# **Digital Transformation in Indian Public Sector** Banks: Challenges, Opportunities, and Future **Growth Prospects – A Case Study Approach**

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#### **Abstract:**

The digital era has profoundly impacted India's banking sector, prompting both private and public sector banks to innovate and adapt. Public sector banks, pivotal in India's financial system, face distinctive challenges in their digital transformation efforts. This study examines the digital transformation within Indian public sector banks, focusing on the current state of digital adoption, identifying key challenges, and exploring future growth opportunities. The emphasis on public sector banks is intentional due to their vital role in advancing financial inclusion and bolstering economic development. Utilizing a qualitative case study approach, the research collects primary data through interviews with bank officials and secondary data from official reports, industry publications, and academic sources. Statistical techniques, such as descriptive analysis and trend analysis, will be used to evaluate the impact of digital initiatives on operational efficiency, customer satisfaction, and overall performance. The analysis will reveal barriers to effective digital transformation and offer strategic recommendations for overcoming these obstacles. The findings will be highly relevant, as public sector banks strive to remain competitive in a digital economy, thus contributing significantly to the discourse on modernizing India's banking sector for future growth.

Keywords: Banking Innovation, Digital Transformation, Financial Inclusion, Operational Efficiency, Public Sector Banks

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# I. INTRODUCTION

The banking sector has undergone a seismic shift with the advent of digital technologies, transforming traditional banking operations in worldwide. In India, the public sector banks (PSBs), which hold a critical role in the nation's financial ecosystem, are at the forefront of this transformation. These institutions serve as the backbone of financial inclusion, aiming to bring the unbanked and underbanked population into the fold of formal financial services. While private sector banks have rapidly adopted digital strategies, public sector banks face a distinct set of challenges, including legacy systems, regulatory constraints, and infrastructural limitations, which have slowed their digital transformation journey.

India's digital revolution, powered by the Digital India initiative launched in 2015, has created immense opportunities for technological innovation across industries, including banking sector. Public sector banks are key players in promoting financial inclusion by leveraging digital tools to reach underserved and rural populations. However, unlike their private counterparts, PSBs often struggle with integrating new technologies into their operations due to legacy infrastructure and bureaucratic processes. As highlighted by Regi and Franco (2020), public sector banks in India often grapple with outdated technology, which hinders their ability to compete in an increasingly digitalized economy.

Despite these challenges, the potential benefits of digital transformation in the banking sector are enormous. According to a report by the Reserve Bank of India, digitization has not only enhanced operational efficiency but also improved customer satisfaction and contributed to the overall growth of financial inclusion across the country. The growing penetration of internet services and smartphones, combined with government initiatives like Aadhaar and the Unified Payments Interface (UPI), has laid a strong foundation for public sector banks to modernize their services. This study aims to investigate the current state of digital transformation in Indian public sector banks, focusing on the key challenges they face and the opportunities for future growth. Through qualitative case studies and analysis of secondary data, this research seeks to provide strategic insights that can help public sector banks navigate their unique digital transformation journey. The research will contribute significantly to the ongoing discourse on modernizing India's banking sector and enhancing financial inclusion through digital innovations.

## II. LITERATURE REVIEW

## **Financial Inclusion and Digital Transformation**

Digital transformation has been a key driver in enhancing financial inclusion, particularly for public sector banks (PSBs) in India. Barot (2017) highlights the limited adoption of financial services among underserved populations, largely due to financial illiteracy. Despite these challenges, digital solutions like mobile banking and digital wallets have shown promise in bridging this gap. Srinivas & Shanigarapu (2020), further emphasize the role of small finance banks in advancing financial inclusion, especially in rural areas, demonstrating how an extensive banking network can be leveraged to reach underserved populations. Moreover, Abdullah (2021) shows that digital financial inclusion programs can spur economic development in rural India by improving access to financial services. This aligns with Vallabhaneni & Nithyashree (2023), who credit the Pradhan Mantri Jan Dhan Yojana (PMJDY) for its impact on the financial inclusion of farmers. Together, these studies underline the potential of digital initiatives to support the financial inclusion agenda while identifying areas where PSBs could play a greater role.

#### **Challenges in Digital Transformation of Public Sector Banks**

PSBs face several challenges in adopting digital solutions. Sardana and Singhania (2018) identify issues like outdated legacy systems and regulatory constraints, which slow the pace of digital transformation compared to private sector banks. Mekinjić (2019), echoes these challenges, noting that the adoption of Industry 4.0 technologies, such as AI and blockchain, has been hindered by technological and operational complexities. These barriers prevent PSBs from fully capitalizing on digital advancements, leaving a gap in their ability to compete with private banks and fintech. In addition, Jha & Bakhshi (2019) discuss the financial hurdles in adopting green finance models, which also affect the digital transformation of PSBs. Kumar & Prakash (2020) argue that, despite the government's green finance efforts, Indian banks, including PSBs, are lagging behind in channelling funding into sustainable projects. These studies reveal the slow progress of digital and green finance initiatives in the banking sector, emphasizing the need for stronger policies and investment.

# Opportunities for Growth Through Digital and Green Finance

While challenges exist, digital transformation presents significant growth opportunities for PSBs. Wewege, Lee, & Thomsett (2020) highlight how disruptions in digital banking, such as mobile banking and AI-driven services, can enhance customer experience and operational efficiency. This is particularly relevant for PSBs as they seek to expand services in rural areas through digital channels. Furthermore, Sharma & Choubey (2021) note the potential of green finance projects to align with digital innovations, offering PSBs opportunities to contribute to sustainability while improving their service offerings. Tsindeliani & Proshunin (2022) underscore the need for regulatory frameworks to support digital finance in the context of sustainable development, providing a dual opportunity for PSBs to advance financial inclusion and sustainability goals.

#### III. RESEARCH GAP

The literature reveals that while PSBs in India are making strides toward digital transformation, they face significant challenges related to outdated systems and regulatory frameworks. At the same time, opportunities exist to leverage digital solutions for financial inclusion and sustainability. However, a clear research gap exists in understanding how PSBs can overcome these barriers to fully integrate digital and green finance initiatives in a way that aligns with India's broader economic and environmental goals. This study seeks to address this gap by exploring the current state of digital adoption in Indian PSBs and providing strategic insights into overcoming the barriers identified in the literature.

#### IV. RESEARCH OBJECTIVES

- 1. To assess the extent of digital technology adoption in Indian public sector banks.
- To identify the key challenges faced by Indian public sector banks during digital transformation, including technological and regulatory barriers.
- 3. To analyze the impact of digital transformation on customer service and financial inclusion in Indian public sector banks.
- 4. To suggest strategies for overcoming challenges and improving digital transformation in Indian public sector banks for future growth.

## V. NEED FOR THE STUDY

The digital transformation of Indian public sector banks (PSBs) is crucial in today's rapidly evolving financial landscape. With increasing customer expectations for seamless, tech-driven banking services, PSBs must modernize to remain competitive and ensure financial inclusion, especially in underserved rural areas. This study is necessary to understand the unique challenges faced by PSBs, such as outdated infrastructure, regulatory hurdles, and technological adoption barriers. Identifying these obstacles and exploring the opportunities for future growth through digital solutions is critical for the sustainable development of India's banking sector. Additionally, the study aims to provide actionable insights that can help PSBs overcome these barriers and contribute to the broader goal of national economic development through digital innovation.

# VI. RESEARCH METHODOLOGY

This study employs a qualitative case study approach to explore the digital transformation of Indian public sector banks, focusing on adoption trends, challenges, and opportunities for growth. A mixed-methods approach is adopted, integrating both qualitative and quantitative data collection techniques. Secondary data will be sourced from bank reports, industry publications, and regulatory guidelines. Descriptive statistics and trend analysis will be applied to assess key performance indicators such as operational efficiency, customer outreach, and financial performance. This methodology ensures a comprehensive evaluation of digital transformation efforts in public sector banks.

For the case study, the State Bank of India (SBI) and several other leading public sector banks will be examined to assess their digital transformation journeys, focusing on key initiatives, obstacles faced, and strategic measures taken to overcome these barriers.

Table 1. Digital Transformation of the top most PSBs

Bank	Digital Financial	Key Digital	Technology	Customer Reach	Strategic Focus for
	Inclusion Initiatives	Banking Services	Adoption	(Digital)	Future Growth
State Bank of India (SBI)	- YONO (You Only Need One) app offers access to a range of financial products and services.	- YONO App, Internet Banking, Mobile Banking, and digital loan services	- AI-based Chatbot (SIA), Blockchain Technology for Trade Finance, and Machine Learning for fraud detection.	- 50+ million YONO app downloads; 22 million+ digital savings accounts created.	- Enhance AI and machine learning for personalized customer services; expand digital-only branches and services in rural areas.

	- Financial literacy programs in rural and semi-urban areas to promote digital banking adoption.	- Instant account opening, digital KYC, e-wallet services, UPI, IMPS, NEFT/RTGS, and e-commerce integration.	- Data Analytics for customer insights and predictive analysis.	- Active digital user base of 70+ million.	- Increase penetration in rural markets through digital platforms and enhance cybersecurity measures.
Bank of Baroda (BoB)	- "Baroda Connect" and "M-Connect Plus" mobile banking services to enhance financial inclusion in urban and rural areas.	- Mobile Banking (M-Connect Plus), Internet Banking (Baroda Connect), UPI services, Digital Wallet (Baroda Pay)	- Robotic Process Automation (RPA) for internal processes and AI for customer interaction analysis.	- 10+ million users actively using mobile and internet banking.	- Develop next-gen digital banking platforms leveraging AI and RPA; enhance customer experience with more personalized digital services.
	- Partnerships with fintech for digital payment solutions and financial inclusion.	- Online loan applications, digital savings accounts, investment services, and customer support via chatbots.	- Big Data Analytics for customer segmentation and targeted marketing campaigns.	- 5 million+ new digital accounts opened in the last financial year.	- Expand digital offerings through collaborations with tech startups; focus on digital literacy programs in tier 2 and tier 3 cities.
Punjab National Bank (PNB)	- PNB One app for a comprehensive digital banking experience, promoting financial inclusion.	- PNB One mobile app, Internet Banking, UPI services, online account opening, and digital loan services.	- AI for fraud detection, blockchain for secure transactions, and cloud computing for scalable services.	- 12 million+ active users on PNB One; significant digital transaction volume growth.	- Enhance digital infrastructure to improve service delivery; expand digital services in rural markets through financial literacy campaigns.
	- Digital literacy drives in collaboration with government initiatives like Digital India.	- Digital passbook, instant loan approvals, e- wallet services, and e-KYC for hassle-free account management.	- Integration of IoT for smart banking services and blockchain for secure digital transactions.	- Over 60% of total transactions are digital.	- Focus on integrating more advanced AI tools for better customer experience and risk management.
Canara Bank	- Financial Inclusion Plan (FIP) with emphasis on digital financial services to underserved regions.	- Canara AI1 app, Internet Banking, and E-Infobook for easy access to banking	- Use of Core Banking Solutions (CBS) upgraded with digital modules and advanced	- Over 8 million digital users with growing adoption of mobile banking apps.	- Enhance digital reach through mobile-first strategies; focus on increasing self-

		information and transactions.	analytics for operational efficiency.		service banking options and enhancing digital literacy.
	- Partnerships with fintech firms to offer innovative digital products tailored for low-income groups.	- Digital wallets, UPI payments, digital personal and business loans, and mobile banking services.	- Deployment of RPA and AI to optimize backend operations and enhance digital service delivery.	- Substantial growth in digital transactions, especially in semi-urban and rural areas.	- Strengthen cybersecurity infrastructure and expand digital services in tier 2/3 cities.
Union Bank of India	- "Union Asha" initiative focused on digital literacy and financial inclusion in rural and semi-urban areas.	- Union Bank mobile app, UPI integration, online savings and loan products, and internet banking services.	- Big Data Analytics for credit scoring, AI for fraud prevention, and cloud-based banking solutions for scalability.	- 10 million+ active digital users with a focus on increasing mobile app adoption.	- Expand digital-only branches and enhance digital service platforms to improve customer reach and service efficiency.
	- Collaborations with government schemes like PMJDY (Pradhan Mantri Jan Dhan Yojana) to promote digital banking access.	- Instant credit facilities, digital KYC, customer support through AI chatbots, and comprehensive mobile banking.	- AI and Blockchain technology for secure digital transactions and improved customer engagement.	- High engagement in digital channels with consistent growth in new digital users.	- Focus on innovative digital solutions for small businesses and rural customers, leveraging government partnerships and fintech collaborations.

Source: Created by Author

Based on the above table, a comparative analysis has been done on the digital transformation initiatives undertaken by top public sector banks (PSBs) in India, with a focus on their digital financial inclusion efforts, key services, technology adoption, customer reach, and strategic growth focus.

- State Bank of India (SBI): SBI leads the digital transformation space with its comprehensive digital offerings through the YONO app, providing services such as internet banking, digital loans, and e-commerce integration. With over 50 million app downloads and 22 million digital savings accounts, SBI has demonstrated strong customer reach. The bank has adopted advanced technologies such as AI-based chatbots, blockchain for trade finance, and machine learning for fraud detection. Its strategic focus includes enhancing AI and expanding digital-only branches in rural areas, which emphasizes both technological innovation and financial inclusion.
- Bank of Baroda (BoB): BoB has focused on enhancing financial inclusion through its Baroda Connect and M-Connect Plus mobile banking services, catering to both urban and rural customers. The bank has embraced Robotic Process Automation (RPA) for internal efficiency and AI for customer interaction, with 10+ million active users. BoB's future growth strategy revolves around developing next-gen digital platforms using AI and RPA, with a particular emphasis on personalized digital services and partnerships with fintech companies to drive financial inclusion.
- Punjab National Bank (PNB): PNB's digital transformation is centred around its PNB One app, which offers a complete digital banking experience with services like internet banking, UPI, and online account opening. The bank has integrated AI

for fraud detection and blockchain for secure transactions to safeguard its operations. With over 12 million active users and a significant rise in digital transactions, PNB's focus is on enhancing its digital infrastructure and expanding services in rural areas through financial literacy campaigns and advanced AI tools for better risk management.

- Canara Bank: Canara Bank has emphasized financial inclusion with its Financial Inclusion Plan (FIP), targeting underserved regions through digital banking services. Its Canara AI1 app and core banking solutions are upgraded with digital modules, providing easy access to services for over 8 million digital users. The bank is focused on mobile-first strategies and strengthening cybersecurity infrastructure, with a vision to increase digital literacy and self-service options in rural and semi-urban areas.
- Union Bank of India: Union Bank's Union Asha initiative reflects its commitment to promoting digital literacy and financial
  inclusion in rural and semi-urban areas. The bank's adoption of Big Data Analytics for credit scoring and AI for fraud
  prevention has helped it reach 10+ million active digital users. Its future focus includes expanding digital-only branches and
  leveraging fintech collaborations to drive digital innovation, especially for small businesses and rural customers.

SBI stands out with its scale and adoption of advanced technologies, whereas BoB and PNB are focusing on next-gen technologies and personalized digital services. Canara Bank and Union Bank emphasize financial inclusion through mobile-first strategies and digital literacy programs. All banks are heavily invested in technology upgrades and partnerships to enhance their digital platforms, aiming to expand customer reach and improve service efficiency. This comparative analysis highlights the diverse strategies and growth trajectories within Indian PSBs' digital transformation journeys, with each bank leveraging its strengths to drive future growth.

## **PSBs Contribution's Towards Financial Inclusion**

Public Sector Banks (PSBs) in India have played a pivotal role in advancing financial inclusion, which aligns with the nation's goal of providing banking access to underserved populations. Their contributions in the context of digital transformation can be summarized in the following five points:

- Branch Network Expansion: PSBs have an extensive branch network in rural and semi-urban areas, which supports the government's financial inclusion goals. By leveraging digital channels such as mobile banking and internet banking, they are now able to offer financial services to remote areas, ensuring wider reach and accessibility.
- Pradhan Mantri Jan Dhan Yojana (PMJDY): A flagship financial inclusion initiative, PMJDY, implemented predominantly through PSBs, enabled millions of unbanked individuals to open zero-balance accounts. Digital tools like mobile wallets, Aadhaar-based authentication, and direct benefit transfers have improved the efficiency and reach of these services.
- **Digital Payment Infrastructure**: PSBs have been instrumental in promoting digital payment solutions, including Unified Payments Interface (UPI) and Bharat Interface for Money (BHIM) applications. This has enabled faster, more secure transactions for individuals and small businesses, enhancing financial inclusion.
- Credit Access for MSMEs: Through digital platforms, PSBs have facilitated easier access to credit for micro, small, and medium enterprises (MSMEs). Initiatives such as the Mudra Yojana and digital loan disbursement mechanisms have increased the availability of affordable credit, driving economic empowerment at the grassroots level.
- Government Subsidy Distribution: PSBs have been the primary conduits for disbursing government subsidies and welfare schemes via direct benefit transfers (DBT). Their integration of digital technologies ensures that funds reach beneficiaries without leakages, contributing to more efficient and transparent financial inclusion.

In recent years, both public and private sector banks in India have made significant progress in digital transformation, though their approaches differ. Private banks, such as HDFC Bank and ICICI Bank, have been quicker to adopt advanced technologies like AI, machine learning, and blockchain, positioning themselves as leaders in urban markets. Their digital services, including mobile and internet banking, now account for over 85-90% of total transactions. In contrast, public sector banks, led by SBI

and PNB, have focused on promoting financial inclusion through digital platforms like UPI and AePS, particularly in rural areas. PSBs account for nearly 70% of UPI transactions, largely driven by government-backed initiatives such as PMJDY. While private banks excel in technological innovation, public banks are essential in expanding digital banking access to underserved populations, despite facing challenges with legacy systems and slower technology adoption. Together, both sectors play a critical role in India's digital banking evolution.

Public sector banks (PSBs) in India face several challenges in adopting AI, primarily due to legacy infrastructure that requires costly upgrades, and data quality issues stemming from inconsistent and siloed information. A lack of skilled personnel to manage AI systems further complicates implementation, while regulatory and compliance hurdles related to data privacy and cybersecurity add delays. PSBs also operate under budget constraints, limiting their ability to invest in advanced technologies compared to private banks. Additionally, AI adoption introduces cybersecurity risks, requiring robust protections against potential breaches. These factors collectively slow the pace of AI integration in PSBs.

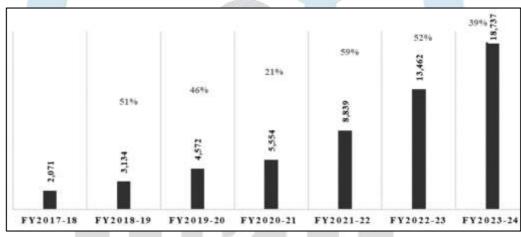


Figure 1. Number of Digital Payment Transactions (in crore)

Source: RBI, NPCI & Banks

The volume of digital payments has witnessed a substantial increase in recent years, driven by the coordinated efforts of the government alongside various stakeholders. The total volume of digital payment transactions grew from 2,071 crore in FY 2017-18 to 18,737 crore in FY 2023-24, achieving a compound annual growth rate (CAGR) of 44%. Digital payment methods encompass a wide range of platforms, including NACH, IMPS, UPI, AePS, NETC, debit and credit cards, NEFT, RTGS, prepaid payment instruments, internet banking, mobile banking, and other intrabank transactions.

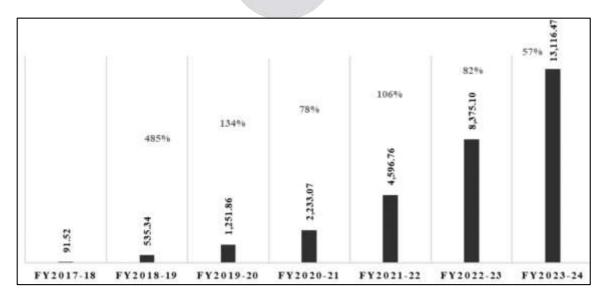


Figure 2. Number of UPI Transactions (in core)

Source: NPCI

UPI has fundamentally transformed the landscape of digital payments in India. UPI transactions have surged from 920 million in FY 2017-18 to an astounding 13.1 billion in FY 2023-24, reflecting a compound annual growth rate (CAGR) of 129%. According to the ACI Worldwide Report 2023, India now accounts for approximately 46% of all real-time payment transactions globally. UPI has been a key driver behind the expansion of digital payments in the country, contributing to 70% of the total digital payment transactions in FY 2023-24. In May 2024, UPI achieved a significant milestone by surpassing 1.4 billion transactions in a single month for the first time.

#### VII. CHALLENGES

# **Challenges for Digital Transformation in Indian Public Sector Banks:**

- Legacy Systems: One of the most significant hurdles is the outdated technological infrastructure that many public sector banks (PSBs) still rely on. Transitioning from legacy systems to modern, agile platforms is costly and complex, often requiring a complete overhaul of core banking systems.
- Regulatory Compliance: The need to adhere to stringent regulatory frameworks adds complexity to the digital transformation journey. Ensuring compliance with cybersecurity norms, data privacy regulations, and financial reporting requirements can slow down the pace of innovation.
- Organizational Culture: Resistance to change within traditional organizational structures is another key challenge. Employees
  in PSBs may lack the necessary skills or be hesitant to adopt digital tools, leading to slower implementation and acceptance of
  digital initiatives.
- Cybersecurity Threats: As banks increasingly adopt digital platforms, they become more vulnerable to cyber-attacks. Ensuring robust cybersecurity frameworks to protect sensitive customer data while maintaining seamless digital services is a critical challenge.
- Customer Adaptation: While digital banking services are growing, a significant portion of the customer base, especially in rural areas, still prefers traditional banking methods. Public sector banks face the dual challenge of promoting digital adoption while maintaining service quality for non-digital customers.
- Budget Constraints: PSBs often operate under financial constraints, limiting their ability to invest in advanced digital solutions
  or attract top talent in technology.

#### VIII. SUGGESTIONS

- Focus on Key Themes: Align your research around critical themes such as operational efficiency, customer satisfaction, and financial inclusion. These areas are crucial for understanding the overall impact of digital transformation in public sector banks.
- Stakeholder Engagement: Conduct interviews with stakeholders at multiple levels, such as bank officials, government regulators, and customers, to gain a comprehensive understanding of the challenges and success factors. This qualitative data can offer valuable insights into organizational readiness and the adoption of digital practices.
- **Barriers to Digital Adoption:** Delve into both internal and external barriers to digital adoption. Consider factors like legacy infrastructure, organizational culture, regulatory constraints, and skill gaps, which might hinder smooth transformation.
- Comparative Analysis: Compare public sector banks' digital efforts with those of private sector banks, identifying gaps and best practices. This can help highlight areas where public sector banks need to focus more, particularly in technology upgradation and customer service.
- Trend Analysis & Case Studies: Utilize statistical tools such as descriptive and trend analysis to analyze data from public sector banks, particularly focusing on how digital initiatives have influenced productivity, cost efficiency, and customer engagement. Additionally, incorporating case studies of specific banks will enhance the real-world relevance of your findings.
- Policy and Strategic Recommendations: Provide policy-level insights by analysing governmental initiatives like Digital India
  and their role in accelerating digital adoption in the public sector. Your strategic recommendations should address not only
  current challenges but also long-term sustainable growth paths, leveraging technologies like AI, blockchain, and fintech
  collaborations.

#### IX. CONCLUSION

The study on the digital transformation of Indian public sector banks (PSBs) has revealed significant progress in enhancing financial inclusion, operational efficiency, and customer satisfaction through the adoption of digital technologies. Major initiatives like the implementation of mobile banking apps, UPI integration, and AI-driven services have enabled PSBs to reach a broader customer base, particularly in rural areas. However, the digital transformation journey for PSBs is not without challenges. Issues such as outdated legacy systems, regulatory hurdles, and the slow pace of digital adoption in rural areas remain significant obstacles.

There is substantial scope for further research in exploring the integration of advanced technologies like artificial intelligence, blockchain, and big data analytics in public sector banking. Additionally, comparative studies between PSBs and private banks in adopting fintech collaborations and next-gen technologies would provide deeper insights into their digital evolution. Future research could also focus on customer perception and the role of digital literacy in accelerating the adoption of digital banking services in underserved areas. The study is limited by its focus on qualitative analysis, relying on case studies and secondary data, which may not capture the full range of digital transformation challenges. A broader quantitative analysis with real-time data across more PSBs would provide a more comprehensive view of the sector's digital progress.

The findings indicate that while PSBs have made significant strides in embracing digital banking, they lag private sector banks in terms of technological innovation and customer experience in urban markets. However, PSBs have been pivotal in promoting financial inclusion and extending digital services to the rural population. Going forward, addressing legacy infrastructure, enhancing cybersecurity, and adopting more customer-centric digital solutions will be critical for sustaining their growth in the digital banking landscape. PSBs are positioned to leverage digital transformation for future growth, but strategic investments in technology and innovation are necessary to fully realize their potential in the rapidly evolving banking sector.

Future trends such as upgrading legacy systems, increased government, and regulatory support, and fintech collaborations will drive AI adoption in public sector banks. Additionally, investment in AI talent, cloud adoption, and advances in AI-powered cybersecurity will further ease integration and enhance operational efficiency in PSBs. These factors will collectively accelerate digital transformation in the banking sector.

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