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Article

Banking Sector Transformation: Disruptions, Challenges and Opportunities

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Abstract: Banking has evolved from ancient times of using grain banks and temple lending to modern banking practices. Transformation of the banking sector has ensured that banks play the crucial role of facilitating faster and efficient service delivery. This paper traced banking evolution and examined associated disruptions, opportunities and challenges. With the specific objective of influencing policy-oriented discussions on the future of banking, this study adopted a literature review methodology of integrating various sources, such as scholarly journals, policy reports, and institutional publications. Public interest theory and disruptive innovation theory underpinned the study. Findings revealed that banking has evolved from Banking 1.0 to Banking 5.0 due to disruptive factors which have been pivotal to the significant structural sector changes. Banking 1.0 (pre-1960s); Banking 2.0 (1960s to 1980s); Banking 3.0 (1980s – 2000s); Banking 4.0 (2000s -2020s); and Banking 5.0 (2020s to the future). Despite the existence of opportunities in the transformation, challenges include regulations, skills shortages, legacy and cybersecurity that must be addressed. This call for stakeholders coordinated response with the banking`s future requiring collaborations as cashless economies, digital economies, and digital currencies take centre stage.

Keywords: banking evolution; fintech; digital banking; banking sector transformation; artificial intelligence; regulatory framework; cybersecurity; customer experience

1. Introduction

In the digitalised world, the financial intermediation role of banks is heightened and remains pivotal. To ensure provision of safe and secure customer centric financial services, digital technologies play a crucial role in facilitating faster and efficient delivery. Notably, banking is evolving from traditional to digital banking. Characteristically, traditional banking has been associated with conventional banking methods and banking services provided mainly in brick-and-mortar structures. On the other hand, digital banking driven by technological innovations introduces digital access in execution of banking services.

Ahmad (2025) concurs with Tuti, Nurul, Hartaty, Fifin and Loso (2023) that digital banking has transformed and reshaped the traditional financial services landscape through operational efficiencies, improved service delivery, and customer experiences among others. Indeed, these developments have been influenced primarily by tech savvy generation, improved internet penetration rates, increased availability of affordable mobile gadgets spurred by integration of fintech and banking (Nanda, 2025; Mbura and Kagoya, 2024). All these have disrupted the approaches and services associated with traditional banking. Noticeably, the integration of financial technologies (fintech) and banking has seen an increased development of digital banking platforms, usage of banking cards in transacting and shift towards cashless society.

Fintech players innovation and creative solutions while financial institutions provide regulatory compliance framework and customer base. For the fintech to scale up and ensure long-term success they require regulatory expertise and customer base possessed by the banking sector. While the banking sector requires adaptive innovations to meet the demands of dynamic operating

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environment. In fact, a mutually reinforcing relationship exists between fintech and financial institutions. For sustainable success, collaboration is key in the existence of fintech and financial institutions. Thus, through collaboration, synergistic benefits accrue to the economy and industry by capitalizing on the strength of both parties (Tuti *et al*, 2023). The synergistic benefits drive innovation and growth in the financial services sector (Sanyaolu *et al*, 2024; Khuan, 2024; Bhasin and Rajesh, 2021).

Originally, the emergence of fintech companies in the financial services sector was viewed as disruptive with potential to eliminate traditional bank dominance (Aysan and Nanaeva, 2022; Chiu, 2016). This view was dominant especially after the 2007/8 Global Financial Crisis (GFC). On the contrary, Zalan and Toufaily (2017) observed inconsistences associated with disruptive innovation theory's suggested strategies for disruptors. Furthermore, they revealed strategies adopted by incumbents as collaborative. Progressively, the disruptive nature is evolving into collaborative partnerships.

Sanyaolu, Adeleke, Azubuko, and Osundare (2024) observed that fintech solutions bridged the infrastructure gap within the traditional banking system by capitalizing on digital innovations to provide crucial financial services such as savings, credit and insurance. Not only have fintech solutions addressed financial inclusion but this has stimulated economic growth and transformed banking. According to Korobov's (2017) hypothesis, banking will become more focused and connected to technology, customers, products, and life. The four pillars of Korobov's (2017) summary of the future of banking are "Bank = technology," "Bank = client," "Bank = product," and "Bank = life." It is further postulated that a human being is Homo financial in the digital age, which means they possess financial literacy and financial thinking.

Accordingly, this paper traces the transformation of the banking sector from the ancient times of barter trade to the modern banking practices. Also, examines associated disruptions, opportunities and challenges. Significantly, the paper`s findings aim to inform and influence policy-oriented discussions on the future of banking. The paper is organised into six sections. Section 1 is the introduction with Section 2 outlining the research approach adopted. Section 3 being the literature review in which the evolution of banking sector and theories are discussed. Section 4 outlines the disruptions, opportunities and challenges in the banking transformation. Section 5 being the conclusion and future directions of study.

2. Research Approach

With the specific objective of influencing strategic policy discussions of the banking sector, this study adopted a literature review methodology as its primary research technique. The study traced both historical and current change drivers alongside assessing the strategic policy implications to the banking sector. The approach enables the integration of various sources, such as scholarly journals, policy reports, and institutional publications. Additionally allowing flexibility in interpreting emerging themes across multidisciplinary domains (Abdul Latif, Nik Mahmood & Mohd Ali, 2020; Arner, Barberis & Buckley, 2015).

Review fosters thematic exploration, historical contextualization, and policy-relevant synthesis, which are essential to comprehending multifaceted disruptions like technological innovation, regulatory change, and organizational structure shifts, in contrast to systematic reviews that prioritize thorough coverage and stringent inclusion criteria (Zetzsche *et al*., 2020). This approach is relevant for generating insights that promote evidence-based decision-making has been confirmed by effective application in similar research focused on digital finance and regulatory innovation among others (Cele & Kwenda, 2025; Demirgüç-Kunt *et al*., 2018; Puschmann, 2017; Beck, Demirgüç-Kunt, and Levine, 2009). This strategy is consistent with the study objective of stimulating policy-oriented discussion on the opportunities and challenges influencing banking's future.

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3. Literature Review

The paper`s literature is organised into two, theoretical underpinnings and evolution of banking.

3.1. Theoretical Framework

Two theories underpin this study, namely public interest theory and disruptive innovation theory. Firstly, to be discussed is public interest theory.

3.1.1. Public Interest Theory

The theory was advanced in 1920 by Pigou. Pigou was of the view that regulations are designed with the regulatory aim of correcting market imperfections (Colm, 2024; Croley, 2009; Ugochukwu, 2001). This was based on the implied assumption that businesses do not operate to serve public interests. Hence, regulations are usually induced by public crises or discontent. For example, The Dod Frank Act of 2010 in USA was enforced to address bank`s risk taking behaviour after the 2007/8 GFC. Additionally, the EU enforced the General Data Protection Regulations (GDPR) in 2018 to address data security issues due to digital operating environment requirements.

Critique of theory centred on regulations capture by industry players as well as failure to adapt in an evolving environment (Colm, 2024; Stigler, 1971). Applying the theory to this study, regulations are designed and developed with the overall objective of aiding attainment of regulatory mandates such as financial stability and integrity. Failure to address these mandates results in a contagion effect in the economy (Su, Zhai, Zhou, Zhuang, and Wang, 2024). Hence, the inclusion of consumer protection and financial inclusion mandate to the traditional regulatory mandates (Allen, 2024; Claessens & Rojas-Suarez, 2016). In the era of modern banking with evolving technologies, failure to have adaptative regulations results in regulatory arbitrage. Regulatory arbitrage can be viewed as market failure.

To overcome public interest theory criticisms and minimise risks of capture by industry players, regulators need a balanced approach to regulating banking in the evolving fintech era. The balanced approach should promote innovation and be sustainable without stifling competition.

3.1.2. Disruptive Innovation Theory

The theory was developed by Christensen in 1997. The theory explains how new entities enter existing markets using innovative technologies as a competitive edge to disrupt or reshape existing markets. Resultantly, new service and products offering, new consumer segments are created, and new approaches to business are introduced into an existing market among others. By leveraging on innovative technologies, this ensures efficient and cheaper service delivery. However, these innovative approaches disrupt the traditional market players (incumbents). Hence, disruptive innovation.

Sintha (2021) revealed that in Indonesia, branchless banking has transformed the financial services sector by leveraging on innovative technologies to provide service access to the unbanked population. Furthermore, with fintech innovations customised financial products and services have been developed targeting the underbanked and unbanked population (Sanyaolu, Adeleke, Azubuko, and Osundare, 2024). Pai (2022) identified the smart mobile phones technology as a disruptor to incumbent banks models. Mobile network service providers such as MTN, Airtel and Glo have transformed by integrating the traditional banking system and mobile banking (Monye & Osio, 2024: Pang & Abdullah, 2024).

Applying the theory to the study, technologies continue to play a key factor in transforming the banking sector. This has resulted in new products, services and players. However, some view technology as a disruptor while others view it as requiring collaborative partnerships.

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3.2. Evolution of Banking (Banking 1.0 to Banking 5.0)

The historical developments of banking assist in having better perspectives on the factors that have been pivotal to the significant structural sector changes. Considerably, previous studies on the evolution of banking, industry and ICT served as basis for the categorisations (Chougule & Dudekula, 2024; Rathnayake, 2023; Mehdiabadi, Shahabi, Shamsinejad, Amiri, Spulbar and Birau, 2022; Megargel, Shankararaman, and Reddy, 2018).

The categorisations to be discussed are Banking 1.0 (pre-1960s); Banking 2.0 (1960s to 1980s); Banking 3.0 (1980s – 2000s); Banking 4.0 (2000s -2020s); and Banking 5.0 (2020s to the future):

3.2.1. Banking 1.0 (Pre 1960s)

Banking began thousands of years ago with its origins dating back to roughly 2000 BC in Assyria and India, when traders lent money to purchase grain (Utami, 2021). During the same period, temples in ancient Greece and Rome started taking deposits, making loans, and even trading money. With time, these Italian banking practices spread throughout the rest of Europe. In 1926, Italy enacted regulatory supervision legislation to deposit taking institution (Molteni & Pellegrino, 2024; Dermine, 2003). Notably, advancements occurred in Amsterdam under the Dutch Republic during the 17th century while in London commenced in the 18th century. These advancements laid the foundation for Europe`s modern banking systems.

Mehdiabadi *et al*, (2022) observed that Banking 1.0, referred to the conventional banking model that existed prior to 1960, when branches operated at scheduled times and banking services were customised. Characteristically, during this period money was physically transferred, records were kept on paper, and bank managers then knew the clients facially, by names and every aspect of client`s life (Chougule & Dudekula, 2024). The decision to lend was based on the reputation and character. Regulations were not stringent with banking transactions, mostly done on good faith and followed by a handshake.

Historically, incorporation of technological innovations in the financial services sector began in 1945 when cheques were first accepted as a form of payment (Chougule & Dudekula, 2024; Megargel, *et al*., 2018). This was followed by the first credit card in 1957 in United States of America (USA), the diners credit card which was mass marketed (Burugulla, 2025; Fry, 2025). However, with the manual system in operation, there was slow service, alteration in cheque payments and prone to human error (Utami, 2021).

In general, operations during this era created the backbone of today`s financial system with core principles of trust and customer service. According to modern banking theory, commercial banks play a crucial role in the economy's wealth distribution when combined with other financial intermediaries (Mehdiabadi *et al*, 2022, 2020; Bhattacharya and Thakor, 1993).

3.2.2. Banking 2.0 (1960s – 1980s)

In this era, showing progression from Banking 1.0 to Banking 2.0, bank`s branch operations and networks expanded (Chougule & Dudekula, 2024). Due to the inefficiencies associated with manual systems under Banking 1.0, mainframe computers for data storage and accounting were introduced (Megargel, *et al*., 2018). For instance, bank transactions were bulk processed at the end of the day.

In the 1960s, Barclays Bank was the first bank globally to introduce the Automated Teller Machine (ATM) which eased financial transactions (Bansal, 2025; Batiz-Lazo, 2009). Later, debit cards were released as a means of conducting transactions. This advancement unlocked the global network of automation in the banking sector, which benefited both banks and clients.

The 1970s saw the creation of Society for Worldwide Interbank Financial Telecommunications (SWIFT), a global automated financial messaging service which eventually harmonized worldwide cross border foreign transactions (Sharmin, *et al*., 2024; Kumar, 2025). To participate in the SWIFT platforms, banks have a unique ID known as SWIFT or Bank Identifier Code (BIC) universally accepted by the central banks (Metzger & Paulowitz, 2018).

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Various technologies were introduced within the banking system during Banking 2.0. Consequently, the advancements came because of electricity being incorporated into the industrial functions in line with Industrial revolution 2.0 (Mehdiabadi *et al*, 2022). Hence, Megargel *et al*. (2018) referring to this period as data processing years.

3.2.3. Banking 3.0 (1980s – 2000s)

The client server period stretched from the 1980s to 2000s, also known as Banking 3.0. Megargel *et al* (2018) revealed that during this period banks facilitated IT based infrastructures to enable bank clients to interact with the bank in addition to the new service offering by banks. Furthermore, Smith & Liu (2024) concurred with Omarini (2018) who opined that new service offerings were prompted by innovative technologies such as internet banking which was popularised in the 1990s with the advent of banks having world-wide websites. For instance, Tan and Teo (2000) revealed that in 1997, Singapore had five banks with customised websites for internet banking namely Post-Office Savings Bank (Postbank), Overseas Union Bank (OUB), Development Bank of Singapore (DBS Bank), United Overseas Bank (UOB) and Overseas-Chinese Banking Corporation (OCBC).

Services which came along with internet banking included paying bills, transferring funds, printing statements, and account balance inquiries. Availability of these technologies enabled faster speed and data flow exchange within the banking sector. Thus, electronic business was done at a faster rate than the previous analogue period, with millions of bank transactions taking place every day. Internet banking represented one of the evolutionary stages of banking (Safari, Bisimwa, and Buzera Armel, 2022). This resonated with industrial automation associated with Industrial Revolution 3.0 (van Thiel, 2025)

In response to this increase, banks began using data warehouses to store a record of all transactions (D'Andrea & Limodio, 2024). This was to enable data mining to be utilized in creation of marketing strategies based on previous consumer interactions. The branches' one-day processing lag was still preventing the supply of real-time data, even if these warehouses signalled the beginning of data analysis in the banking industry (van Thiel, 2025; Del Gaudio, *et al*., 2021; Megargel, Shankararaman and Reddy, 2018).

3.2.4. Banking 4.0 (2000s – 2020s)

According to Megargel, *et al* (2018) the predictive period is where banks can process real time transactions. For instance, the bank should be able to respond promptly and maintain the customer's satisfaction if a customer lodges a complaint with the call centre (Megargel, Shankararaman and Reddy, 2018). Accordingly, the Banking 4.0 era enabled banks to utilise forecasting or prediction models based on historical transactions. During this era, financial and non-financial firms retained data virtually and limitlessly due to the cheap cost of data storage (Arslanian and Fischer, 2019). Banking 4.0 embraces the innovative solutions offered through financial technology companies and specializes in providing customized customer-oriented experiences through digital channels (van Thiel, 2025).

Banking operations are crucial to banks performing and executing customer transactions seamlessly. Saxena (2022) discovered that over the last two decades of the 20th century and the first part of the 21st century, banking operations have changed. They changed from traditional ledgers to automated ledger posting machines (ALPMs) to current core banking systems (CBS).

Predictive period known as Banking 4.0 encouraged collaboration and innovation in the financial services ecosystem. Mehdiabadi, Tabatabeinasab, Spulbar, Yazdi, and Birau (2020) emphasised that Banking 4.0 was premised on promoting collaboration between customers and financial institutions. Collaboration remains key as evidenced by products and service offering being driven by customers in need of convenience. So, this resonates with Industrial 4.0 which is based on the development of smart products and services that rely on integration of internet of things (Chougule & Dudekula, 2024) and use of big data analysis (Rajeshkumar, 2025).

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3.2.5. Banking 5.0 (2020s to the future)

Banking 5.0 is going to be characterised by Exchange-traded funds (ETFs), cryptocurrencies, high-frequency trading, intelligent banking, robo-advisors and cobots, embedded banking, and responsible banking. Emphasis is going to be placed on sustainability issues. Thus, Banking 5.0 would require greater collaboration between human and intelligent systems (Chougule & Dudekula, 2024; Rathnayake, 2023).

To improve client experiences, Banking 5.0 emphasizes the seamless integration of technology with human interfaces, with particular emphasis on sustainable banking (). In Banking 5.0, banks will serve as platforms that collaborate with different partners in the ecosystem to offer a wide range of financial and non-financial services.

The emergence of technologies like voice recognition, virtual and augmented reality, and artificial intelligence, which together provide a powerful combination for improving banking services and addressing current banking issues, is more responsible for the transition towards Banking 5.0 rather than new inventions solely (Shahabi *et al*., 2020).

In comparison, Banking 4.0 and Banking 5.0, collaboration in Banking 4.0 centred on financial institutions with fintechs while Banking 5.0 is on human and intelligent system. This shows great advancement in the interaction which requires traditional banks to move away from legacy systems.

Traditional banks are anticipated to undergo major transformation and create alliances with fintechs start-up businesses (Chougule & Dudekula, 2024; Elsaid, 2023). Therefore, there is little chance that traditional banks would cease operating. However, it is anticipated that the spread of fifth-generation technology will make it easier for innovative banking models to be adopted and shared. The model includes digital banks with a different approach to service offering.

4. Disruptions, Challenges and Opportunities

Banking has evolved from the barter system used in ancient times, industrial revolution propelling trade and commerce, and embracing digital solutions in the financial intermediary role (Rajeshkumar, 2025; Tochukwu, Ahmed, Anwuli, Chibuike, Blessed, Chinwe, 2023; Kurobov, 2017). The changes reflect technological advancements, evolving customer behaviour and regulatory developments. However, Kurobov (2017) pointed out that banking sector changes were revolutionary not evolutionary. This indicates radical and significant structural changes within the banking sector.

Tochukwu *et al* (2023) argued that the future of bank success is hinged on overcoming regulatory, ethical, and technological challenges. Mehdiabadi *et al*. (2022) identified technology, together with political and economic factors, as drivers of future banking. Whereas Korobov (2017) highlighted innovation and competition being the drivers of banking transformation. Globalization, capital concentration, the creation of new banking models, and a new banking culture are some of the unique drivers of the banking sector's evolution. Notably, these factors have significantly changed the competitive and highly regulated banking sector.

The transformation has disrupted the banking sector, created opportunities and challenges for the stakeholders which are summarised in Table 1. Herein discussed after are the disruptions, challenges and opportunities.

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Table 1. Summary of each Banking era`s characteristics, disruption, challenges and opportunities. .

Banking Era	Characteristics	Disruption	Challenges	Opportunities
Banking 1.0 (pre (1960s)	Traditional relationship banking Physical cash transportation; Manual system and physical record keeping	Credit card Cheque Mass banking	Limited banking services Slow service delivery Cheque fraud Regulations	Foundational banking principles
Banking 2.0 (1960s-1980s)	Expanding branch networks Analogue system; Bulk transaction processing; Relationship banking	Debit and credit card SWIFT international payment platform Mainframe computers	Regulations Risk management Limited banking access	More customers and development of more products Development of risk management strategies and credit scoring models
Banking 3.0 (1980s-2000s)	Data warehouse; Internet banking; Banking access 24/7; Relationship banking; batch transaction processing. Expanding branch networks;	Electronic banking Financial liberalisation Globalisation ICT based infrastructure	Regulations Financial instability	ATMs cash access outside banking hours Increased automation
Banking 4.0 (2000s – 2020s)	Instant and real time transaction processing; Digital record keeping; Reducing branch networks; mobile banking; banking apps and digital wallets	Financial innovation Regulation arbitrage and competition between fintech and traditional financial institutions 2007/8 Global Financial Crisis Artificial Intelligence Blockchain Big data	Cybersecurity Compliance Data ethics and privacy Reduced traditional earnings Customer behaviour	Data Analytics Collaboration between banks and non-banks Digital banking Ancillary earnings
Banking 5.0 (2020s – future)	Customer driven banking; electronic fund transferring; robots, application program-ming interface (APIs), and bots; Instant and real time transaction processing; mobile banking apps - digital payments, online de-liveries, and mobile wallets, use of QR codes to access banking services; digital banks; digital currency	Cloud computing Artificial Intelligence Blockchain ESG and Sustainable Finance Lifestyle banking	Risk Management Data ethics Regulations	Collaboration between human and intelligent systems Ancillary earnings

Source: Researcher's synthesis.

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4.1. Disruption Factors

These are factors that result in structural sector change. Disruptions have been identified in four areas – regulations, technology, human capital and customer behaviour.

4.1.1. Technology

The banking sector is seeing an unparalleled wave of technological disruption due to emergence of fintech, blockchain, and artificial intelligence (AI). By providing quicker, easier, and more user-friendly services through digital-only platforms, these innovations have placed traditional banks' dominance to the test (Prayoga, 2023; Omarini, 2018; Arner, Barberis & Buckley, 2015). To offer real-time, customized financial services, fintech companies and non-banking startups have used agile development models and client data, prompting traditional banks to reorganize their digital strategies and IT infrastructure. Modern banking operations nowadays heavily rely on technologies like chatbots driven by artificial intelligence, biometric authentication, and smartphone apps.

Traditional banking practices have been severely reshaped by technological developments, mostly because of the emergence of FinTech businesses that provide modern financial services. Agility and customer-focused strategies as key characteristics, platforms such as Revolut have challenged traditional banks by offering a range of services through user-friendly mobile applications, currency exchange, international money transfers, and cryptocurrency support (Rybacki, 2022; Polasik, Widawski, and Lis, 2022; Boda & Immaneni, 2019). Revolut and Monzo are some digital banks that have brought competition to the traditional banks in the UK (Volik, 2024; Polasik, *et al*, 2022). In a similar vein, Stripe has revolutionized online payments by providing developers with simple application programming interfaces (APIs) for incorporating payment processing, which helps organizations streamline intricate financial processes (Sen, 2024; Gomber *et al*., 2016).

In reaction to these technology disruptions, traditional banks are adopting open banking initiatives and forming strategic partnerships with FinTech companies. For example, Goldman Sachs and Apple collaborated to produce the Apple Card, integrating technical innovation with financial know-how to provide smooth user experience (Case, 2025). A more competitive and customer-focused financial environment is promoted by open banking, which is made possible via APIs and enables third-party developers to create new financial products. Deutsche Bank made the decision to capitalize on the prospects presented by open banking in 2015 by developing an API programme (Hensen & Kötting, 2022). Through the Deutsche API programme, Deutsche Bank enabled its partners and customers to integrate banking data as well as financial products and services into their own applications and products. As a result, partners can provide their clients with financial services right when they need them.

Cloud computing, blockchain, and artificial intelligence (AI) have all been incorporated into banking, further accelerating technological disruption. While blockchain technology guarantees safe and transparent transactions, AI-powered chatbots and robo-advisors improve customer service by offering immediate, individualized responses (Mohan, 2025). Because cloud computing provides scalable infrastructure, banks may quickly and effectively roll out services to satisfy the changing needs of tech-savvy customers.

These developments challenge established revenue sources including fees from intermediary providers and reduce dependency on physical branches. While banks that embrace transformation are reinventing business models to include innovation as an essential competence, those that do not face the risk of losing market share. However, all these technological developments present new challenges in the areas of cybersecurity, data security, and system compatibility, putting pressure on banks to innovate while safeguarding consumer confidence.

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4.1.2. Regulations

The presence of fintech has forced countries to have guidelines which either foster innovation or enforce stringent control (Sharma, 2024). The main reason for regulatory restrictions includes cybersecurity concerns such as fraud, money laundering, and data breaches. In addition to promoting fintech innovation, financial regulators have an enormous duty of striking a balance on the regulatory mandates such as consumer protection, competition and financial stability (Allen, 2024; Claessens & Rojas-Suarez, 2016).

To oversee fintechs in the USA, a market-driven approach is applied. Regulators enforcing this being Security Exchange Commission (SEC) and Office of Comptroller Currency (OCC). In the UK through the Financial Conduct Authority (FCA) and Prudential Regulation Authority (PRA), the country has an approach that fosters innovation through the regulatory sandboxes. Whereas China enforces stringent government led oversight. The enforcements are done by People`s Bank of China (PBOC) and the China Banking and Regulatory Insurance Commission (CBRIC). In the EU using the revised Payment Services Directive (PSD2), they promote open banking, giving fintechs access to banking information. This is done through European Central Banking (ECB) and European Banking Authority (EBA). Similar to South Africa, SARB advances the fintech innovation agenda in collaboration with banks.

Regulatory disruption has significantly improved banking operations. The emergence of data-driven compliance mechanisms and regulatory technology (RegTech) offers banks another chance to improve their governance and risk management frameworks. Banks are being forced to update compliance systems and reporting procedures because of the introduction of frameworks like open banking, data privacy regulations like the General Data Protection Regulation (GDPR), and more stringent anti-money laundering (AML) regulations. Regulatory technology, or RegTech, is becoming an essential investment, according to Zetzsche *et al*. (2020), as it enables institutions to automate compliance and adjust to changing legal requirements. Also, streamlines compliance tasks like fraud detection, anti-money laundering (AML) monitoring, and reporting obligations, which not only improves regulatory responsiveness but also lowers administrative burdens and human error.

Failure of Silicon Valley Bank (SVB) in March 2023 shows that regulatory control has been a challenge despite regulatory technologies developments. This was viewed as the third largest bank failure in USA (Casey, 2024). Regulatory enforcement deficiencies were highlighted by the San Francisco Federal Reserve's reluctance to take meaningful action despite identifying problems with SVB's risk management methods more than a year prior (Conti-Brown, 2023). In order to avert systemic risks, such occurrences highlight the necessity for more proactive and coordinated regulatory actions. For instance, customer onboarding has now been automated by most banks allowing ongoing client risk assessment. Incorporation of AI into the banking service provision provides personalised and predictive services. AI algorithms analyses service users to offer customised services (Wagner & Eidenmuller, 2019).

To drive institutions toward accessibility and seamless integration, regulators now encourage banks to securely exchange consumer data with approved third parties using standardized APIs. For instance, in the EU with the PSD2 which allows information sharing with prior consent, a credit scoring model has been developed which allows customer evaluation in the absence of established data sets (Saia, Giuliani, Pompianu, and Carta, 2021). On the other hand, these policies place an enormous amount of load on legacy infrastructure and make operations more difficult, even as they encourage innovation. To ensure that bank systems can adapt to changing requirements without negating performance or user experience, traditional banks must find a balance between innovation and regulatory compliance.

Within the transformation landscape, banks' operational expenses and capacity for innovation have also been hampered by the growing regulatory constraints. Adhering to conflicting legislation frequently results in high operating costs, while reducing innovation expenses and possibly impeding the creation of new financial services and products (Financial Times, 2025). To commensurate with this environment, banks are spending money on Regulatory Technology

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(RegTech) solutions that automate compliance procedures, which reduce operational expenses and increase productivity. The financial regulatory landscape has grown deeper, with new frameworks designed to improve consumer protection and transparency among others.

4.1.4. Human Capital

The banking sector is changing due to artificial intelligence (AI) technology such as chatbots, robotic process automation (RPA), and machine learning algorithms (Premkumar & Arivazhagan, 2025). Employees with expertise in data analysis, cybersecurity, and digital product development are in greater demand as conventional operations are replaced by automation and artificial intelligence. To stay relevant in the changing banking landscape, banks fund reskilling initiatives to perform more sophisticated and strategic tasks. For instance, BankCo's FORWARD project (Abdul Latif *et al*., 2020). Resultantly, banks are being forced to change from being product-focused entities to becoming experience-driven, adaptable ecosystems.

Organizational structures and employment approaches must be rethought considering the banking sector's digital transformation. The banking sector has two major obstacles, overcoming a shortage of digital skills in the workforce and adjusting to a demographic of digitally native consumers that anticipate multichannel, seamless experiences (Premkumar & Arivazhagan, 2025; Abdul Latif *et al*., 2020). On the other hand, Bessen (2019) posits that though bank operational efficiencies are expected to improve, job security and skills extinction concerns arise. Thus, to manage tech-driven operations, HR must upskill staff in analytics and innovation and encourage agile mindsets.

The banking sector's digital transformation demands an adjustment to more flexible and agile work environments. Cross-functional teams are replacing traditional hierarchical organizations because they can react quickly to changes in the market and in technology. The shift necessitates a cultural shift that values cooperation, ongoing education, and flexibility (Tenakwah & Watson, 2025; Abdul Latif *et al*., 2020). Agile, digitally enabled approaches that prioritize employee empowerment, data analytics, and collaboration are displacing traditional HRM approaches. Banks are investing more effort into creating agile work cultures that allow teams to employ design thinking and provide customer-focused solutions.

The COVID-19 pandemic hastened the adoption of digital technologies for collaboration and remote work. Also, the shift to hybrid work model that blends in-person and remote labour (Cahyono, 2025). Establishing secure communication platforms and remote access systems was necessary as institutions swiftly adjusted to virtual work settings. Many banks are now considering long-term hybrid work models because of this change, which not only guaranteed company continuity during the crisis but also showed the viability and advantages of flexible work arrangements. However, organisations ought to encourage hybrid models that incorporate mental health initiatives, flexible work schedules, and individualized well-being programs (Telu & Kumar, 2025). Maximizing the advantages of hybrid work arrangements and maintaining a resilient and balanced labour market require addressing the support mechanisms and updating labour regulations (Singh & Sharma, 2025).

HR leaders must take a proactive and strategic approach to successfully integrate AI and automation in the workforce. Adopting AI-driven innovations requires a workforce that is both literate and flexible, which calls for the development of new career pathways and positions focused on AI, creative employment models, and extensive upskilling initiatives. In the era of AI, HR must serve as a mediator between people and machines (Tenakwah & Watson, 2025). Also, ensure a smooth transition, by addressing skill transitions, job insecurity, and changes in workplace culture (Premkumar & Arivazhagan, 2025). To maintain a motivated workforce, organizations must assist employees through engagement, training, and having open communication channels.

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4.1.5. Customers Behaviour

The banking sector is facing significant disruption because of shifting consumer expectations. Consumers of modern banking prefer fast, simple, and customized experiences on a variety of channels (Mohsen, Hamdan, and Shoaib, 2025). Sen (2024) concur with Arner *et al*. (2015) that banks have been forced to redesign their digital engagements and provide more value through personalization. This was due to competition with tech giants that provide quick satisfaction and user-friendly interfaces (Sen, 2024). To sustain engagement and loyalty, customers now need real-time information, integrated digital wallets, and AI-driven recommendations.

Modern consumers demand seamless, customized digital banking experiences. They are seeking services that can be accessed on any device, at any time, and from any location. In response to customer demands for ease and personalization, banks such as JPMorgan Chase have created mobile applications that provide real-time transaction alerts and customized budgeting tools (Ranjan, 2025). The rise of digital-only banks, like Ally Bank, which has no physical branches and provides affordable fees and competitive interest rates, is a result of consumers' preference for the convenience of online banking. These banks challenge established banks to improve their digital offerings by appealing to tech-savvy customers who value time and efficiency (Ranjan, 2025; Rybacki, 2022; Polasik *et al*, 2022).

Banks are customizing their products using customer journey mapping and big data to match expectations. This change in design from a product-centric to a customer-centric approach represents a profound cultural shift in bank operations (Casey, 2024). However, it takes a significant investment in infrastructure, data management, and cybersecurity to achieve these objectives. Banks must constantly reinvent their platforms while maintaining privacy and trust since customer loyalty is becoming more and more linked to digital experiences. Failure to do so, face the risk of losing clients to agile competitors.

Banks are using AI-driven virtual assistants into their customer service operations with the goal of fulfilling changing customer demands. For example, Bank of America's Erica enhances client engagement and satisfaction by offering swift responses to questions, proactive financial guidance, and tailored insights (Ranjan, 2025). These developments highlight how crucial it is to leverage technology to fulfil the ever-changing demands of customers.

4.2. Opportunities

The ability of institutions to use technological innovations, data analytics, and flexible business models to boost customer interaction, improve financial service delivery, and promote equitable, sustainable economic growth constitutes a few of the opportunities in the banking sector transformation.

4.2.1. Efficiency and Cost Reduction

Cloud computing, AI-driven analytics, and robotic process automation (RPA) are examples of digital solutions that provide opportunities to reduce administrative costs and streamline processes. Banks can increase efficiency and decrease human error by digitizing internal procedures and automating repetitive tasks (Arner *et al*., 2015). For instance, RPA has been shown to significantly reduce costs for compliance reporting and loan processing at India's ICICI Bank. Banks' total agility is increased by this resource reallocation, which allows them to concentrate on strategic innovation and client engagement.

Banks can access marginalized individuals through digital wallets, banking agency models, and mobile technologies thanks to digital transformation. In low- and middle-income nations, mobile financial services have been helpful in reducing the disparity in financial access (Demirgüç-Kunt *et al*., 2018). Low-cost banking has been made possible in South Africa by mobile platforms such as ABSA`s cashsend and Standard Bank's Instant Money, especially for those living in rural areas and in the unorganized sector. By doing away with the requirement for physical infrastructure, these services enable banks to lower overhead expenses while reaching a wider audience.

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Banks can provide individualized goods and services and gain a deeper understanding of consumer behaviour by utilizing big data analytics (Munira, 2025). By using customer retention tactics, cross-selling, and targeted marketing, this generates new revenue potential. AI-driven platforms that personalize financial suggestions and identify early indicators of financial stress were first introduced by banks such as DBS in Singapore. These programs raise lifetime value, promote digital engagement, and enhance consumer experience.

4.2.2. Digital Financial Solutions

Information technology induced financial services are also promoting accessibility, efficiency, and innovation (Ardhendu, 2025). To promote financial inclusion and reduce barriers for marginalized people, banks are using digital technologies to offer secure transactions, effective payment systems, and individualized financial advice. Additionally, emerging opportunities for improved decision-making and fraud prevention are being made possible by technologies like blockchain and artificial intelligence (Djibran, 2025).

As mobile phones and internet become more widely used, the use of digital payment methods has increased dramatically on a global scale (Babu, Hameed, Nair, Babu, Sharma, Chinnaiyan, and Sungheetha, 2024). By eliminating the need for middlemen and reducing transaction costs, these technologies enable smooth cross-border transactions. Therefore, digital payments have become widely used due to their speed and convenience, which has substantial implications for both businesses and consumers. Global payment providers such as PayPal and Alipay, drastically reduced transaction costs and processing times while enabling real-time financial tracking and management for consumers (Sanyaolu *et al*, 2024: Vives, 2017).

Cybersecurity concerns continue to increase in the modern world, and these threaten customers access to financial services (Adejumo & Ogburie, 2025). For instance, fraud, phishing, identity theft and ransomware are some examples that affect consumers use of digital banking platforms. With the coming up of technological developments, some innovative solutions have been developed which strengthen financial security. These include multi-factor authentication (MFA), blockchain-based secure transactions, and artificial intelligence (AI)-driven fraud detection. Real-time transaction analysis and flagging by AI models enable prompt action, including transactions red flagging or suspending accounts (Lam, 2025). This preventative strategy minimizes the adverse effects of fraud on consumers and financial institutions. Likewise, the decentralized and irreversible ledger of blockchain technology has raised security and transparency in financial transactions, lowering the possibility of fraud and boosting confidence in financial systems (Sanyaolu *et al*, 2024; Zohar, 2015).

Siano *et al* (2020) observed that mobile money is transformative in nature by making use of mobile phones to conduct financial transactions. In Africa the mobile money technology transfer platform gained prominence in Kenya through M-PESA which was launched by Safaricom in 2007. Safaricom the licenced cellular network initiated the mobile money transfer services with support from development-oriented stakeholders (Foster, 2024; Omwansa: 2009). These included the Commercial Bank of Africa which provided traditional banking infrastructure. Musembi (2024) posits that M-PESA has evolved with registered users now able to send and receive money globally. Indeed, it contributed significantly to increasing financial service access to marginalised members of society.

4.2.2. Innovative Collaborative Partnerships

The financial landscape is transforming primarily due to the convergence of Fin-tech and traditional banking approaches (Karani & Jadhav, 2025). Resultantly, traditional banks have been compelled to reconsider strategies and adjust to remain competitive. Through these partnerships, by embracing the Fin-tech revolution, traditional banks can leverage the use of digital innovations and provide a seamless digital banking experience (Sunitha & Madhav, 2020). Financial and non-financial players, including BigTech such as Facebook, PayPal, Google, and Apple, FinTech firms, telecommunications companies, and retailers are making inroads into the mobile banking market

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(Aliu, Ikharo, and Jegede, 2024; Arner, Buckley, Charamba, Sergeev, and Zetzsche, 2022). Undoubtedly, the growing demand for mobile banking services has been brought about by the growing adoption of smartphones.

The mobile banking evolved to integrating mobile technologies with the financial services system (Iyelolu, Agu, Idemudia and Ijomah, 2024). Nevertheless, integration has been more prevalent in developed countries such as the USA and European Union while in developing countries the focus was on using mobile technologies to bridge the financial inclusion gap. The mobile money services were evidently in Ghana with MTN Mobile Money, Kenya with M-PESA, and Zimbabwe with Ecocash. Admittedly, in the late 2000s banks were the key users of SMS-based banking, which changed to app-based banking as smartphones became more widely used (Vinoth *et al*, 2024; Chaimaa *et al*, 2021; Gupta, 2008).

Use of mobile banking brought with it new services like m-wallets, which allow users to store and utilize bank cards as well as merchant loyalty cards, and mobile payments via near-field communication (NFC) technology (Dhumal, 2025; Arner *et al*, 2022). NFC enables contactless payments such as Apple Pay, Google Pay, and Samsung Pay. Mobile banking makes use of portable devices like smartphones, tablets or other mobile devices to conduct transactions and access banking services. Mobile banking apps allow users to pay bills, deposit, transfer money, and check account balances. Though mobile banking provides easier accessibility and convenience, which are essential, this underscores the drivers of a growing and interconnected global financial ecosystem.

With the increasing adoption of mobile banking and expansion of payment systems risks arise (Cele & Kwenda, 2025; Hassan, Ewuga, Abdul, Abrahams, Oladeinde & Dawodu, 2024). The risks include but are not limited to cyber security, data breaches and fraud require concerted efforts to protect consumers and ensure financial system integrity. Thus, emphasis on stakeholders should focus on improving regulatory frameworks, incorporating advanced security technologies, and consumer education.

4.2.3. Explore Additional Revenue

Tuti, *et al* (2023) observed that the disruptive nature has not only affected the traditional revenue streams but forced the institutions to focus on earning through offering value added services and fee-based earning models. Revenue for banks is earned from a range of banking activities they offer. Traditionally, bank`s earnings are in the form of commissions, fees, and net interest income. Thus, to operate profitably and sustainably in the future, banks should explore a new and innovative approach to reconnect with their traditional customers and connect with new customers. Notably, the new category of customers is tech savvy, young and enterprising.

The changing customer demographic requires banks to be strategic in market positioning by aligning with the expected future environment. These include earning income from ancillary services being offered such as cross-selling, that is offering additional products to existing customers (Chougule and Dudekula, 2024: Mehdiabadi, Tabatabeinasab, Spulbar, Karbassi Yazdi, & Birau, 2020). For instance, offering legal and insurance services to an existing customer. This entails additional income and enhancing customer satisfaction. Similarly, in the fintech era banks collaborating with fintech have additional sources of income.

4.2.4. Customer Engagement Channels

Delivery channels refer to the vehicles or ways in which bank customer interacts or engages with the bank. Significantly, interaction to access banking services such as cash withdrawals, payment processing, account opening, debit order activation and funds transfer. Traditionally customers have interacted with the bank using the single channel, face to face or physical visit to the branch (Chougule and Dudekula, 2024; Mehdiabadi *et al*, 2020). Another is multichannel which are independent channels aimed at satisfying several market segments (Xuan, Truong, and Quang, 2024). Various channels that have gained traction and transformed interactions are through electronic

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channels such as ATMs, mobile phones, and computers. These channels operate independently with no interface between these channels.

Cao and Li (2015) identified cross channel as an attempt to partially integrate traditional and online channels. Omnichannel refers to a channel integrating physical and digital channels which includes digital assistants, online, mobile, and in-person, to give clients an efficient banking experience (Chougule and Dudekula, 2024). For instance, using omni channel customers can initiate a service request online via apps and complete physically in the branch. Customers can use a variety of methods to access bank accounts to perform transactions. Additionally, this channel facilitates communication and allows accessibility from any location at any time and across all devices.

In fact, the financial services sector has evolved from the Banking 1.0 era and continues to evolve. This has been precipitated by the technological innovations and customer preferences among others. Banks now operate in a customer centric environment, where clients select financial service providers according to preferences for speed, flexibility, and personalized banking (D'Andrea & Limodio, 2024; Tanda and Schena, 2019). Indeed, banking services and delivery channels have gone through an enormous shift from traditional processes supported by bank employees, to fully automated and self-service. Thereby limiting usage of physical branches to more complicated transactions. Admittedly, Shaikh, Hanafizadeh, and Karjaluoto (2017) observed the significant digitalisation of banking services in the last two decades. This shift places emphasis on efficiency and financial accessibility.

4.3. Challenges

Even though there are many potential benefits to the banking sector's transformation, there are also numerous challenges to overcome. These call for a coordinated response.

4.3.1. Data Privacy and Cybesecurity Threats

The banking sector's digital transformation, which has been facilitated by the adoption of technologies such as cloud computing, big data analytics, and artificial intelligence, has greatly increased vulnerability to cybersecurity risks and data privacy issues (Wang *et al*., 2024). According to IMF (2024), cyber risks cost global banks an estimated US$2.5 billion a year, with over 20,000 cyberattack incidents recorded. This has resulted in financial liabilities valued at more than US$12 billion during the past two decades. These figures highlight the importance of cybersecurity in ensuring institutional resilience and financial stability. As digital platforms manage ever-increasing amounts of private client data, protecting data against ransomware, fraud, and breaches becomes not only a technical issue but also an inherent business necessity (Meduri, 2024; Amoo *et al*., 2024).

Identity theft, phishing, malware, and ransomware are just some of the risks related to cybersecurity that have greatly impacted digital banking. According to Cele and Kwenda (2025), these threats were cited as the most significant barriers to the implementation of digital banking in South Africa. The gross losses increased by 45% to approximately ZAR438 million in 2021, despite an overall 18% decrease in digital banking fraud incidences. This underscores the growing sophistication of cyberattacks (SABRIC, 2021). Common strategies that undermine customer confidence and discourage a wider use of digital services include social engineering, ATM card skimming, malware-injected platforms, and phony banking websites (Acharya & Joshi, 2020; Wang *et al*., 2020).

The willingness of individuals to use digital banking systems is significantly affected by how they perceive associated risks (Njeru & Gaitho, 2019; Apau & Koranteng, 2019). Risks are made worse by limited bank communication and the absence of customer awareness of online security procedures. Additional systemic risks are brought about using untrustworthy third-party vendors and unencrypted data transmission (Alzoubi *et al*., 2022). Research conducted in developing nations reveals a significant gap in public cybersecurity education and technical infrastructure, exposing consumers and institutions to frequent attacks (Mphatheni & Maluleke, 2022). Such constraints undermine banks' reputations and compromise the credibility of digital financial systems.

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WEF (2025) posits that cybersecurity is becoming increasingly complex and complicated with the push for AI and data standards. Cele and Kwenda (2025) outlined some important ways to mitigate these threats. These consist of client education initiatives, antiviral software, intrusion detection systems, secure application development, and strong password standards. Enhancing regulatory compliance, encouraging information-sharing cultures, and upholding current security procedures are crucial to boosting user confidence and the robustness of digital banking.

4.3.2. Legacy Systems

Over the past 20 years, financial services have been the major users and purchasers of ICT services globally (Sharma & Kumar, 2025; Tsingou, 2022; Arner & Barberis, 2015). Legacy systems refer to information systems that have been in existence for some time and used by traditional banks in service delivery. Crucially, these systems have been core to traditional bank`s profitability and hold substantial value (Chougule and Dudekula, 2024).

Saksonova and Kuzmina-Merlino (2017) argued that traditional bank legacy systems contribute to failure to innovate and adopt new technologies. Additionally, legacy systems make compliance expensive and obtaining the requested information or data very slow (Chittoor, 2025; Stulz,2019). For example, an online customer onboarding process using legacy systems costs at least US$10 million and is implemented over a two-year period (Cognizant, 2023). However, the same process carried out using modern technologies, costs US$0.3 million and implemented over a three-month period.

Likewise, fintechs can acquire modern systems without huge capital outlay and be the competitive edge. Essentially, with the current environment of big data, banks can have better insights by making data driven decisions in real time. The decisions are derived from analysis of current and historical data. Compliance-based data requires data extraction from different sets within the banking system; integration, algorithm-based data aggregation and automation can only be achieved using modern technologies. Notably, modern customers prefer better customer experience which can be offered by fintechs than traditional banks.

When integrating new digital technologies with legacy systems, banks encounter significant organizational and technological challenges. Security shortcomings and operational inefficiencies are frequently brought about by incompatibility between outdated and modern systems (Shivaramakrishna & Nagaratna, 2023). Furthermore, the ability to integrate operations and risk functions is based on access to high quality data which is consistent across the organisation (Chinamanagonda, 2024). Challenges associated with legacy systems modernisation include regulatory compliance, legacy data migration, disruption risk and organisational resistance. As a result, this affects agility and scalability.

4.3.3. Systemic Risk

Sanyaolu *et al* (2024) argued that the rise of unregulated or minimally regulated fintech companies, which might function beyond the authority of traditional financial regulators, further increases the possibility of market disruption. Because such entities might engage in unethical activities without being subject to the same level of surveillance as traditional financial institutions, might result in systemic risk. Furthermore, the financial system may be affected if a key fintech company fails, especially if it is linked to other financial institutions (Enriques and Ringe, 2020).

Strategies to reduce the risks associated with fintech while promoting innovation include regulatory sandboxes, mentorship programs, and improved collaboration between regulators and fintech companies. In addition to having appropriate safeguards in place to protect customers and maintain financial stability, these strategies seek to create an atmosphere that is more conducive to fintech innovation (Khan, Kutan, and Qureshi, 2024; de Koker, Morris, and Jaffer, 2019).

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4.3.4. Changing Customer Demographics

The financial services sector is undergoing transformation which has largely been attributed to technological innovations. Furthermore, Kuchciak and Warwas (2021) points out that the financial services sector continues to evolve due to technological innovations, changing regulatory mandates, growing customer preferences, and changes in demographics. These have forced service providers to adjust the way they offer services in line with the changing customer segments.

In line with the demographic transition theory, consumer decision making is influenced by demographic factors (Kaur and Arora, 2019: Warf, 2010). The theory further argues that as people grow so do preferences. For instance, on making decisions about what to purchase, men, children and women interpret information differently resulting in different decisions. Hence, the role of demographic factors in consumer decision making cannot be ignored.

They are five categories of generation namely baby boomers, gen X, gen Y, gen Z, and gen A (Salam, 2024; Seyfi *et al*, 2024; Goh & Okumus, 2020). Baby boomers were born between 1946 and 1964. Gen X was born in 1965 and 1980. Gen Y, also known as Millennials, was born between 1981 and 1996. Gen Z 1997 and 2012. Gen Alpha (A) was born in 2012 to date. The most important thing in identifying the generation categories is to customise marketing messages and strategies based on the groups preferences. Baby boomers prefer cash transactions and physical visits to the bank.

Generation Z, a significant consumer generation born between the mid-1990s and the early 2010s (Salam, 2024). Seyfi, Hall, and Strzelecka, (2024) referred to this group as post-millennials or centennials. Goh and Okumus (2020) also identifies this group as iGeneration. In making purchase decisions, they place reliance on digital channels and social media influences. Also, they prefer highly personalised tech experience. As the Gen Z population grows, notable shifts in customer preferences are expected. To remain competitive with this generation, customized marketing strategies should be adopted. For instance, millennials and Gen Z, as digital natives, are leading the shift towards digital banking, and their preferences and behaviours play a crucial role in shaping next generation centric banking.

Some of the banking services are now being provided online with a few requiring physical branch visits. Services available online include bank transfers, statement requests, balance enquiry and loan application. Arkhipova (2022) argued that years back mobile bank apps and online banking were a distinctive and not mandatory feature for banks but at present without convenient online services, banks will not withstand competition.

In Tanzania, Mbura and Kagoya (2024) revealed that geographic, demographic and psychographic constructs of market segmentation had a positive influence on the bank`s profitability. Based on the results, the authors recommended that markets should be segmented based on these three constructs. Therefore, banks should customize marketing strategies in line with the unique requirements of each market segment. Indeed, the study by Mbura and Kagoya (2024) emphasised the importance of considering customer demographics in design of marketing strategies as this influences profitability.

A study was conducted by Kaur and Arora (2019) to determine the criteria used by Indian bank customers in selecting banks and how these affect demographic subgroups. The factors influencing bank selection were identified as convenience and service delivery. However, these factors differ significantly based on demographic attributes such as gender, age, income level, education level and occupation. These results indicate the practical implications for the marketing team to devise customised demographic driven marketing strategies in line with customer preferences.

Fares, Aversa, and Lee (2024) conducted an analysis study on psychographic segmentation in Canada`s banking sector. The study identified three different customer groups namely conservatives, sceptics, and visionaries. These groups approach digital banking differently; hence marketing approaches should be customised. The most important finding is not to focus solely on demographic construct but incorporate psychographic construct as well.

The studies by Mbura and Kagoya (2024) and Fares *et al* (2024) concur with Kaur and Arora (2019) as they all emphasised the importance of customised demographic driven marketing strategies

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especially in a digital driven evolving landscape. Though, Fares *et al* (2024) further identified the psychographic element to designing the marketing strategies.

4.3.4. Skills Shortage's and Upskilling

Significant gaps in employee readiness have been revealed by the banking sector's rapid digital transformation, especially in the areas of data analytics, digital literacy, and flexible working arrangements. WEF (2025) highlighted that the cyber skills gap has widened in 2024 with 2 in 3 companies reporting moderate to critical skills gap. Only 14% of the organisation were confident that they have the people and skills required.

Abdul Latif, Nik Mahmood, and Mohd Ali (2020) revealed that employees deficiencies in technological skills to effectively utilize the latest technology adds to legacy systems and antiquated infrastructure challenges. To remain relevant in a changing workplace, employees are constantly required to renew their skill sets. Thus, to maintain long-term competitiveness in digital banking environments, it was highlighted that a move from simply technical competence to broader digital skill sets (Kornelakis, Kirov, and Thill, 2022; Abdul Latif, *et al*, 2020).

Kuchciak and Warwas (2021) posits that HR transformation processes must rethink the HR department as a business partner and co-creator of digital strategy, going beyond simple upskilling. This includes building tech-enabled, human-centred solutions that require cross-departmental collaboration, especially with marketing and finance. Furthermore, paradigm shifts in the way banks manage people, and performance should move toward design thinking, human-centred design, and agile techniques. Upskilling initiatives run the risk of becoming dispersed and inadequate in the face of continuous digital disruption.

5. Conclusion and Future Directions

The study highlighted the evolution of banking from ancient times to modern times. Banking has evolved through the five era, Banking 1.0 to Banking 5.0. Banking 1.0 being the period pre -1960s while Banking 2.0 from 1960s to 1980s, Banking 3.0 being 1980s to 2000s, Banking 4.0 starting from 2000s to 2020s and Banking 5.0 being 2020s to the future. Admittedly, the exact timelines are difficult to establish, hence using indicative. Despite using indicative period, these provide a representative timeframe to understand key transformations that occurred within the banking sector. The evolution followed the industrial evolution that happened during the almost similar indicative periods. Resultantly, significant structural sector changes were observed. These changes were induced by factors such as regulations, technology, human resources and customer behaviour.

Theories assisted in enhancing knowledge of banking. Public interest theory revealed regulations development considerations and evolving operating environment. Hence, requiring careful thoughts to minimize regulatory capture and regulatory arbitrages among others. On the other hand, disruptive innovation theory highlighted how new entities enter existing markets using innovative technologies as a competitive edge to disrupt or reshape existing markets. These two theories indicated that the modern banking sector requires greater collaboration to understand the operating environment dynamics and how regulation should be designed by balancing the interest of stakeholders.

In the study, the significant finding was opportunities and challenges exist in banking sector transformation which are associated with dynamic banking operating environment. Opportunities included development of new business models such as digital banks and integration with non-banking providers which improved service delivery and data analytics among others. Despite the existence of opportunities, challenges include regulations, skills shortages, legacy and cybersecurity that must be addressed.

The findings suggest a multi-disciplinary stakeholders coordinated response on the future of banking both at micro and macro level. Thus, at company level, the institutions should conduct an internal review assessment to identify strength and weakness. This should inform the strategic positioning of the institution in the new operating environment. Also, at national, regional and global

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level policy-oriented discussions and regulatory formulation should be given priority in the dynamic banking operating environment. Importantly, the future of banking requires collaborations as digital economies, digital currencies, cashless society, customer centric banking institutions and artificial intelligence take centre stage. These findings add to the growing body of research on the future of banking related areas such as cybersecurity disclosures, integration of artificial intelligence and data standards sharing, regulatory uncertainty and collaborative models of banking.

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References

Abdul Latif, K., Nik Mahmood, N.H. and Mohd Ali, N.R., 2020. Exploring sustainable human resource management change in the context of digital banking. Journal of Environmental Treatment Techniques, 8(2), pp.779–786. Available at: https://core.ac.uk/display/334606668 [Accessed 20 Apr. 2025].

Abraham, K., Haltiwanger, J., Sandusky, K. and Spletzer, J., 2017. Measuring the gig economy: Current knowledge and open issues. Measuring and Accounting for Innovation in the 21st Century.

Acharya, S. and Joshi, S., 2020. Impact of cyber-attacks on banking institutions in India: a study of safety mechanisms and preventive measures. PalArch's Journal of Archaeology of Egypt/Egyptology, 17(6), pp.4656–4670.

Adejumo, A. and Ogburie, C. (2025): Strengthening finance with cybersecurity: Ensuring safer digital transactions: World Journal of Advanced Research and Reviews, 25(3) pg 1527-1541.

Ahmad, N.R. (2025): Financial Inclusion: How Digital Banking is bridging the Gap for Emerging Markets. Journal of Applied Linguistics and TESOL (JALT), 8(1), pp.894-902.

Aliu, N.F., Ikharo A.B and Jegede AJ (2024): Enhancing Regulatory Compliance in the National FinTech Ecosystem: A Centralized RegTech Approach. University of Ibadan Journal of Science and Logics in ICT Research, 12(2), pp.1-11.

Allen, H.J., 2024. Regulating fintech: A harm focused approach. Computer Law & Security Review, 52, p.105910.

Alzoubi, H.M., Ghazal, T.M., Hasan, M.K., Alketbi, A., Kamran, R., Al-Dmour, N.A. and Islam, S., 2022. Cyber security threats on digital banking. In: 1st International Conference on AI in Cybersecurity (ICAIC). pp.1–4.

Amoo, O.O., Osasona, F., Atadoga, A., Ayinla, B.S., Farayola, O.A. and Abrahams, T.O., 2024. Cybersecurity threats in the age of IoT: a review of protective measures. International Journal of Scientific Research Archive, 11(1), pp.1304–1310.

An Hui, Yang Ruibo, Ma Xuejiao, Zhang Siqi, Sardar M.N. Islam, (2021): An evolutionary game theory model for the inter-relationships between financial regulation and financial innovation: The North American Journal of Economics and Finance, Volume 55,

Apau, R. and Koranteng, F.N., 2019. Impact of cybercrime and trust on the use of e-commerce technologies: an application of the theory of planned behavior. International Journal of Cyber Criminology, 13(2), pp.228–254.

 doi:10.20944/preprints202506.0867.v1

Ardhendu Sekhar Nanda. (2025): Technology Advantage in Finance: Revolutionizing the Rise of IT-Enabled Financial Services in the Digital Age: International Journal of Computer Science and Information Technology Research (IJCSITR), 6(1), 62-71.

Arkhipova, N., 2022. Impact of Demographic Trends on Retail Banking. Procedia Computer Science, 214, pp.831-836.

Arner & Barberis, 2015 Arner, D.W. and Barberis, J., 2015. Regulating FinTech innovation: A balancing act. Asian Institute of International Financial Law. [Электронный ресурс]. URL: http://www.law.hku.hk/aiifl/regulating-fintech-innovation-a-balancing-act-1-april-1230-130-pm

Arner, D., Buckley, R., Charamba, K., Sergeev, A. and Zetzsche, D., 2022. Governing FinTech 4.0: BigTech, platform finance, and sustainable development. Fordham J. Corp. & Fin. L., 27, p.1.

Arner, D.W., Barberis, J. and Buckley, R.P., 2015. The evolution of Fintech: A new post-crisis paradigm? University of Hong Kong Faculty of Law Research Paper No. 2015/047. Available at: https://ssrn.com/abstract=2676553 [Accessed 20 Apr. 2025].

Aysan, A.F. and Nanaeva, Z. (2022): Fintech as a financial disruptor: A bibliometric analysis: FinTech, 1(4), pp.412-433.

Babu, S.K., Hameed, A., Nair, R.R., Babu, T., Sharma, R., Chinnaiyan, R. and Sungheetha, A. (2024): Analyzing the Digital Transformation and Evolution of Financial Technology (Fintech) Across Various Industries. In 2024 4th International Conference on Innovative Practices in Technology and Management (ICIPTM) (pp. 1-8). IEEE

Bansal, N. (2025): The Impact of Financial Security Enhancement Through One Time Password in ATM Cash Transactions: The Impact of Financial Security Enhancement. In Organizational Sociology in the Digital Age (pp. 453-468). IGI Global Scientific Publishing.

Batiz-Lazo, B (2009): Emergence and evolution of ATM networks in the UK, 1967–2000. Business History, 51(1), pp.1-27.

Beck, T., Demirgüç-Kunt, A. and Levine, R. (2009): Financial institutions and markets across countries and over time-data and analysis: World Bank policy research working paper, (4943).

Bhasin, N.K. and Rajesh, A. (2021): Impact of E-collaboration between Indian banks and fintech companies for digital banking and new emerging technologies: International Journal of e-Collaboration (IJeC), 17(1), pp.15-35

Bhattacharya, S. and Thakor, A.V., 1993. Contemporary banking theory. Journal of financial Intermediation, 3(1), pp.2-50.

Boda, V.V.R. and Immaneni, J., 2019. Streamlining FinTech operations: The power of SysOps and smart automation. Innovative Computer Sciences Journal, 5(1).

Burugulla, J.K.R. (2025): Enhancing Credit and Charge Card Risk Assessment Through Generative AI and Big Data Analytics: A Novel Approach to Fraud Detection and Consumer Spending Patterns. Cuestiones de Fisioterapia, 54(4), pp.964-972.

Cahyono, N.D. (2025): Adaptive Leadership Strategies for Hybrid Workforces: Navigating the Future of Human Resource Management. The Journal of Academic Science, 2(1), pp.12-20.

Cao, L. and Li, L., 2015. The impact of cross-channel integration on retailers' sales growth. Journal of retailing, 91(2), pp.198-216.

Capie, F. (2010): The Bank of England: 1950s to 1979. Cambridge University Press.

Casey, A (2024): Silicon Valley Bank A case study in Post crisis Bank Failures: Banking and Finance Law Review 41(2) Forthcoming

 doi:10.20944/preprints202506.0867.v1

Cele, N.N. and Kwenda, S., 2025. Do cybersecurity threats and risks have an impact on the adoption of digital banking? A systematic literature review. Journal of Financial Crime, 32(1), pp.31–48. https://doi.org/10.1108/JFC-10-2023-0263

Chaimaa, B., Najib, E. and Rachid, H., 2021. E-banking overview: concepts, challenges and solutions. Wireless Personal Communications, 117, pp.1059-1078.

Chinamanagonda, S., (2024): Revitalizing Legacy Systems: Proven Strategies for Successful Application Modernization. Journal of Computing and Information Technology, 4(1).

Chittoor, D.S., 2025. Implementing data lineage frameworks in financial institutions: A systematic analysis of compliance, efficiency, and risk management. International Journal of Science and Research Archive, 14(1), pp.353-361.

Chiu, I.H. (2016): Fintech and disruptive business models in financial products, intermediation and markets-policy implications for financial regulators: J. Tech. L. & Pol'y, 21, p.55.

Chougule, P.S. and Dudekula, C.S (2024): Banking in the Future: An Exploration of Underlying Challenges: Book Chapter The Adoption of Fintech Using Technology for Better Security, Speed, and Customer Experience in Finance, pg 160-191. Taylor and Francis Jafar, Syed Hasan, Hemachandran K., Shakeb Akhtar, Parvez Alam Khan, and Hani El-Chaarani. 2024. The Adoption of Fintech: Using Technology for Better Security, Speed, and Customer Experience in Finance. Oxford: Productivity Press.

Christie, R., 2018. Setting a standard path forward for KYC. Journal of Financial Transformation, 47, pp.155-164.

Claessens, S. and Rojas-Suarez, L., 2016. Financial regulations for improving financial inclusion. Center for Global Development, 2(3), pp.44-53.

Colm, G., 2024. In defense of the public interest. In Classics in Institutional Economics, Part II, Volume 9 (pp. 376-389). Routledge.

Conti-Brown, P. E (2023): Lessons from History. FINANCE & DEVELOPMENT. International Monetary Fund March 2023, Volume 60, Number 1 page 67.

Croley, S.P., 2009. Regulation and public interests: The possibility of good regulatory government.

D'Andrea, A. and Limodio, N. (2024): High-speed internet, financial technology, and banking. Management Science, 70(2), pp.773-798.

De Koker, L., Morris, N. and Jaffer, S. (2019): Regulating financial services in an era of technological disruption: Lawin Context, 36(2), pp.90-112.

Demirgüç-Kunt, A., Klapper, L., Singer, D., Ansar, S. and Hess, J., 2018. The Global Findex Database 2017: Measuring financial inclusion and the fintech revolution. Washington, DC: World Bank.

Dermine, J. (2003): Banking in Europe: Past, present and future. The Transformation of the European Financial System, 21(1), pp.31-95.

Dhumal, K., 2025. Virtual business card using NFC technology. Recent Advances in Sciences, Engineering, Information Technology & Management.

Djibran, F (2025): Enhancing SME Growth Through Online Banking Solutions: Opportunities And Challenges In The Digital Era: Journal Riset Multidisiplinary Edukasi, 2(1), pp.413-426.

Du Toit, R., Hadebe, P.N. and Mphatheni, M., 2018. Public perceptions of cybersecurity: a South African context. Acta Criminologica: African Journal of Criminology and Victimology, 31(3), pp.111–131.

Elsaid, H.M., 2023. A review of literature directions regarding the impact of fintech firms on the banking industry. Qualitative Research in Financial Markets, 15(5), pp.693-711.

Enriques, L. and Ringe, W.G. (2020): Bank–fintech partnerships, outsourcing arrangements and the case for a mentorship regime: Capital Markets law journal, 15(4), pp.374-397

 doi:10.20944/preprints202506.0867.v1

Eyo-Udo, N.L., Apeh, C.E., Bristol-Alagbariya, B., Udeh, C.A. and Ewim, C.P.M. (2025): Digital Banking in Africa: A Review of Recent Developments and Challenges: Account and Financial Management Journal, Volume 10 Issue 01, Page No.-3457-3466

Fares, O.H., Aversa, J. and Lee, S.H., 2024. The digital divide: Psychographic segmentation in the Canadian banking context. Journal of Marketing Analytics, pp.1-16.

Foster, C., 2024. Intellectual property rights and control in the digital economy: Examining the expansion of M-Pesa. The Information Society, 40(1), pp.1-17.

Fry, T.H. (2025): For Everthing Else, There's Taxes: Why Credit Card Rewards Should Stop Being Priceless. Boston College Law Review, 66(1).

Goh, E. and Okumus, F. (2020): "Avoiding the hospitality workforce bubble: strategies to attract and retain generation Z talent in the hospitality workforce": Tourism Management Perspectives, Vol. 33, p. 100603

Gupta, P.K., 2008. Internet banking in India–Consumer concerns and bank strategies. Global journal of business research, 2(1), pp.43-51.

Hamilton, D.E. (1985): The causes of the banking panic of 1930: Another view. The Journal of Southern History, 51(4), pp.581-608.

Hassan, A. and Ahmed, K., 2023. Cybersecurity's impact on customer experience: an analysis of data breaches and trust erosion. Emerging Trends in Machine Intelligence and Big Data, 15(9), pp.1–19.

Hassan, A.O., Ewuga, S.K., Abdul, A.A., Abrahams, T.O., Oladeinde, M. and Dawodu, S.O., 2024. Cybersecurity in banking: a global perspective with a focus on Nigerian practices. Computer Science & IT Research Journal, 5(1), pp.41-59.

Hensen, J. and Kötting, B. (2022): From open banking to embedded finance: the essential factors for a successful digital transformation: Journal of Digital Banking, 6(4), pp.308-318.

International Monetary Fund (IMF), 2024. Global Financial Stability Report 2024. [online] Washington, D.C.: IMF. Available Available at: https://www.imf.org [Accessed 20 Apr. 2025].

Iyelolu, T.V., Agu, E.E., Idemudia, C. and Ijomah, T.I., 2024. Legal innovations in FinTech: Advancing financial services through regulatory reform. Finance & Accounting Research Journal, 6(8), pp.1310-1319.

Karani, G. and Jadhav, B. (2025): How Traditional Banks Adapt to the Fintech Revolution in Banking and Finance Sector: In Shaping Cutting-Edge Technologies and Applications for Digital Banking and Financial Services (pp. 214-225). Productivity Press.

Kaur, H. and Arora, S (2019): Demographic influences on consumer decisions in the banking sector: evidence from India: J Financ Serv Mark 24, pg 81–93.

Khan, H.H., Kutan, A.M. and Qureshi, F., (2024): Fintech integration: Driving efficiency in banking institutions across the developing nations: Finance Research Letters, 67, p.105772.

Khuan, H. (2024): Fintech and the Future of Banking: Collaboration and Innovation for Better Financial Services: Economics Studies and Banking Journal (DEMAND), 1(2), pp.75-9

Kornelakis, A., Kirov, V. and Thill, P. (2022): The digitalisation of service work: A comparative study of restructuring of the banking sector in the United Kingdom and Luxembourg: European Journal of Industrial Relations, 28(3), pp.253-272.

Korobov, Y., 2017. Global banking: transformation, innovation & competition. In SHS Web of Conferences (Vol. 39, p. 01012). EDP Sciences.

Kuchciak, I., & Warwas, I. (2021): Designing a Roadmap for Human Resource Management in the Banking 4.0: Journal of Risk and Financial Management, 14(12), 615

Kumar, R (2025): THE EVOLUTION OF BANKING THROUGH DIGITAL PAYMENT SYSTEMS: IJEETE Journal of Research, Volume 11, Issue 2 page 284-295.

 doi:10.20944/preprints202506.0867.v1

Lam, A.Y. (2025): Artificial Intelligence Applications in Financial Technology: Journal of Theoretical and Applied Electronic Commerce Research, 20(1), p.29.

Lessa, L. and Gebrehawariat, D., 2023. Effectiveness of banking card security in the Ethiopian financial sector: PCI-DSS security standard as a lens. International Journal of Industrial Engineering and Operations Management, 5(2), pp.135–147.

Martin, A., 2021. Aadhaar in a box? Legitimizing digital identity in times of crisis. Surveillance & Society, 19(1), pp.104-108.

Mbura, O.K. and Kagoya, S.M., 2024. Consumer Market Segmentation Adoption and Its Influence on the Performance of Tanzania's Banking Industry. ORSEA JOURNAL, 14(2), pp.111-131.

McCauley, R., McGuire, P. and Wooldridge, P. (2021): Seven decades of international banking. BIS Quarterly Review, September Volume 20 page 61 -75.

Meduri, K., 2024. Cybersecurity threats in banking: unsupervised fraud detection analysis. International Journal of Scientific Research Archive, 11(2), pp.915–925.

Megargel, A., Shankararaman, V. and Reddy, S.K., 2018. Real-time inbound marketing: A use case for digital banking. In Handbook of Blockchain, Digital Finance, and Inclusion, Volume 1 (pp. 311-328). Academic Press.

Mehdiabadi, A., Shahabi, V., Shamsinejad, S., Amiri, M., Spulbar, C., & Birau, R. (2022). Investigating Industry 5.0 and Its Impact on the Banking Industry: Requirements, Approaches and Communications. Applied Sciences, 12(10), 5126. https://doi.org/10.3390/app12105126

Mehdiabadi, A., Tabatabeinasab, M., Spulbar, C., Karbassi Yazdi, A., & Birau, R. (2020): Are we ready for the challenge of banks 4.0? Designing a roadmap for banking systems in Industry 4.0: International Journal of Financial Studies, 8(2), 32.

Metzger, J. and Paulowitz, T., 2018. Seeking common legal entity standards to facilitate cross-border payments. Journal of Payments Strategy & Systems, 12(4), pp.365-370.

Mohan, P., 2025. Technologies for Digital Disruption in Banking. South Asian Journal of Social Studies and Economics, 22(3), pp.22-34.

Mohsen, S.E., Hamdan, A. and Shoaib, H.M. (2025), "Digital transformation and integration of artificial intelligence in financial institutions ", Journal of Financial Reporting and Accounting, Vol. 23 No. 2, pp. 680-699.

Molteni, M. and Pellegrino, D. (2024): The establishment of banking supervision in Italy: an assessment (1926–1936). Business History, 66(6), pp.1442-1470.

Monye, M. and Osio, J., 2024. Adapting to Digital Disruption: Evaluating Implementation Challenges and Effective Strategies in Nigerian Banking Marketing. Journal of Policy and Development Studies, 17(1), pp.129-151.

Mphatheni, M.R. and Maluleke, W., 2022. Cybersecurity as a response to combating cybercrime: demystifying the prevailing threats and offering recommendations to the African regions. International Journal of Research in Business and Social Science, 11(4), pp.384–396.

Munira, M.S.K(2025): Digital transformation in banking: A systematic review of trends, technologies, and challenges: Strategic Data Management and Innovation, Volume 2(1) page 78 -95.

Musembi, P.M., 2024. Africa's Contributions to Digital Technology: A Case of M-Pesa Technology in Kenya. In Contributions of Africa's Indigenous Knowledge to the Wave of Digital Technology: Decolonial Perspectives (pp. 260-289). IGI Global.

Nanda, A.S. (2025). Technology Advantage in Finance: Revolutionizing the Rise of IT-Enabled Financial Services in the Digital Age. Journal ID, 9471, p.1297.

 doi:10.20944/preprints202506.0867.v1

Njeru, P.W. and Gaitho, V., 2019. Investigating extent to which cybercrime influences performance of commercial banks in Kenya. International Journal of Economics, Commerce and Management, 8, pp.489–514.

Nwokolo, S.C., Eyime, E.E., Obiwulu, A.U. and Ogbulezie, J.C. (2023): Africa's Path to Sustainability: Harnessing Technology, Policy, and Collaboration. Trends in Renewable Energy, 10(1), pp.98-131.

Omarini A E (2018): Banks and Fintechs: How to Develop a Digital Open Banking Approach for the Bank's Future: International Business Research; Vol. 11, No. 9; page 23-36.

Omwansa, T. (2009): M-PESA: Progress and prospects. Innovations, 107, p.476.

Pai, V.S., 2022. Innovation and Market Disruption: Some Exploratory Thoughts. KIM Journal of Business Research, pp.1-8.

Pang, Z. and Abdullah, M.Y., 2024. Disruptive Innovation and Its Impact on Traditional Business Models: A Multi-Industry Study. Uniglobal Journal of Social Sciences and Humanities, 3(2), pp.294-300.

Peltzman, S. (1989) 'The economic theory of regulation after a decade of deregulation', in Bailey, M. N. and Winston, C. (eds) 'The Brookins Papers of Economic Activity', Brookins Institution, Washington, p. 4; and Ogus (1994) op. cit., p. 15

Pigou, A., 2017. The economics of welfare. Routledge.

Polasik, M., Widawski, P. and Lis, A. (2022): Challenger bank as a new digital form of providing financial services to retail customers in the EU internal market: The case of Revolut. In The Digitalization of Financial Markets. Taylor & Francis. Edited by Adam Marszk and Ewa Lechman.

Prayoga, R.G. (2023): Digital Banking and Traditional Banking: A Comparative Study on Advanced Financial Service. SUKUK: INTERNATIONAL JOURNAL OF BANKING, FINANCE, MANAGEMENT AND BUSINESS, 2(I), pp.35-51.

Premkumar, V. and Arivazhagan, R (2025): A STUDY ON BEHAVIOURAL DISRUPTION AMONG THE BANKING WORKFORCE DUE TO APPLICATION OF EMERGING TECHNOLOGIES IN WORKPLACE: Tec Empresarial, volume 7 (1) pp.564-574.

Puschmann, T. (2017): Fintech: Business & Information Systems Engineering, Volume 59, page 69–76.

Rajeshkumar, L. (2025): Financial Evolution: Tracing the Roots of Al in Finance. AI, Economic Perspectives, and Firm Business Management, p.45.

Ranjan, 2025 Ranjan, R., 2025. Behavioural Finance in Banking and Management: A Study on the Trends and Challenges in the Banking Industry. Asian Journal of Economics, Business and Accounting, 25(1), pp.374-386.

Rathnayake, N.D.N.B., 2023. The Era of the transition–from traditional to digital banking. In Transformation for Sustainable Business and Management Practices: Exploring the Spectrum of Industry 5.0 (pp. 41-55). Emerald Publishing Limited.

SABRIC (South African Banking Risk Information Centre), 2021. Annual crime statistics 2021. [online] Available at: https://www.sabric.co.za/media-and-news/press-releases/sabric-annual-crime-stats-2021/ [Accessed 20 Apr. 2025].

Safari, K., Bisimwa, A. and Buzera Armel, M., 2022. Attitudes and intentions toward internet banking in an underdeveloped financial sector. PSU Research Review, 6(1), pp.39-58.

Saia, R., Giuliani, A., Pompianu, L. and Carta, S., 2021. From payment services directive 2 (PSD2) to credit scoring: A case study on an Italian Banking Institution. IC3K, 1, pp.164-171.

Salam, K. N. (2024): "Gen-Z Marketing Strategies: Understanding Consumer Preferences and Building Sustainable Relationships": Golden Ratio of Mapping Idea and Literature Format, 4(1), pp. 53–77.

 doi:10.20944/preprints202506.0867.v1

Sanyaolu, T.O., Adeleke, A.G., Azubuko, C.F. and Osundare, O.S. (2024): Exploring fintech innovations and their potential to transform the future of financial services and banking. International Journal of Scholarly Research in Science and Technology, 5(1). page 54-72

Saxena, D., 2022. Regaining legitimacy after an information systems implementation failure: Case of a National Blood Bank Service. Journal of Information Technology Teaching Cases, 12(1), pp.50-54.

Sekhar, S.C. and Kumar, M., 2023. An overview of cyber security in digital banking sector. East Asian Journal of Multidisciplinary Research, 2(1), pp.43–52.

Sen, S. (2024): The Effect of Consumer Trust on the Growth of Online Payment Platforms: A Case Study of PayPal and Stripe. Shodh Sagar Journal of Commerce and Economics, 1(3), pp.17-21.

Seyfi, S., Hall, C.M. and Strzelecka, M. (2024), "Introduction: gen Z, tourism, and sustainable consumption", in Seyfi, S., Hall, C.M. and Strzelecka, M. (Eds), Gen Z, Tourism, and Sustainable Consumption, Routledge, London, pp. 3-17

Shahabi, V., Azar, A., Faezy Razi, F., & Fallah Shams, M. F. (2020). Simulation of the effect of COVID-19 outbreak on the development of branchless banking in Iran: case study of Resalat Qard–al-Hasan Bank. Review of Behavioral Finance, ahead-of(ahead-of-print), 1–24. https://doi.org/10.1108/rbf-06-2020-0123

Shaikh, A.A., Hanafizadeh, P. and Karjaluoto, H., 2017. Mobile banking and payment system: A conceptual standpoint. International Journal of E-Business Research (IJEBR), 13(2), pp.14-27.

Shan H.Y. and Yang J.L (2019): Sustainability of photovoltaic poverty alleviation in China: an evolutionary game between stakeholders: Energy, 181 (2019), pp. 264-280.

Sharma, P., 2024. Fintech Startups and Traditional Banking: Rivals or Collaborators. Computer Fraud & Security, 2024, pp.357-370.

Sharma, V.K. and Kumar, A., 2025. Determinants of online banking adoption in India: an empirical investigation. International Journal of Business Innovation and Research, 36(2), pp.229-247.

Sharmin, S., Kalam, F.A., Islam, A.F. and Aubhi, R.U.H., 2024. Impact of emotional intelligence on employee performance: A bibliometric approach. Journal of Human Resource and Sustainability Studies, 12(2), pp.243-262.

Shivaramakrishna, D. and Nagaratna, M., 2023. A novel hybrid cryptographic framework for secure data storage in cloud computing: integrating AES-OTP and RSA with adaptive key management and time-limited access control. Alexandria Engineering Journal, 84, pp.275–284.

Siano, A., Raimi, L., Palazzo, M. and Panait, M.C. (2020): Mobile banking: An innovative solution for increasing financial inclusion in Sub-Saharan African Countries: Evidence from Nigeria. Sustainability, 12(23), p.10130

Singh, S.K. and Sharma, P. (2025): Role of Hybrid Entrepreneurship in the Gig Economy. In Entrepreneurial Ecosystems Driving Economic Transformation and Job Creation (pp. 29-56). IGI Global Scientific Publishing.

Sintha, L., 2021, June. Branchless banking as a disruptive innovation in Indonesia. In 2nd Annual Conference on blended learning, educational technology and Innovation (ACBLETI 2020) (pp. 380-385). Atlantis Press.

Smith & Liu (2024)

Stigler, G. (1971). The Theory of Economic Regulation. Ñ Bell Journal of Economics and Management Science. 2(1), 3–21.

Stulz, R.M., 2019. Fintech, bigtech, and the future of banks. Journal of Applied Corporate Finance, 31(4), pp.86-97.

Su, F., Zhai, L., Zhou, Y., Zhuang, Z. and Wang, F., 2024. Risk contagion in financial markets: A systematic review using bibliometric methods. Australian Economic Papers, 63(1), pp.163-199.

 doi:10.20944/preprints202506.0867.v1

Tan, M. and Teo, T.S., 2000. Factors influencing the adoption of Internet banking. Journal of the Association for information Systems, 1(1), p.5.

Tanda, A. and Schena C., 2019. 4.1 DIGITAL TRANSFORMATION AND DIGITAL DISRUPTION. FinTech, BigTech and Banks, p.52.

Telu, S. and Kumar, S. (2025): "Towards a sustainable future: a comprehensive review of employee well-being in hybrid work settings": Management & Sustainability: An Arab Review, Vol. ahead-of-print No. ahead-of-print

Tenakwah, E.S. and Watson, C. (2025): "Embracing the AI/automation age: preparing your workforce for humans and machines working together": Strategy & Leadership, Vol. 53 No. 1, pp. 32-48

Tochukwu Onunka, Ahmed Raji, Anwuli Nkemchor Osafiele, Chibuike Daraojimba, Blessed Afeyokalo Egbokhaebho, Chinwe Chinazo Okoye (2023): Banking: A Comprehensive Review of The Evolution and Impact of Innovative Banking Services on Entrepreneurial Growth: Economic Growth and Environment Sustainability, 2(2): 66-78

Tuti Awaliyah, Nurul Safitri, SriHartaty, Fifin Felani, Loso Judijanto (2023): The Impact of Financial Technology Innovation on Banking Service Transformation: A Case Study in the FinTech Industry. Global International Journal of Innovative Research.306-313

Ugochukwu Uche, C. (2001), "The theory of regulation: A review article", Journal of Financial Regulation and Compliance, Vol. 9 No. 1, pp. 67-80. https://doi.org/10.1108/eb025063

van Thiel, D. (2025): On The Human-Centred AI Transformation of Banking. Dissertation accessed 19 April 2025 https://repository.tilburguniversity.edu/server/api/core/bitstreams/51f89b64-ce94-4e59-8077-d2208d5037b9/content

Vinoth, B., Ravindran, D., Sudha, T. and Raja, S., 2024. Growth in Asian Developing Nations. Harnessing AI, Machine Learning, and IoT for Intelligent Business: Volume 1, 555, p.179.

Vives, X. (2017): The impact of FinTech on banking: European Economy, (2), pp.97-105

Volik, D.E.(2024): Innovative approaches to developing a digital banking platform: a case study of an online bank for SMBs (small and medium-sized businesses) Main part. Regional and Sectoral Economy, 14, pp.132-140.

Wagner, G. and Eidenmuller, H. (2019): Down by algorithms: siphoning rents, exploiting biases, and shaping preferences: regulating the dark side of personalized transactions: U. Chi. L. Rev., 86, p.581

Wang, S., Asif, M., Shahzad, M.F. and Ashfaq, M., 2024. Data privacy and cybersecurity challenges in the digital transformation of the banking sector. Computers & Security, 147, 104051. https://doi.org/10.1016/j.cose.2024.104051.

Wang, V., Nnaji, H. and Jung, J., 2020. Internet banking in Nigeria: cyber security breaches, practices and capability. International Journal of Law, Crime and Justice, 62, p.100415.

Warf, B (2010): Demographic transition. In Encyclopedia of geography, ed. B. Warf, 708–711. Thousand Oaks, CA: SAGE.

WEF (2025): Cybersecurity disclosures under the spotlight, and other cybersecurity news to know this month: World Economic Forum Accessed 20 April 2025 1420 https://www.weforum.org/stories/2025/04/effective-cybersecurity-communications-other-cybersecurity-news-this-month/?utm_source=whatsapp&utm_medium=social

Xuan, Q. T., Truong, H. T. H. and Quang, T. V. (2023) 'The impacts of omnichannel retailing properties on customer experience and brand loyalty: A study in the banking sector', Cogent Business & Management, 10(2)

 doi:10.20944/preprints202506.0867.v1

Yang, Y., Zhang, X. and Feng, B. (2023): The Impact of Developing Fintech on Banks: From the Perspective of Net Interest Margin and Non-performing Ratio: Frontiers in Business, Economics and Management, 8(1), pp.266-271

Zakaria, S., Manaf, S.M.A. and Amron, M.T. (2024): Fintech Frenzy: An engaging review of the transforming financial services: Environment-Behaviour Proceedings Journal, 9(SI19), pp.103-108

Zalan, T. and Toufaily, E. (2017): The promise of fintech in emerging markets: Not as disruptive: Contemporary Economics, 11(4), p.415.

Zetzsche, D.A., Buckley, R.P., Arner, D.W. and Barberis, J.N., 2020. From FinTech to TechFin: The regulatory challenges of data-driven finance. NYU Journal of Law and Business, 16(2), pp.379–460.

Zhang, Y., Liu, Q. and Li, X., 2023. The strategic value of cybersecurity in digital banking transformation. Journal of Financial Technology and Innovation, 5(3), pp.221–240.

Zohar, A. (2015): Bitcoin: under the hood: Communications of the ACM, 58(9), pp.104-113