

Banking 6.0: Exploring the Architectural and Regulatory Landscape of Metaverse Banking in the Indian Financial Sector

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African Journal of Commercial Studies, 2026, 7(2),149-154

DOI Link: <https://doi.org/10.59413/ajocs/v7.i2.15>

Abstract

The metaverse represents a foundational shift in financial service delivery, transitioning the sector into the era of Banking 6.0. This research investigates the architectural requirements and regulatory constraints of metaverse banking within the Indian ecosystem. Utilizing a multi-methodological analysis, the study identifies blockchain, 5G, spatial computing, and AI as the critical technical pillars of this shift. Empirical data from 583 respondents, alongside case studies of early adopters like Union Bank of India, indicates that adoption is primarily driven by trust-mediated by structural assurance and self-efficacy—while traditional performance metrics show diminished relevance. The study further scrutinizes the legal implications of the DPDPA 2023, VDA taxation, and the e-Rupee. Findings suggest that while transformative, significant hurdles remain regarding hardware accessibility and virtual property rights. The report concludes with a strategic roadmap for hyper-personalized financial ecosystems powered by 6G and generative AI.

Keywords: Banking 6.0, Metaverse, India Stack, CBDC, e-Rupee, DPDPA 2023, Extended Reality (XR), Blockchain, UTAUT, Self-Efficacy, Virtual Digital Assets (VDA), Cybersecurity

Article Info

Volume 7, Issue 2

Publication history:

Accepted on 3 February 2026;

Published: 30 March 2026

Article DOI:

[10.59413/ajocs/v7.i2.15](https://doi.org/10.59413/ajocs/v7.i2.15)

1. Introduction

The trajectory of the global banking industry has been one of continuous technological displacement and philosophical reconfiguration. From the earliest grain-based credit systems in ancient Mesopotamia to the hyper-connected API ecosystems of the modern day, the industry has transitioned through several distinct generations, each characterized by a specific interface between the institution and the individual. Today, the Indian financial sector stands at the precipice of Banking 6.0, a paradigm that transcends the transactional nature of mobile apps to embrace immersive, social, and persistent virtual environments known as the metaverse.

1.2 The Evolution of Banking Paradigms

To contextualize Banking 6.0, one must first appreciate the evolutionary milestones of its predecessors. Banking 1.0 was defined by physical proximity and personal character. Before the 1960s, banking was an intensely personal business where managers made lending decisions based on face-to-face interactions and local reputation. While this model fostered trust, it was hampered by manual processes, limited hours, and geographical barriers.

The shift to Banking 2.0 (1960s–1980s) introduced the first wave of digitalization through the deployment of the ATM and the credit card. This era democratized access to funds, allowing customers to withdraw cash outside of banking hours, yet it also introduced early forms of digital fraud such as card skimming. Banking 3.0 (1990s–2000s) saw the rise of the internet, which converted the bank into a web-based portal, while Banking 4.0 (2010s–present) leveraged the smartphone to make banking "invisible" and embedded into the daily digital habits of consumers.

Banking 5.0, the immediate predecessor to the current shift, focused on the "intelligence" of banking. By utilizing Open Banking APIs and Big Data analytics, institutions moved from being passive repositories to active financial advisors. However, this digitalization often came at the cost of the "social quotient"—the human connection that characterized the early branch-based era. Banking 6.0 aims to restore this lost human element through spatial computing and virtual presence, allowing customers to interact with digital twins of bank employees in immersive 3D environments.

1.3. The Indian Context and Digital Public Infrastructure:

India's transition toward Banking 6.0 is uniquely supported by its robust Digital Public Infrastructure (DPI), often referred to as the "India Stack". The synergy between Aadhaar (Identity Layer), UPI (Payments Layer), and the burgeoning Data Layer (Account Aggregators) provides the structural integrity required for a metaverse economy. Furthermore, the Indian government's ambition to reach a \$1 trillion digital economy by 2030 serves as a powerful macroeconomic driver for the adoption of Web3 and immersive technologies.

Table 1: Banking Generation in India

Banking Generation	Era	Defining Technology	Interface Paradigm
Banking 1.0	Pre-1960s	Manual Ledgers	Physical Branch/Handshake
Banking 2.0	1960s–1980s	Mainframes/ATMs	Card-based Self-service
Banking 3.0	1990s–2000s	Internet/Browsers	Desktop Portals
Banking 4.0	2010s–Present	Cloud/Mobile	Smartphone Apps
Banking 5.0	Emerging	AI/Open APIs	Personalization/Intelligence
Banking 6.0	Future Horizon	AR/VR/Blockchain	Immersive Metaverse

1.4. Objectives

The primary objective of this research is to evaluate the feasibility and strategic impact of metaverse banking within the Indian financial sector. Specifically, the study aims to:

- Identify the architectural and technical pillars required to sustain a persistent, 3D banking environment, including the integration of blockchain, 5G, and spatial computing.
- Examine the regulatory landscape, focusing on the impact of the Digital Personal Data Protection Act (DPDPA) 2023 and the Reserve Bank of India's guidelines on Digital Banking Units (DBUs).
- Analyze early adoption case studies, such as Union Bank of India's 'Uni-Verse' lounge and Kiyai.ai's 'Kiyaverse', to determine operational efficacy and lead generation potential.
- Assess consumer sentiment and the psychological antecedents of trust in immersive financial interactions, utilizing structural equation modeling.
- Evaluate the role of Central Bank Digital Currencies (CBDCs), specifically the e-Rupee, as the native economic medium for the Indian metaverse.
- Identify novel cybersecurity risks inherent in extended reality (XR) environments, such as immersive social engineering and the "human joystick" phenomenon.

2. Literature Review

The academic and professional discourse on Banking 6.0 reflects a convergence of multiple technological disciplines, shifting the industry focus from the "invisible banking" of the smartphone era to an "immersive banking" paradigm (Kandpal et al., 2025). This evolution is characterized by the transition from 2D screen-based interfaces to 3D spatial environments, where the "social quotient"—the human connection lost during rapid digitalization—is restored through high-fidelity digital twins and avatar-based interactions (Singh et al., 2025). Within this framework, the metaverse is conceptualized not merely as a gaming interface, but as a persistent "mirror world" where blockchain protocols enable decentralized ownership and the interoperability of financial assets across diverse virtual ecosystems (Johri et al., 2024). The shift toward Web 3.0 and Distributed Ledger Technology (DLT) serves as the structural backbone of this new era, returning data sovereignty to the user and facilitating the rise of Decentralized Finance (DeFi) (Pham & Vu, 2024). Research indicates that while Banking 4.0 leveraged cloud-native architectures for real-time analytics, Banking 6.0 utilizes hyper-automation and spatial computing to "humanize" digital services (Taifa, 2024). However, the Indian legal context remains in a state of "contradictory governance"; while the Digital Personal Data Protection Act (DPDPA) 2023 provides a robust privacy framework, existing statutes like the Information Technology Act 2000 and the Transfer of Property Act 1882 struggle to define the ownership of virtual land and NFTs, often relegating them to "platform licenses" rather than actual property (Record of Law, 2026; Seerwani & Ram Mohan, 2025).

3 Research Methodology

This report utilizes a mixed-methods research design to capture the multidimensional nature of Banking 6.0. The methodology integrates quantitative analysis of consumer adoption factors with qualitative investigations into the

technical and regulatory landscape.

3.1 Framework for Adoption Analysis

The study adopts an extended Unified Theory of Acceptance and Use of Technology (UTAUT) model, hybridized with the Technology Acceptance Model (TAM). This framework is specifically calibrated for the Indian market to examine how factors such as self-efficacy, structural assurance, and social influence mediate trust and behavioral intent in virtual banking.

3.2 Data Sources and Sample

The quantitative analysis is based on a primary study of 583 Indian respondents from various urban centers. Participants engaged in 10-minute sessions within a simulated metaverse banking environment, interacting with virtual assistants and navigating 3D lounges before providing feedback through a structured survey.

Secondary data was synthesized from a comprehensive review of current technical whitepapers, RBI circulars, and annual reports from leading Indian banks (e.g., Union Bank of India, ICBC, and CITI). Additionally, market intelligence from firms such as IMARC Group, UnivDatos, and IDC provided the statistical foundation for AR/VR market growth projections in India.

3.3 Statistical Evaluation

The research utilizes Partial Least Squares Structural Equation Modeling (PLS-SEM) to validate the relationships between the constructs. This approach allows for the assessment of trust as an overwhelming mediating factor for behavioral outcomes, such as satisfaction and use intent. Complementary to this, the study evaluates architectural risk management using a combination of machine learning techniques (LSTM, ARIMA) and graph-based analysis to simulate money-laundering and fraud dynamics in decentralized networks.

4 Data Collection and Analysis

The analysis of Banking 6.0 in India is grounded in both the performance metrics of current implementations and the projected growth of the underlying technology market.

4.1 Early Implementation Results

Union Bank of India's 'Uni-Verse' lounge, launched in July 2022, provides the most significant real-world dataset for metaverse banking in India. The platform was developed to counter the high costs of physical expansion and to re-engage young digital natives who were migrating to private sector banks.

Table 2: Performance Metric

Performance Metric	Recorded Value (2022–2024)
Total Visitors	367,653+
Average Daily Visitors	3,000+
Leads Generated	76,000+
Primary Interaction Mode	Avatar-based VR and WebGL
Core Services Accessed	Balance Enquiry, Mini-Statements, Loan Certificates

The data indicates that the lounge serves not only as an experiential tool but as a significant customer acquisition channel. The generation of 76,000 leads suggests that the immersive environment can effectively facilitate the initiation of "Straight Through Processing" (STP) journeys for Mudra loans and other retail products.

4.2 Analysis of Adoption Factors (PLS-SEM Results)

The empirical study on 583 respondents provides a granular look at the psychological drivers of metaverse adoption in India.

Table 3: Adoption Factors

Construct	Path Coefficient (β)	P-Value	Impact Significance
Self-Efficacy → Trust	0.305	0.001	High
Structural Assurance → Trust	0.264	0.006	Moderate
Perceived Privacy → Trust	0.234	<0.001	Significant
Social Influence → Trust	0.082	0.019	Low
Performance Expectancy → Trust	0.024	0.509	Insignificant

The analysis reveals a fundamental shift in consumer behavior. In traditional digital banking, "Performance Expectancy" (the belief that technology will improve task performance) is a primary driver. In the metaverse, however, this factor is statistically insignificant. Instead, the user's belief in their own ability to navigate the 3D space (Self-Efficacy) and the institutional safeguards provided by the bank (Structural Assurance) are the most potent predictors of trust. Trust, in turn,

is an overwhelming predictor of satisfaction ($\beta=0.896$) and use intent ($\beta=0.866$).

4.3 Market Growth Projections for India (2024–2034)

The viability of Banking 6.0 is tethered to the availability and affordability of AR/VR hardware in the Indian market.

Table: 4 Market Growth Projections for India

Market Segment	2024 Value	2033/34 Projection	CAGR
India VR Headset Market	USD 1.30 Billion	USD 5.30 Billion	15.40%
India Overall AR/VR Market	USD 4.84 Billion (2023)	~USD 30-40 Billion	38.30%
India VR Gaming Market	USD 4.20 Billion	USD 30.2 Billion	21.70%
VR Economic Contribution	-	USD 450.5 Billion (by 2030)	-

While the global headset market saw a decline in shipments in 2024, the Indian market is projected to sustain a strong growth trajectory. The high user penetration rate in the 18–34 age group (78%) further supports the banking sector's strategy of using the metaverse to onboard millennial and Gen Z customers.

4.4 Interpretation

The findings suggest that Banking 6.0 is not merely an incremental technological upgrade but a systemic transformation of the banking-customer relationship.

The Primacy of Trust Over Utility: The statistical insignificance of performance expectancy in the metaverse suggests that Indian consumers do not necessarily expect the metaverse to be faster or more efficient than a mobile app. Instead, they value the "social quotient"—the sense of being present in a space where they can interact with a human-like avatar. However, this desire for social interaction is tempered by extreme caution regarding security. The fact that trust mediates all behavioral outcomes indicates that if a bank fails to provide transparent data protection and clear structural assurance, visual impressiveness will not be enough to sustain user engagement.

The Architectural Necessity of CBDCs: The research underscores that a functioning metaverse economy requires a frictionless, native medium of exchange. The RBI's e-Rupee is interpreted as the critical architectural component that bridges the gap between traditional fiat and the decentralized virtual world. Unlike private cryptocurrencies, which are subject to a flat 30% tax and a 1% TDS in India, the e-Rupee offers the security and legal tender status of the central bank, combined with the programmability of digital tokens. The use of Hardware Security Modules (HSMs) for encryption key management further aligns the e-Rupee with the high structural assurance requirements identified in the adoption studies.

Regulatory Friction as a Barrier to Innovation: The interpretation of the regulatory data suggests a state of "contradictory governance". While the government promotes digital transformation and DPI, the taxation regime for VDAs is exceptionally stringent, potentially driving trading volume and innovation to overseas platforms. Furthermore, the lack of a clear definition for virtual property under the Transfer of Property Act means that assets acquired in the metaverse (such as virtual land) currently exist in a legal grey area, preventing them from being used as collateral for traditional bank loans.

4.5 Discussion

The investigation into the architectural and regulatory landscape of Banking 6.0 in India reveals a complex ecosystem where technological capability is rapidly outstripping legislative readiness. The architectural foundation of this new era rests upon four synergistic technologies that transform digital finance into a high-fidelity, immersive experience. At the base, 5G and 6G telecommunications provide the ultra-low latency infrastructure necessary for real-time edge rendering, which effectively eliminates the "cyber-sickness" often associated with virtual interactions. This connectivity is secured by Distributed Ledger Technology (DLT), which serves as an immutable backbone for managing decentralized identities (DIDs) and verifying the ownership of virtual assets. The user-facing layer is powered by Spatial Computing and Extended Reality (XR), delivering a 3D interface that allows for the physical navigation of digital spaces. Orchestrating these layers is Artificial Intelligence (AI), which powers autonomous digital twins and generative "Robo-advisors" to provide personalized, 24/7 customer service that mimics the nuance of human interaction.

Beyond the technical requirements, the study identifies a critical shift in consumer psychology termed the Trust-Self-Efficacy Axis. For Indian consumers, the readiness to adopt metaverse banking is more strongly correlated with their confidence in navigating the environment (Self-Efficacy) than with the specific functional utility of the platform. This represents a significant departure from traditional mobile banking models, where "Performance Expectancy" was the primary driver. The data suggests that banks must pivot their strategy toward user education and intuitive UI/UX design to build trust. Trust in this immersive context is a total mediator of use intent, constructed primarily through structural assurance—the visible presence of institutional safeguards and robust security protocols.

However, the transition toward Banking 6.0 faces a significant "governance gap" due to the mismatch between technological innovation and the evolution of Indian law. In terms of property rights, virtual land and NFTs are not currently recognized as tangible property capable of attachment under the Transfer of Property Act 1882, leaving users vulnerable to arbitrary changes in platform-side Terms of Service. Furthermore, while the DPDPA 2023 provides a robust framework for data privacy, it does not yet fully address the novel challenges posed by the harvesting of high-fidelity

biometric data, such as eye-tracking and ambient light sensors, which are inherent in XR hardware. This regulatory friction is compounded by a stringent taxation regime, where the flat 30% tax on Virtual Digital Asset (VDA) gains acts as a significant deterrent for integrating these assets into mainstream retail banking.

Finally, the shift to immersive banking introduces a new taxonomy of cybersecurity threat vectors that do not exist in traditional digital channels. These include "Man-in-the-Room" (MitR) attacks, where malicious actors eavesdrop on private 3D consultations, and "Immersive Social Engineering," which utilizes deepfakes to lead users into fraudulent transactions. Most concerning is the "Human Joystick" phenomenon, a physical-digital hybrid threat where a user's movements are manipulated by altering their VR screen content, potentially leading to real-world disorientation or injury. Addressing these risks requires a proactive security framework that combines hardware encryption with real-time AI threat detection to ensure the safety of the Banking 6.0 ecosystem.

5 Conclusions and Recommendations

5.1 Conclusion

Banking 6.0 represents a systemic transformation of the Indian financial sector, moving beyond the transactional efficiency of Banking 4.0 to embrace an experiential and social paradigm. The research demonstrates that while the technology is still in its nascent stages, early implementations like Union Bank of India's Uni-Verse have already shown significant potential for lead generation and brand repositioning among younger demographics.

However, the transition is not without substantial risk. The architectural requirements for a secure, low-latency metaverse are significant, requiring heavy investment in 5G and decentralized protocols. Furthermore, the current regulatory environment in India presents a complex challenge; the DPDPA 2023 provides a much-needed framework for data privacy, but the taxation of virtual assets and the lack of legal clarity regarding virtual property rights could stifle domestic innovation.

The study concludes that for Banking 6.0 to succeed in India, the industry must shift its focus from purely technical utility to a trust-centric model. This involves prioritizing user education to increase self-efficacy, implementing robust structural assurances, and advocating for regulatory reforms that recognize the unique nature of virtual property. The integration of the e-Rupee as a secure, central-bank-backed native currency will be a critical factor in building the "structural assurance" that Indian consumer demand.

5.2 Future Scope

The future of Banking 6.0 will be defined by the 2030 rollout of 6G and haptic technology, enabling hyper-realistic immersion where users can physically "feel" digital assets. This sensory evolution will be complemented by Generative AI and Digital Twins, restoring the personalized empathy of Banking 1.0 through emotionally intelligent, autonomous avatars.

To support this ecosystem, the industry must transition toward Metaverse Interoperability, allowing users to port identities and credit scores across platforms, backed by specialized legal frameworks and "Metaverse Tribunals" for dispute resolution. Finally, as energy demands scale, the roadmap prioritizes Sustainable Infrastructure, utilizing green computing and efficient consensus mechanisms to ensure that the growth of Banking 6.0 aligns with global ESG goals.

Declaration of Competing Interests

The authors declare that they are not aware of any competing financial interests or personal relationships that may have influenced the work described in this document.

Funding

This research did not receive specific grants from any public, commercial, or non-profit sector funding bodies.

Acknowledgements

The author would like to offer my heartfelt gratitude to everyone who made a contribution to this research

Ethical considerations

The article followed all ethical standards appropriate for this kind of research.

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