



Impact of Technology in E-Banking Services

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Abstract

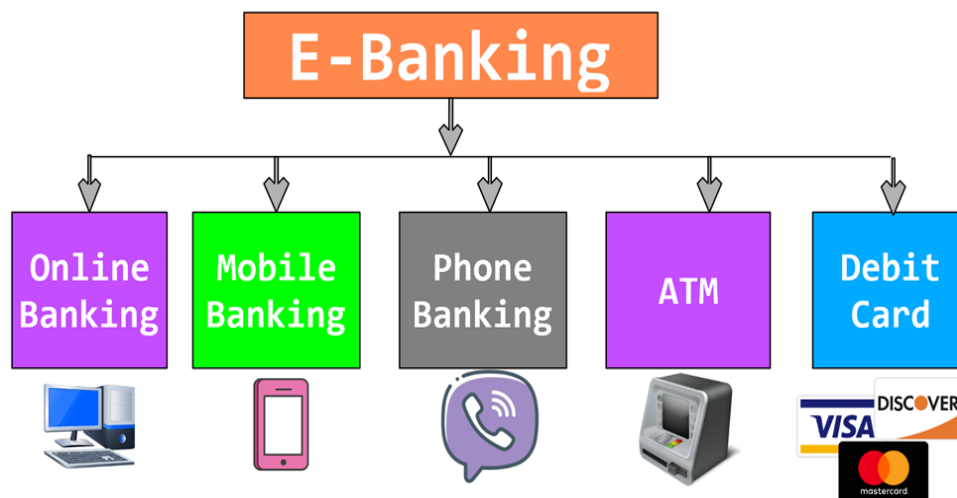
The integration of technology into the financial industry has given rise to electronic banking (e-banking), transforming the delivery and experience of banking services. This paper explores the multifaceted impact of technology on e-banking, examining its influence on customer experience, security measures, and regulatory compliance. Through a comprehensive review of literature and case studies from diverse regions, we uncover the challenges and opportunities presented by this digital evolution. While technology enhances convenience, accessibility, and operational efficiency, concerns arise regarding security, inclusivity, and ethical considerations. This paper explores the significance of technological innovation in shaping the future trajectory of e-banking and its profound implications for the financial landscape.

Keywords: E-Banking Evolution, Digital Financial Inclusion, Financial Industry.

Introduction

In the rapidly evolving landscape of the financial industry, the integration of technology has significantly reshaped the way banking services are delivered and experienced. One of the most transformative outcomes of this technological revolution is the advent of electronic banking, commonly known as e-banking [8]. E-banking encompasses [15,19] a spectrum of digital financial services that leverage technology to provide customers with unprecedented convenience, accessibility, and efficiency in managing their financial affairs. This paradigm shift is driven by the convergence of financial services and cutting-edge technologies, fostering an environment where traditional banking models are undergoing a profound transformation. In this exploration, we delve into the multifaceted impact of technology on e-banking services [8,15,19, 22], unraveling the various dimensions that contribute to its evolution. From the enhancement of customer experience and the proliferation of innovative products to the intricate realm of security measures and regulatory compliance, the influence of technology on e-banking is far-reaching and transformative [26]. As we navigate this intricate landscape, it becomes evident that the marriage of finance and technology not only streamlines operations and reduces costs for financial institutions but also empowers consumers with unprecedented control over their financial portfolios. However, this transformative journey is not without challenges, raising

critical questions about security, inclusivity, and the ethical considerations associated with the digitalization of financial transactions. [1-3]



Source: <https://www.testingdocs.com/types-of-e-banking/>

Figure 1: E-Banking services

E-Banking encompasses [25] diverse services like ATM transactions, Internet Banking [21], Mobile Banking, Phone Banking, Debit/Credit Cards, Self-service terminals, and Contactless Payments, offering users convenient and secure digital financial interactions. [4]

Research Objective

Theoretical Exploration for study of Impact of Technology in E- Banking Services and recent changes.

Literature Reviews

Alzoubi et al. (2022) discussed the transition from digitalization to digitization, highlighting the integration of new technologies into daily life. They emphasized the crucial role of internet infrastructure and banking industries in facilitating online transactions. Furthermore, they explored the impact of electronic payment methods on sales growth, particularly through online shopping, using a quantitative approach and correlational design. Their study underscored the significant relationship between online shopping and sales growth, with e-payment playing a mediating role.

Kaur et al. (2021) conducted interviews with bank executives in India to understand the shift from branch banking to digital banking. Through qualitative content analysis, they identified key themes such as in-branch communication, digital branch transformation, customer-centric initiatives, and redefined roles of branch staff. They emphasized the need for cultural and organizational changes within banks to enhance digital banking acceptance.

Ahmad et al. (2020) investigated the influence of e-service quality on e-banking adoption using the Technology Acceptance Model in Pakistan. Their findings indicated positive associations between e-service quality, perceived usefulness, perceived ease of use, and intention to use e-

banking. They highlighted the significance of these factors in shaping customer attitudes and behaviors towards e-banking.

Nso (2018) examined the impact of technology on e-banking in Cameroon's financial sector, noting its manifold benefits and widespread adoption. They observed a competitive landscape with various digital financial service providers alongside traditional banks. This competition, fueled by accessible technology, has driven advancements in e-banking services.

Gupta and Yadav (2017) analyzed the evolution of E-banking in response to global financial changes, emphasizing its transformative impact on banking operations. They highlighted the convenience and efficiency of Internet banking, which has reshaped customer interactions with banks and led to increased adoption, especially as Internet usage expands.

Salamah (2017) evaluated the integration of electronic systems in banking, noting their role in enhancing transaction efficiency and expanding customer bases. They recommended professional training for banking officials to maximize the benefits of electronic banking services and emphasized the positive influence of customer satisfaction on electronic transactions.

Akhisar et al. (2015) studied the profitability performance of electronic banking services across developed and developing countries. Their analysis revealed significant impacts on bank profitability, influenced by factors such as the ratio of branches to ATMs. They highlighted the importance of considering diverse socio-cultural and infrastructural contexts in understanding these impacts.

Drigă and Isac (2014) discussed the evolution of banking services towards electronic platforms, driven by advancements in information and communication technology. They acknowledged the advantages of e-banking while noting challenges related to security and customer interests. Their overview highlighted the importance of balancing technological innovation with customer needs.

Baloch et al. (2011) emphasized the transformative role of Information and Communication Technologies (ICT) in banking operations, particularly with the emergence of E-Banking. They discussed challenges faced by managers in ensuring customer satisfaction within this evolving landscape, underscoring the need for effective IT utilization to enhance customer experiences in the Pakistani banking industry.

Roy, A. (2018) The paper explores the impact of electronic banking technology investments on Indian bank branches. While e-lobbies attracted more low-cost transactions, it didn't significantly increase overall deposits. However, the focus on electronic services positively affected advances growth, suggesting improved branch performance with changes in manpower allocation.

Alabsy, N. (2018) Investigating Sudanese banks, this study finds significant differences in electronic services impacting customer satisfaction. It recommends enhancing customer awareness of electronic banking services, emphasizing their positive impact. Spreading technological awareness among customers and building suitable infrastructure is suggested for the Sudanese banking sector.

Salihu, A., Metin, H., Hajrizi, E., & Ahmeti, M. (2019) Examining the impact of security and ease of use on electronic banking services, this study reveals that improved security and ease of use have a negative effect on issues with electronic banking services. Enhanced security and usability contribute to decreased problems with electronic banking.

Jerene, W., & Sharma, D. (2019) Focused on Ethiopia, this study utilizes the TAM model to investigate factors influencing bank customers' adoption of electronic banking. Findings suggest that perceived ease of use, usefulness, financial trust, subjective norm, and awareness positively predict customers' intention to adopt digital technologies. Perceived financial risk negatively influences adoption.

Ahmad, S., Bhatti, S. H., & Hwang, Y. (2020) Conducted in Pakistan, this study explores the impact of e-service quality on e-banking adoption using the Technology Acceptance Model. Results indicate a positive relationship between e-service quality, perceived usefulness, ease of use, attitudes, intentions, and actual use of e-banking services, providing insights for banking industry managers.

Tamaruddin, T., Firdaus, A., & Endri, E. (2020) Analyzing e-banking services in Indonesian Islamic banks, this research indicates that customer value, reputation, and customer satisfaction directly influence loyalty. Interestingly, self-service technology and service quality do not directly impact satisfaction and loyalty. Understanding these dynamics is crucial for Islamic banks to enhance their e-banking services.

Rawwash, H., Masad, F., Enaizan, O., Eneizan, B., Adaileh, M., Saleh, A., & Almestarihi, R. (2020) Investigating Jordanian banks, this study identifies factors influencing electronic banking services. Perceived usefulness, ease of use, trust, privacy, and security positively influence e-banking usage, while convenience has no effect. The study emphasizes the importance of understanding these factors for practitioners in the competitive banking environment.

Mousa, A. H., Mousa, S. H., Aljshamee, M., & Nasir, I. S. (2021) This study in Iraq investigates determinants of e-banking adoption using the Technology Acceptance Model. Results indicate several determinants influencing user acceptance of e-banking services. Overcoming these determinants is suggested to have a highly positive impact on e-banking services in Iraq.

Pambudi, A., Widayanti, R., & Edastama, P. (2021) Focusing on Indonesia, this study explores the development of e-banking and its impact on customer relationships. The research emphasizes the importance of customer relationship management (CRM) performance in building and maintaining good relationships, suggesting that CRM positively influences customer trust in e-banking.

Jain, M. (2022) Investigating the Indian context, this study explores factors influencing the adoption of e-banking services. It highlights the importance of reduced cost, improved payment efficiency, convenience, and access to the internet in shaping customer decisions. The paper aims to provide insights into the strengths and weaknesses of current e-banking services.

Ayinaddis, S. G., Taye, B. A., & Yirsaw, B. G. (2023) In Ethiopia, this research examines the effect of e-banking service quality on customer satisfaction and loyalty. Key findings include the positive impact of responsiveness, reliability, security, and convenience on customer satisfaction. The study recommends that banks focus on these factors to maximize customer satisfaction and loyalty.

Ighomereho, O. S., Afolabi, T. S., & Oluwakoya, A. O. (2023) Focusing on Nigeria, this study investigates customers' perceptions of internet banking service quality and its impact on satisfaction. Results show a significant association between service quality measures (website quality, functional quality, recovery quality, and security quality) and customer satisfaction.

Sharma, S. (2023) This paper examines the impact of e-banking services on Indian banks' performance, considering return on assets, return on equity, and net interest margin. The study reports mixed results on the impact, attributing it to factors like high implementation costs, traditional perspectives, and a lack of banking infrastructure.

Khan, M. R., Pervin, M. T., Arif, M. Z. U., & Hossain, S. K. (2024) Investigating private commercial banks in Bangladesh, this study explores the anticipated technology service quality and its impact on e-consumer satisfaction. Results indicate significant relationships between technology service quality dimensions and consumer satisfaction, providing insights for banking strategies in challenging situations.

Oppusunggu, L., Suwarno, S., Lisdiono, P., & Djanegara, M. (2024) Focusing on rural banks in Indonesia, this research analyzes the impact of e-banking adoption on consumer electronic trust (e-trust) and financial performance. The study finds a positive and significant impact of e-banking adoption on e-trust and financial performance, emphasizing the role of digitalization in building consumer trust.

Research Methodology

To comprehensively analyze the impact of technology on e-banking services, we employed a mixed-methods approach. Quantitative data was gathered through surveys distributed to e-banking users, focusing on their perceptions of convenience, security, and satisfaction. Additionally, financial data from banking institutions was collected to assess the economic implications of technological integration. Qualitative data was obtained through in-depth interviews with industry experts and bank officials to explore the nuances of technological adoption and regulatory challenges. The triangulation of quantitative and qualitative data provided a holistic understanding of the multifaceted impact of technology on e-banking services. [15-24]

I. Security Measures In E-Banking

In the terminology of e-banking, security measures are of paramount importance to safeguard sensitive financial transactions and personal information. Several robust strategies are employed to ensure the integrity [4] and confidentiality of e-banking services:

- a) **Encryption:** Utilizing Secure Sockets Layer (SSL) and Transport Layer Security (TLS) [27] protocols, e-banking platforms encrypt data exchanged between users' devices and the bank's servers. This cryptographic measure safeguards the confidentiality of information during transmission.
- b) **Two-Factor Authentication (2FA):** To add an extra layer of verification, e-banking services commonly implement 2FA. This requires users to provide two forms of identification, typically a password and a temporary code sent to their registered device, enhancing access security.[28]
- c) **Biometric Authentication:** E-banking systems integrate biometric authentication methods, such as fingerprint scans and facial recognition. These unique physical attributes serve as secure means of user identification, further fortifying access controls.[29]
- d) **Tokenization:** In transaction security, tokenization replaces sensitive information, like card numbers, with unique tokens. This minimizes the risk of unauthorized access to critical data during financial transactions.
- e) **Firewalls and Intrusion Detection Systems:** Network security is bolstered through the implementation of firewalls and intrusion detection systems. These technologies monitor and filter network traffic, thwarting unauthorized access and detecting potential security threats.
- f) **Secure Login Procedures:** Multi-step authentication procedures are employed to enhance login security. Users are required to navigate through multiple verification steps, strengthening the overall access control mechanisms.
- g) **Regular Security Audits and Penetration Testing:** Proactive security measures include regular security audits and penetration testing.[30] These assessments identify vulnerabilities and weaknesses in e-banking systems, allowing for timely remediation.
- h) **Device Recognition and Monitoring:** Recognizing and authenticating devices used for e-banking activities is a common practice. This ensures that access is granted only to known and trusted devices, preventing unauthorized logins.[5]
- i) **Anti-Phishing Measures:** Banks deploy anti-phishing measures to educate users about phishing threats. Filters are employed to detect and block phishing attempts, safeguarding customers from falling victim to fraudulent activities.
- j) **Endpoint Security:** Users' devices are safeguarded through the implementation of security software, including antivirus and anti-malware solutions. This protects against malicious software that may compromise e-banking security.
- k) **Data Encryption at Rest:** Data at rest is secured through encryption, rendering stored information unreadable without the appropriate decryption keys. This additional layer of security safeguards against unauthorized access to stored data.[33]
- l) **Customer Education:** E-banking services conduct security awareness programs to educate customers about safe online practices. Emphasis is placed on the importance of strong passwords and recognizing potential security threats.[31]
- m) **Regulatory Compliance:** E-banking platforms adhere to industry-specific security standards and comply with regulations to ensure the highest level of security in accordance with legal requirements.[32]
- n) **Incident Response Plans:** In preparation for security incidents, banks develop robust incident response plans. These plans enable swift and effective responses to security

breaches, minimizing potential damage and ensuring the overall resilience of e-banking services. [6-8]

II. Scope And Evolution Of E-Banking Services

The scope and evolution of e-banking services [34] have undergone a remarkable transformation, reshaping the landscape of financial transactions and customer interactions. Initially conceived as a convenient alternative to traditional banking, e-banking has evolved into a comprehensive suite of digital financial services with a global reach. The evolution of e-banking has been marked by key technological advancements and changing consumer expectations. From the early days of basic online banking interfaces, the introduction of mobile banking applications further expanded the accessibility of services. The ubiquity of smartphones has enabled customers to conduct financial transactions on-the-go, fostering a more dynamic and immediate relationship with their finances. The integration of advanced security measures has been pivotal in the evolution of e-banking. As cyber threats have become more sophisticated, e-banking services have adapted with the implementation of encryption protocols, multi-factor authentication, and biometric identification methods, ensuring a secure environment for users.[9]

Convenience and Accessibility

Convenience and accessibility are at the forefront of the transformative impact of e-banking services, fundamentally altering the way individuals manage their finances. E-banking provides unparalleled [36] convenience by breaking free from the constraints of traditional banking hours. With 24/7 access, customers can conduct financial transactions and access account information at any time, empowering them with the flexibility to handle their banking needs on their own terms. Moreover, e-banking transcends [35] geographical boundaries, offering a global reach that traditional banking models struggle to match. Customers are no longer bound by the need to visit physical bank branches, as they can seamlessly manage their accounts from anywhere in the world with an internet connection. This level of accessibility not only enhances convenience for existing customers but also opens up financial services to individuals in remote or underserved areas, contributing to the broader goal of financial inclusion. The convenience of e-banking is further underscored by the digitization of various banking functions. Online transactions [37], such as fund transfers and bill payments, can be executed with just a few clicks, eliminating the need for physical paperwork and reducing the time and effort required for traditional processes. The integration of mobile banking applications has taken this convenience a step further, putting financial management directly into the palms of users' hands. Additionally, automated features within e-banking platforms contribute to enhanced convenience. Scheduled payments, recurring transactions, and automatic alerts simplify financial management and help users stay on top of their accounts effortlessly. The efficiency gains achieved through these automated processes not only benefit customers but also contribute to cost savings for financial institutions, fostering a win-win scenario. [9-10]

Customer Experience and Personalization

Customer experience and personalization stand as pivotal pillars in the evolution of e-banking services, shaping a new paradigm in how individuals interact with their financial institutions. E-

banking platforms are not only transactional interfaces but also dynamic environments tailored to meet the unique preferences and needs of each customer. The essence of customer experience in e-banking lies in the seamless, user-friendly interfaces that facilitate easy navigation and intuitive interactions. From account management to transaction execution, the design of these platforms prioritizes simplicity and efficiency, ensuring that users can effortlessly access and utilize various banking services. Mobile applications, in particular, have played a significant role in enhancing customer experience by providing on-the-go access through user-friendly interfaces. Moreover, personalization has emerged as a cornerstone of e-banking innovation. Through advanced data analytics and customer profiling [38], financial institutions can offer personalized services, recommendations, and tailored product offerings. Customer behaviors, transaction histories, and preferences are analyzed to create a customized experience, ensuring that users receive relevant information and suggestions aligned with their financial goals. Chatbots and virtual assistants contribute further to the personalized customer experience. These AI-driven tools engage with customers in real-time, providing instant assistance, answering queries, and guiding users through various processes. The integration of artificial intelligence not only enhances efficiency but also adds a layer of personalization as these systems learn from user interactions over time. E-banking's commitment to customer experience extends to responsive and efficient customer support mechanisms. Live chat features, email support, and dedicated helplines ensure that customers can easily seek assistance when needed. The proactive resolution of issues and the provision of real-time support contribute to an overall positive customer experience. The evolution of customer experience in e-banking [39] also involves the integration of feedback loops. Regular surveys, customer feedback mechanisms, and data analytics allow financial institutions to continuously refine and optimize their services based on user input, ensuring a customer-centric approach to development. [9-10]

Mobile Banking and Digital Wallets

Mobile banking and digital wallets represent a transformative shift in the way individuals manage their finances, providing unparalleled convenience and flexibility through the integration of cutting-edge technology.[40]

Mobile Banking: Mobile banking refers to the use of smartphones and tablets to perform various banking activities, bringing financial services directly to the palm of the user's hand. Key features of mobile banking include:

- a) **Account Management:** Users can check account balances, view transaction histories, and monitor their financial activities in real-time.
- b) **Fund Transfers:** Mobile banking facilitates instant transfers between accounts, both within the same bank and across different financial institutions.
- c) **Mobile Deposit:** Users can deposit checks remotely by capturing images of the checks using the mobile banking app, eliminating the need to visit a physical branch.[41]
- d) **Bill Payments:** Mobile banking enables users to pay bills, schedule recurring payments, and manage their financial obligations conveniently.
- e) **Alerts and Notifications:** Real-time alerts and notifications keep users informed about account activities, ensuring prompt awareness of transactions and potential security issues.

- f) **ATM Locator:** Integration with GPS technology allows users to locate nearby ATMs [7], providing convenient access to cash withdrawal services.
- g) **Biometric Authentication:** Many mobile banking apps incorporate biometric authentication methods, such as fingerprint recognition or facial ID, enhancing the security of user accounts.

Digital Wallets: Digital wallets, or e-wallets, are virtual platforms that store payment information securely, allowing users to make electronic transactions without the need for physical cash or cards. Key features of digital wallets include:

- a. **Contactless Payments:** Digital wallets enable contactless payments using near-field communication (NFC) technology, providing a quick and secure way to make transactions in stores.
- b. **Online Purchases:** Users can make secure online purchases by selecting the digital wallet as the payment method, streamlining the checkout process.
- c. **Card Storage:** Digital wallets store multiple payment cards, loyalty cards, and even boarding passes, reducing the need to carry physical cards and documents.
- d. **Peer-to-Peer Payments:** Users can easily transfer funds to friends and family by linking their digital wallet to the recipient's mobile number or email address.
- e. **Security Features:** Digital wallets employ robust security measures, such as tokenization and biometric authentication, to protect the stored payment information.
- f. **Integration with Loyalty Programs:** Some digital wallets integrate with loyalty programs, allowing users to earn and redeem rewards seamlessly during transactions.
- g. **Expense Tracking:** Digital wallets often provide features for tracking and categorizing expenses, offering users insights into their spending patterns. [11-12]

Financial Inclusion and Societal Impact

Financial inclusion through e-banking services has emerged as a powerful force in fostering economic empowerment and societal development. By providing access to formal financial services for individuals who were previously excluded or underserved, e-banking contributes significantly to enhancing financial well-being and driving positive societal impact. Financial inclusion [42] is particularly crucial for segments of the population that have limited access to traditional banking infrastructure, such as those in rural areas or low-income communities. E-banking platforms transcend geographical barriers, offering a cost-effective and accessible means for individuals to participate in the formal economy. Mobile banking applications, in particular, have played a pivotal role in reaching unbanked populations, allowing them to conduct transactions, save, and access credit services. The societal impact of financial inclusion through e-banking extends beyond individual empowerment to broader economic development. By bringing more people into the formal financial system, e-banking facilitates increased savings, enables access to credit for entrepreneurial ventures, and fosters a culture of financial responsibility. This, in turn, contributes to economic growth and resilience at both the individual and community levels. Moreover, e-banking services create opportunities for small and medium-sized enterprises (SMEs) to thrive. Access to digital financial tools allows entrepreneurs to manage their finances more efficiently, access working capital, and participate in e-commerce ecosystems. This, in turn, stimulates local economies and contributes to job creation, further

amplifying the positive societal impact. The use of e-banking for financial inclusion also aligns with broader sustainable development goals. It promotes gender equality by providing women with increased financial autonomy, as well as supporting initiatives to alleviate poverty and reduce income inequality. Additionally, e-banking can serve as a catalyst for improved financial education and literacy, empowering individuals to make informed decisions about their finances. [9-13]

Significance of the Research

The significance of the impact of technology in e-banking services is multifaceted, influencing various aspects of the financial industry, customer experiences, and societal dynamics. Understanding this significance provides insights into the transformative effects and the future trajectory of electronic banking. Here are key points highlighting its significance:

- a. Enhanced Convenience and Accessibility:** Technology in e-banking has made financial services accessible 24/7 from anywhere, allowing users to manage their accounts and conduct transactions at their convenience. This has transformed the accessibility of banking services on a global scale.
- b. Cost Efficiency and Operational Streamlining:** The integration of technology has led to cost savings for financial institutions by reducing the need for physical infrastructure and streamlining operational processes. E-banking eliminates many traditional costs associated with brick-and-mortar establishments.
- c. Security Advancements:** Technological innovations have significantly improved the security measures in e-banking, including robust encryption, biometric authentication, and advanced fraud detection systems. This has instilled confidence in users, mitigating risks associated with online financial transactions.
- d. Innovative Financial Products and Services:** Collaboration between traditional banks and fintech companies, fueled by technology, has given rise to innovative financial products and services. This includes digital wallets, robo-advisors, peer-to-peer lending platforms, and block chain-based solutions, enhancing the overall suite of offerings.
- e. Customer Experience and Personalization:** Technology has revolutionized the customer experience in e-banking by providing user-friendly interfaces, personalized services, and efficient customer support. Data analytics and artificial intelligence contribute to tailored recommendations, fostering positive interactions.
- f. Global Financial Inclusion:** E-banking has played a pivotal role in advancing financial inclusion, bringing banking services to previously underserved populations. Technology facilitates access to formal financial systems, empowering individuals and businesses worldwide.
- g. Efficient Regulatory Compliance:** Technology aids financial institutions in adhering to regulatory requirements more efficiently. Automated compliance processes and data analytics contribute to timely and accurate compliance, ensuring adherence to industry standards and legal obligations.
- h. Economic Development and Job Creation:** The impact of technology in e-banking contributes to economic development by stimulating entrepreneurship, supporting small

businesses, and creating job opportunities. It fosters a more dynamic and inclusive financial ecosystem.

- i. **Societal Transformation:** E-banking services contribute to broader societal transformations by promoting financial literacy, reducing economic disparities, and empowering marginalized communities. It aligns with global efforts toward sustainable development goals.
- j. **Adaptation to Changing Consumer Behavior:** The significance lies in the adaptation of banking services to changing consumer behavior. As users increasingly prefer digital interactions, the evolution of e-banking ensures that financial institutions remain relevant and meet evolving customer expectations. [11-14]

Conclusion

The transformative journey of e-banking propelled by technology is evident in its impact on convenience, security, and global financial inclusion. While innovations like mobile banking and digital wallets redefine customer interactions, security measures such as encryption and biometric authentication safeguard sensitive transactions. The societal impact is pronounced, fostering economic empowerment and entrepreneurship. However, challenges persist, requiring continual adaptation to changing consumer behavior and addressing concerns of security and inclusivity. The significance of this research lies in understanding and navigating the dynamic interplay between technology and e-banking, guiding the financial industry toward a more resilient, inclusive, and technologically advanced future.

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