy Draft, 2081
[117] Sharma (n 42)
[118] Moharrak (n 9)
[119] 'The Future of AI in Banking: Opportunities for Nepal's Financial Sector - Our Blogs' (*f1soft Group*) <https://f1soft.com/blogs/future-of-ai-in-banking-opportunities-nepal-financial-sector> accessed 12 August 2025

National AI Policy Draft 2081 establishes strategic directions, there is a relative lack of binding rules that might focus on data protection, the transparency of algorithms and the right to use AI ethically, and increase the risks of verifiability and consumer rights.[120] Also, a human-based monitoring dependence, garnered by black-box AI systems, and oversights in the cybersecurity measures increase vulnerability. The ongoing disparity between the urban and rural digitalization and the absence of an organized reskilling of the workforce pose a risk of increasing disparities and jeopardizing the inclusive development of AI spread.

India does not have such issues, as India is already developed with a mature infrastructure and an advanced regulatory machinery, and the complexity here is on a scale and diversity level. Dealing with the data privacy of 400+ million customers who have gone digital requires following regulations like the Digital Personal Data Protection Act (2023), the RBI AI/ML governance, etc.[121] Eliminating the bias of algorithms on marginalized groups, explaining how machine learning models work, and ensuring the visible and explainable nature of automated critical decisions (particularly in credit and fraud detection) are key to preserving consumer trust.[122] The importance of workforce disruption is pressing, even in comparison to Nepal, where the innovation of upskilling is good, and it demonstrates that the necessity to balance the fast development of technology and human capital abilities will always exist.

Whereas the innovation-friendly Indian regulatory environment, RBI FinTech Regulatory Sandbox, and the planned Artificial Intelligence and Data Authority of India (AIDAI), banks– especially the newer, fintech startups- face the complexity of complying with the divergence and convergence of IT laws, AI ethics laws and laws governing financial transactions, as well as possible arbitrage opportunity.[123] Marked by incessant privacy issues, indeed, the public confidence depends on the visibility of governance and active consumer safety campaigns. In this context, the two societies have common ethical and functional quandaries that include the protection of sensitive financial information against cyber-attacks, holding AI developers accountable for AI malfunctions, and coping with socio-economic impacts like loss of jobs.[124] The smaller economy and institutional potential of Nepal exacerbate these risks, and the larger

[120] Deshpande (n 83)
[121] Kumar, K. (n 59)
[122] Fares (n 32) *28*(4), 835–852
[123] Bharati (n 5)
[124] Gyau (n 3)

size of the Indian economy increases its systemic weakness.[125] The danger of AI increasing inequalities by showing bias in its data compounds the necessity of concrete data governance and ongoing algorithmic monitoring in both fields.

Here, the examples of AI-driven innovations in banking in India serve as positive examples of what has been operationalized and supported by regulations. The multilingual chatbot Eva helps to save a substantial number of operational expenses and increases financial accessibility in HDFC Bank at large. Other data used in ICICI Bank AI-powered credit underwriting include a variety of behavioral and social data, which can be used to broaden MSME lending through efficient risk management. The modern fraud detection systems at Kotak Mahindra have reduced financial crimes by about 25%.[126] Such accomplishments demonstrate the regulatory focus of India on the transparency of the model, regular auditing, and standard requirements of cyber security. The relative successes of Nepal show that there is contextual relevance with AI. The chatbot decreased traffic at the call centre by 70 % and increased customer experience, even though there was a limitation at the infrastructural level due to Nabil Bank.[127] This paper describes how pilot credit models developed by the Agricultural Development Bank on phone and agri-input data support financial inclusion among a key demographic: smallholder farmers in Nepal, and contribute to its development.

Real-time risk management is the sign of opportunity that Nepal Investment Bank's world is approaching, as an AI-driven fraud anomaly detection promises to yield.[128] Combined, these examples present the two-sided effect that AI can have, bringing both improved productivity and access and highlighting the ongoing issues of data availability, digital literacy, scalability, and enforcement of regulations. In the case of Nepal, an emphasis on a steady, whole-system approach is important regarding the coherent AI incorporation and integration enabled by the capacity-building of infrastructural and regulatory capacities.[129] In the case of India, the scale and ethical, transparent use of AI in a complex, diversified ecosystem is the key to success.[130] Meanwhile, Nepal and India are at different levels of AI adoption, but their adoption trajectory is defined in a continuum that brings new opportunities and challenges.

[125] Bredt, S. (2019). Artificial intelligence (Ai) in the financial sector—Potential and public strategies. *Frontiers in Artificial Intelligence*, *2*. https://doi.org/10.3389/frai.2019.00016
[126] Sharma (n 42)
[127] Niroula (n 8)
[128] Sthapit (n 4)
[129] Karki (n 101)
[130] Guha (n 17)

With a strong regulatory vision, ecosystem of innovation and digital support base, India is a leader of AI in its region, but long-standing ethical struggles and the need to further risk mitigation and financial inclusion continue to pose a challenge.[131] Nepal provides valuable insights into the potential of AI to transform the developing world, especially regarding inclusion and cost-efficient delivery of timely services, despite structural and legislative shortfalls.[132] Here, both countries ought to work on comprehensive AI plans that will involve developing infrastructure, skills training, ethical governance, and adaptive regulation. Peer learning, regional cooperation, and harmonised regulation of AI are some of the potential benefits that might be augmented and risks mitigated. Dynamic unity between and among governments, financial institutions, technology companies, and civil society is the key to success in ensuring sustainable, inclusive, and resilient bank sectors that can satisfy the needs of various stakeholders.

6.3 Financial Inclusion Impact of AI in Banking: Nepal and India

Artificial Intelligence (AI) is revolutionizing the nature of financial services across the world. To a larger extent, the potential that it holds, especially in India and Nepal, the emerging economies, is bound to revolutionize financial inclusion. The two countries are using AI in banking to reach underserved segments, but they vary so much in scope, levels of development, and contexts that it is hard to think of them in the same context.[133] The massive Indian digitalization, well-developed regulatory environment, and large fintech innovation landscape have spurred AI-powered financial inclusion at scale, and the use of AI in Nepal, albeit at its infant stages, is a localized, contextually conscious deployment to benefit rural and underserved populations.[134] Their experiences show a complex environment of potentials and perils of AI in terms of inclusive finance in South Asia. Meanwhile, the banking industry of India is unique in the combination of a fully developed digital infrastructure and well-developed state policies that have led to the integration of AI tools into key business operations. Lending banks, such as ICICI and HDFC, are taking advantage of AI-powered credit scoring models that leverage non-traditional data sets (including mobile phone usage patterns and

[131] Ibid.
[132] Ghimire, S., Sitaula, J., Karki, S., Khatri, D., & Jha, S. (2024). Benefits and implication in artificial intelligence (Ai) adoption in the health sector: A survey of cultural, privacy, and legal issues in nepal. *2024 6th International Conference on Advancements in Computing (ICAC)*, 145–150. https://doi.org/10.1109/ICAC64487.2024.10851094
[133] Khadka (n 76)
[134] Rao (n 90)

social media insights) to assess creditworthiness beyond traditional data points.[135] This has facilitated access to micro, small, and medium enterprises (MSMEs), which have been significantly underserved in the past, and has decreased the level of non-performing loans due to improved credit evaluation.[136] To this effect, the Reserve Bank of India (RBI) has developed stringent regulations on transparency, auditability, and ethical governance of AI that have safeguarded consumers' rights and data privacy, ensuring the repeatability and confidence in utilizing the AI-powered services.[137] Nevertheless, even with these advancements, India faces several issues like algorithm discrimination and job change caused by AI robotisation, which show that the thin line between innovations and inclusions is a problem.

The AI story in Nepal banking is still embryonic, with the infrastructural limitations, but is also characterized by innovative and localized approaches that have a close synchronization with the socio-economic reality. The use of experimental pilot programs (as done by the Agricultural Development Bank in developing AI-driven credit scoring based on agricultural inputs and mobile transaction information) can show how AI can be used to address information asymmetries that exist between rural lending sectors, making credit available to smaller farmers who cannot be formally excluded.[138] On the same note, chatbots enabled by AI have ensured a smooth experience of customer communication by banks such as Nabil and Nepal Investment Bank, despite limited resources, lowering operational costs and making customer services accessible to linguistically diverse and geographically remote areas.[139] Policy intentions to support digital transformation and ethical AI-related practices are reflected by the regulatory environment in Nepal, mainly guided by the Nepal Rastra Bank, and draft polices such as the National AI Policy Draft 2081; the lack of binding data protection laws and AI-specific legal requirements are areas of concern in terms of accountability, privacy, and fair lending.[140] Various setbacks cast their dark shadows, such as the poor level of broadband penetration, a sharp urban-rural split on the digital divide, and a lack of AI talent. However, inclusion-based AI applications in Nepal can teach rich lessons on how to customize AI in light of capacity limitations with a critical eye on development needs.

[135] Sindhu J (n 92)
[136] Rao (n 132)
[137] Ibid.
[138] 'The Future of AI in Banking: Opportunities for Nepal's Financial Sector - Our Blogs' (*f1soft Group*) <https://f1soft.com/blogs/future-of-ai-in-banking-opportunities-nepal-financial-sector> accessed 12 August 2025
[139] Niroula (n 8)
[140] National AI Policy Draft 2081

Contrast and complementarities exist between the two nations. India stands out in terms of size, with its well-developed IT infrastructure, sophisticated regulatory framework, and integration of AI on a large scale in the banks and among consumers.[141] It has an ecosystem, which allows millions of users, and it promotes fintech innovation by launching regulatory sandboxes and a national AI talent scheme. This broad adoption is associated with quantifiable areas of operational efficiencies and a growing financial inclusion base, especially among urban and semi-urban customers.[142] On the contrary, contextualising AI to achieve financial inclusion is an advantage of Nepal, considering its linguistic, geographic, and economic circumstances. The emphasis of its pilots on rural microcredit scoring and multilingual AI services demonstrates that prioritising financial accessibility for marginalised communities is more important than technological and regulatory immaturity.[143] These two countries share specific ethical and operational issues, primarily dealing with algorithmic bias, transparency, data privacy, and workforce disruption.[144] The legal and institutional systems in India are more developed, which allows for the reduction of these problems. Governance vacuums in Nepal pose a pressing threat to regulatory capacity-building and infrastructural investment.

To sum up, AI can be described as a game changer in the field of financial inclusion in the banking sphere of India and Nepal, yet their divergent path reveals that technology is not a magic bullet. The policy of India is an example of how synergistic human capital development, regulatory foresight, and synergistic digital infrastructure can scale AI-driven inclusive finance on diverse populations. The new experience in Nepal emphasises the need to adjust the AI implementations to local realities and to provide ethical protections against infrastructural and regulatory constraints. Further investment in digital literacy, holistic AI governance, and cooperation with neighbouring nations to share best practices and align regulatory frameworks is in the best interests of the two countries. When wielded responsibly, AI-enabled banking has the potential to do much more than increase credit access and decrease operational costs: it will also mean that marginalised communities are empowered with the ability to generate lasting economic growth and social equity in the South Asian region.

[141] Vijai C, 'ARTIFICIAL INTELLIGENCE IN INDIAN BANKING SECTOR: CHALLENGES AND OPPORTUNITIES.' (2019) 7 International Journal of Advanced Research 1581 <http://www.journalijar.com/article/26427/artificial-intelligence-in-indian-banking-sector:-challenges-and-opportunities/> accessed 12 August 2025
[142] Ibid.
[143] Sthapit (n 4)
[144] Stephanie Ness, Mykola Volkivskyi, Tayyab Muhammad, & Kristina Balzhyk. (2024). *Banking 4. 0: The impact of artificial intelligence on the banking sector and its transformation of modern banks.* https://doi.org/10.5281/ZENODO.10707418

7. Conclusion

Artificial Intelligence (AI) is tremendously changing financial inclusion in the banking sectors of India and Nepal through various means, although the two countries are at differing stages and proportions. Since India has a well-developed digital infrastructure, extensive fintech industry, and elaborate regulatory frameworks, large-scale adoption of AI enables it to maximise credit availability, reduce fraud occurrence, and improve the efficiency of customer care. Although Nepal is in the pre-mature stage of the AI integration process, it illustrates that the country has some interesting context-specific developments aimed at servicing the rural and poor population, mainly in the form of localized AI-based credit scoring and multilingual customer interfaces. India and Nepal share similar issues, such as digital and algorithmic biases, workforce reskilling demands, and data protection regulatory challenges. India is more developed in terms of governance mechanisms to guard against these risks, and Nepal needs more regulatory reinforcement and infrastructural investment.

Additionally, AI has the potential to revolutionize and enrich finances, enhancing operational efficiencies and empowering unbanked and underserved locals in South Asia. The achievement of this potential will require long-term investments in digital infrastructure, building human capital, ethical governance of AI, and flexible regulatory frameworks that will provide suitable solutions to the socio-economic realities of countries. There can be mutual collaboration between the India and Nepal, which in turn will help in advancing the area of innovation aligning with consumer protection standards and assuring fairness. When put to good use, AI-based banking holds the potential to be a potent force of inclusive growth and social fairness and bountiful financial cultures at the national level and beyond.

The countries should focus on embedding AI-specific Provisions in the Regulatory Framework. India ought to keep perfecting AI regulation, which includes the integration of growing ethical standards and aligning data security regulation to enhance transparency and consumer confidence. First, Nepal desperately needs binding AI-specific regulation to address such areas as algorithmic responsibility, data protection, and consumer rights to mitigate legal uncertainty and establish trust around AI banking services. Similarly, both nations should focus on developing both Advanced Network Technologies and digital literacy, particularly in rural and underserved areas, to promote fair accessibility of AI and financial inclusion. In addition, both countries should undertake education, vocational training, and industry-academia

collaborations to expand AI skills, ethics experts, and compliance auditors to ensure a secure future for AI implementation in the banking industry. Moreover, initially, Nepal must draw upon lessons regarding regulatory sandboxes and innovation centres to scale up AI pilots aimed at inclusion. Regional and bilateral collaboration will help align regulatory regimes and best practices, and develop the capacity to deal with systemic AI-related risks in transformative financial systems. Furthermore, the countries should develop strong data governance policies to protect financial data sovereignty, implement cybersecurity requirements, and be independent in vital AI platforms.

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