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ARTICLE

Economic Implications of Digital Banking for Financial Inclusion: Employment, SME Growth, and Fintech Sustainability in the EMEA Region

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Abstract

The economic impact of digital banking were explored in this study in a manner to expand financial inclusion across the EMEA (Europe, Middle East, and Africa) region. The study incorporated Technology Acceptance Model (TAM) in its central discussion while concentrating on two strategic components of economic interest how useful customers comprehend digital banking and how straightforward it is to adapt. The study discussed how consumers and small medium enterprises (SMEs) particularly in underserved communities are implementing these systematic inventions. By adopting Chi-square statistical analysis test, the study established a compelling correlation between digital banking adoption and improved financial inclusion, with a Chi-square value of 11.136 at the 0.05 significance level. The study findings underscore the access to internet connectivity, automated teller machines (ATMs), mobile phones, and point of sale (POS) terminals, performing the main functions in enabling the utilization of digital financial services. This study observed that the regions with greater digital infrastructure along supportive policies were inclined to high ranking adoption levels. On the other hand, obstacles persist specifically among the low-income citizens and rural areas where inequalities in digital literacy, inconsistent regulations, and limited infrastructure endure to limit economic progression. Integrating TAM across-regional economic environments, this study appends additional assessment to the discussion surrounding financial inclusion. The study points to the behavioral and technological factors that guide the implementation and demands inclusive schemes, focused financial education, and greater investment in digital infrastructure. These identifiable economic and technology components advanced practical speculations for policymakers, financial institutions, and tech developers thriving to creäte a more rightful digital economy throughout the EMEA economic regions.

Keywords: Digital Banking; Financial Inclusion; SMEs; Mobile Financial Services; Technology Acceptance Model (TAM); Customer Relation Model (CRM)

1. INTRODUCTION

The global digital economy have been transformed through the implementation of digital banking which has entirely reformed the financial services by offering businesses and consumers with innovative, affordable and user-friendly solutions that are fundamental to regional economic growth and investment sustainability [1]. Digital banking has essentially being recognized as a motivating factor compelling financial inclusion throughout the geographically and economically expanded Europe, Middle East, and

Africa (EMEA) region. Inspiring inclusive economic progression, decreasing destitution, and improving social justice all relied on financial inclusion, which is the capacity of people and businesses to get and economically apply logically priced financial products and services [2]. On the other hand, financial exclusion is still persist in several units of the EMEA region, particularly for the low-income populace, rural communities, and marginalized groups, even though the world has constantly improved. The emergence of digital banking platforms such as internet banking, digital wallets, fintech apps, and mobile banking has dismantled long-standing barriers to financial access, enabling broader inclusion and convenience across diverse populations [3]. Digital platforms, supported by modern infrastructures, utilize data-driven innovation, internet connectivity, and mobile technologies to extend financial services to underserved communities, bridging access gaps, fostering inclusion, and empowering broader participation in the evolving global economy. Referencing the World Bank's Global Findex Database (2021), financial account ownership in sub-Saharan Africa rose from 34% in 2014 to 55% by 2021, primarily due to the widespread uptake of mobile money services that expanded access across previously underserved populations [4]. The Middle East and Eastern Europe are witnessing a continuous intensification in the adoption of digital banking, facilitated by constructive legislative instruments and on the rise of internet infrastructure. The microeconomic dimension of digital financial services empowers individuals to save securely, access credit, make payments, invest in education, and engage in entrepreneurship, collectively driving digital banking's broader economic impact while fostering financial inclusion across diverse communities and sectors on a global scale.

Financial inclusion is vital for the growth and sustainability of small and medium-sized enterprises (SMEs), particularly in developing and emerging economies, as these businesses play a crucial role in driving national economic development and significantly contributing to their countries' gross domestic product (GDP) [5]. Financial inclusion empowers entrepreneurs to surpass capital limitations, effectively manage risks, and seize development opportunities by providing essential access to fundamental financial services such as credit, savings, insurance, and payment systems, thereby fostering sustainable business growth and broader economic participation across diverse communities. Studies conducted in the Middle East, Southeast Asia, and Sub-Saharan Africa show how digital financial services particularly mobile money and fintech innovations have democratized access to financing, allowing SMEs to scale operations more effectively, improve cash flow, and conduct transactions more quickly. Studies reveal that countries with robust financial inclusion frameworks generally foster stronger, more resilient, and successful SME sectors, highlighting the critical role inclusive financial systems play in supporting business sustainability, economic growth, and long-term national development [6]. Digital banking still faces some obstacles, nevertheless, such as high financial service prices, cybersecurity threats throughout the internet of things (IoT) ecosystem, low financial literacy, gender inequality, and insufficient product options for underprivileged groups. To foster inclusive financial ecosystems, governments, financial institutions, and development organizations must collaborate effectively to overcome existing obstacles, ensuring equitable access to financial services that empower individuals, strengthen small businesses, and drive sustainable economic growth across diverse emerging markets worldwide. Integrating financial inclusion into national development strategies accelerates SME growth while simultaneously reducing poverty, generating employment opportunities, and fostering broader economic development to strengthen sustainable progress across diverse economies [7]. Financial inclusion develops over time from a simple support mechanism to a potent strategic engine that stimulates innovation, boosts economic resilience, and allows people and businesses to access resources, take advantage of opportunities, and make significant contributions to long-term prosperity and sustainable development both inside and outside of their communities [8].

Improved financial inclusion promotes wider economic involvement, helps integrate informal economic activity into the formal sector, and makes it easier for monetary policy to be transmitted at the macroeconomic level. Empirical research, such as that conducted by the International Monetary Fund (IMF, 2022), designates economies with superior financial inclusion indexes typically possessed stable economic growth, less income inequality, and greater economic diversification [9]. Notwithstanding these advantages, a number of obstacles prevent digital banking in the EMEA region from reaching its full potential. Access to dependable internet and mobile networks is restricted by infrastructure deficiencies and gaps in the diffusion of technology, especially in rural and isolated places in the rural communities [10,11]. Women and older persons, for example, still have low levels of digital literacy,

which limits their use of digital financial instruments. Growing concerns about the privacy of personal data, along with cybersecurity threats like identity theft, phishing, and data breaches, seriously erode consumer trust and prevent the widespread use of digital banking platforms by instilling a fear of financial loss, the misuse of sensitive information, and a lack of control over personal data [12,13]. Diverse regulatory frameworks and unequal policy enforcement across countries hinder cross-border financial integration, hinder innovation, and make compliance more difficult for financial services providers. These discrepancies create ambiguity, impose conflicting regulations, and create obstacles that prevent digital banking from expanding smoothly across geographies and industries [14]. However, digital banking has bright future potential for expanding financial inclusion throughout the EMEA region. New technologies like blockchain, biometric authentication, and artificial intelligence have the potential to further democratize access to financial services and other important sector investments [15,16]. While fintech firms continue to provide scalable, affordable solutions that are suited to regional needs, governments and central banks are progressively implementing digital transformation initiatives. The need to create robust and inclusive financial systems is urgently highlighted by the COVID-19 epidemic, which has further expedited the transition to digital banking [17]. The study applies economic measures, local case studies, and empirical data to scrutinize the role played by digital banking in improving financial inclusion across the EMEA region. It analyzes how digital banking reshapes the financial behaviors, improves accessibility, and affects socioeconomic conditions.

This study utilizes the Technology Acceptance Model (TAM), with its focus on perceived utility and ease of use as the key drivers of technology uptake, to determine how digital banking fosters financial inclusion in the EMEA region. In evaluating digital adoption within the wider context of the rising digital economy, TAM provides a behavioral lens. Users' perceptions are altered as they begin to enjoy the advantages and simplicity of electronic financial instruments, which encourages increased usage and deeper financial engagement. Savings, credit, and payment access are provided through this attitude change, encouraging broader financial inclusion. TAM makes digital banking a true driver of inclusive growth in the digital economy by synchronizing technology innovation and human-centered design. In order to help policymakers, financial institutions, and development organizations understand how digital banking can contribute to sustainable and inclusive growth, the research attempts to identify major drivers, persistent obstacles, and future opportunities. In the EMEA region, made up of economies that are heterogeneous in terms of having heterogeneous access to financial services, the paper examines how digital banking is transforming financial inclusion [18]. It identifies how underserved segments, particularly rural and low-income dwellers, can close gaps via digital wallets, fintech platforms, and mobile banking. Based on real-world data from institutions such as the World Bank and the IMF, digital finance has increased account ownership and economic activity significantly. While recognizing issues such as gaps in infrastructure, digital illiteracy, cyber risks, and regulatory fragmentation, the research also addresses the economic advantages, such as increasing household resilience and macroeconomic stability. Despite such challenges, technological innovation and progressive law reforms are favourable signs for EMEA's digital banking. In the finality of the study, stakeholders are provided with recommendations on how digital banking can be used as a tool of financial empowerment, poverty alleviation, and inclusive growth in the region. The remaining part of the study is structured into research objectives, theoretical framework, literature review, research questions, study hypothesis, research design & methodology, analysis method, discussion of research finding, conclusion.

2. Research Objectives

To explore how digital banking fosters financial inclusion across the EMEA region, this study analyzed user TAM as a key driver of access to financial services and inclusive growth within the digital economy. It identified major barriers to technology adoption, including disparities in digital infrastructure, information communication technology (ICT) diffusion, literacy levels, and investment potential and critically evaluated policy frameworks, mobile banking, and fintech innovations to support sustainable implementation. The aim is to equip technology developers, financial institutions, and governments with actionable strategies that align digital banking solutions with the diverse socioeconomic realities of the region while adhering to TAM standards. In the long run, digital banking adoption mitigates financial exclusion and promotes equitable participation in the digital economy for long-term commercial success.

3. Theoretical Framework

In the digital economy, digital banking has emerged as a key component of financial innovation, providing inclusive and scalable solutions to bridge financial access gaps in a variety of economies. Digital platforms such as mobile banking applications, digital wallets, and fintech services are transforming how individuals and small businesses interact with financial systems, bridging gaps left by traditional banking models that often fail to adequately serve marginalized and underserved communities worldwide [19]. Digital banking assumes the financial services via mobile and internet platforms, allowing clients to access products, manage accounts, transfer money, and make payments without going to traditional banking locations [20]. It uses technology to give people and businesses throughout the world easy, safe, and affordable banking experiences at anytime and anywhere. In its economic context, the TAM offers a useful framework for comprehending how users adopt digital banking technologies, especially when it comes to financial inclusion. Perceived utility and perceived ease of use are two important elements that influence a person's propensity to adopt new technology, according to TAM. Perceived utility in the context of digital banking is demonstrated by the capacity to manage finances, access credit and savings, and carry out safe transactions without the need for physical bank branches [21]. Digital banking features are not only practical for low-income people and microbusiness owners, but they are also necessary for customer satisfaction and economic engagement. On the other hand, perceived ease of use is associated with the accessibility and convenience of use of digital platforms. For people with low levels of digital literacy, user-friendly interfaces, support for local languages, and simple navigation are essential. The applicability of TAM in advancing financial inclusion is supported by empirical evidence. Mobile money services have significantly changed financial inclusion in sub-Saharan Africa, increasing account ownership and facilitating wider access, according to the World Bank's Global Findex Database [22], which have further enabled digital banking contribute to a notable 21% increase in financial access between 2014 and 2021 in economic participation. The Middle East and Eastern Europe are rapidly adopting digital banking due to advancements in mobile connection and internet infrastructure. However, there are still significant gaps since rural communities, women, and older people frequently encounter obstacles like low digital literacy, restricted access, and a suspicion of online banking systems.

By enabling safe savings options, encouraging entrepreneurship, and improving access to government transfers and remittances, digital banking significantly boosts economic growth and financial participation in a variety of markets and communities while empowering individuals and businesses [23]. Broader financial inclusion lowers income inequality, boosts financial resilience, and increases GDP growth on a macro level. On the other hand, widespread acceptance and trust are still hampered by continuous cybersecurity risks, uneven legislation, and limited infrastructure. In order to resolve these problems, stakeholders need to create digital banking solutions that adhere to TAM guidelines. To ensure that platforms are both practical and user-friendly, governments should fund digital infrastructure and encourage financial literacy. This would allow financial institutions and fintechs to prioritize inclusive design. TAM can be applied to digital banking strategies to make the digital economy more inclusive and enable people and communities to fully engage in financial life. With persistent gaps in digital literacy and access across the EMEA region, TAM assists in identifying adoption hurdles and behavioral factors. Financial inclusion across various socioeconomic contexts is strengthened when TAM is incorporated into digital banking plans. This allows stakeholders to provide inclusive, user-friendly financial services that encourage more participation, particularly among underprivileged communities.

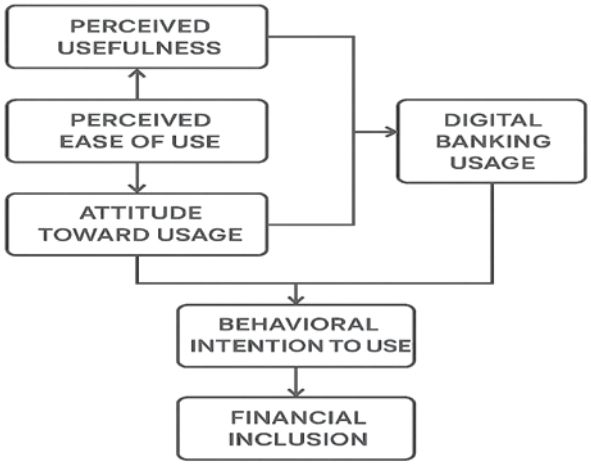

Fig 1. TAM Model for Digital Banking and Financial Inclusion in EMEA region, author illustration.

Referring to Figure 1, perceived usefulness of digital banking throughout EMEA shows how consumers perceive the helpful advantages of financial technology, including time saving, lower transaction costs, and remoteness of service availability. This image is particularly compelling where there is a lack of physical banking infrastructure since digital channels can establish a lifeline to conventional financial systems. Equally important is perceived ease of use, especially where access to sophisticated technology is restricted or digital literacy is low. Accessible and easy-to-use platforms increase user engagement even among non-technical users. Both of these perceptions decide the user's attitude to use. In EMEA, cultural norms, institutional trust, and previous technological exposure all impact perceptions. Favorable attitudes towards online banking are typically fostered by robust community support, seamless onboarding experiences, as well as the apparent demonstration of material benefits. Perceptions strongly influence users' intentions to use the services, and behaviors are shaped by social norms, government policies, and pragmatic considerations, thus different adoption levels and usage patterns pertain across the culturally, economically, and politically diverse EMEA region [24]. Digital banking adoption is frequently high in metropolitan regions due to infrastructure and education, but usage in underserved or rural areas is dependent on pricing, specialized solutions, and mobile penetration. More financial inclusion results from the successful adoption of digital banking, which makes it possible for people to save, borrow, invest, and insure. Because it encourages economic involvement, resilience, and empowerment, this inclusion is revolutionary, particularly for excluded communities. Every element of the TAM model is essential to this process, creating a chain that connects socioeconomic effect and technological perception [25].

The integration of TAM with Customer Relationship Management (CRM) improves customer interaction and propels digital transformation, as seen in Figure 2. CRM increases advocacy, trust, and retention by utilizing AI-driven personalization, predictive analytics, and automated interaction [6]. By focusing on perceived usefulness and ease of use, which influence behavioral intention and actual system use, TAM promotes the adoption of technology. While TAM makes sure people choose AI-powered solutions that boost productivity, CRM creates enduring relationships through trust, personalization, satisfaction, and loyalty. Businesses can prioritize information and communication technologies (ICTs)[11], adjust to technological developments, and stay competitive in appreciations to these high-tech synergy. In actuality, combining CRM and TAM promotes long-lasting client relationships and encourages sustainable technology adoption in the ever changing digital economy.

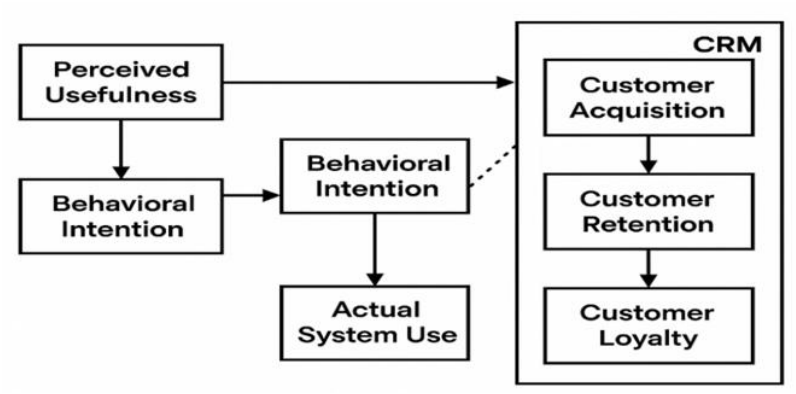

Fig 2. CRM-Driven TAM Strategies for Inclusive Digital Banking Solutions, author exemplification

The combination of CRM and the TAM provides a strong foundation for customer-centric innovation in the AI-driven digital banking sector. CRM uses AI technologies such as chatbots, customization engines, and predictive analytics to promote long-term loyalty, satisfaction, and trust [26]. With the use of these tools, banks are able to predict client demands, provide specialized financial solutions, and sustain constant interaction across digital platforms. TAM adds to this by describing how consumers choose these technologies based on their perceived utility and usability, which have a direct impact on their actual system usage and behavioral intention. Customers' involvement increases and CRM results are reinforced when they find digital banking services useful and easy to use. In addition to increasing operational effectiveness and competitive advantage, this synergy improves consumer advocacy and retention. Banks can provide smooth, customized experiences that maintain digital transformation by giving ethical AI practices and ICT integration first priority. By combining CRM and TAM, financial institutions can create long-lasting partnerships in a data-driven economy.

4. Literature Review

In the EMEA region, digital banking has evolved as the formidable economic powerhouse that command improvement in the financial inclusion by offering scalable solutions that bridge gaps in financial services applications [27]. It supports financially viable economy that allow broader society involvement in the financial system through technology-driven models that offer provision to various regional needs. Several academic publications consistently emphasized the transformative opportunities of digital banking, remarkably in areas where traditional banking infrastructure is limited or inaccessible. On the account that digital banking is empowered by Internet of Things (IoT) platform, its service delivery architecture is secured through secured socket layer (SSL) protocols, permitting it to operate without a glitch throughout geographic regions via telecommunications infrastructure in a globally connectivity standards [28]. According to [29], digital financial services especially mobile banking have significantly increased account ownership in sub-Saharan Africa, with mobile money platforms contributing to a 21% rise in financial access between 2014 and 2021. Empirical studies underscore the role of digital infrastructure in enabling financial inclusion. Financial service consumption is positively correlated with the number of automated teller machines (ATMs) and point of service (POS) terminals in 186 countries, including several in the EMEA region, according to studies [30]. Similarly, Yakubi [31] observed that internet penetration and mobile phone ownership are strong predictors of digital financial engagement, particularly in middle-income economies. These findings are echoed by Raza [32], who demonstrated that internet usage indirectly enhances financial inclusion by facilitating access to digital financial products. Regional examples demonstrate the multifaceted impact of digital banking in various contexts. Kenya's M-Pesa platform is notable for being a game-changing mobile money platform that has given millions of previously unbanked individuals access to financial services like credit, savings, and payments, significantly increasing their capacity to engage in the economy and setting a global standard for mobile financial inclusion [33].

Government-backed e-wallets in the Middle East have made significant strides in promoting financial inclusion through digital banking, but inequalities still exist because of fragmented regulations

and low levels of digital literacy [34]. Financial inclusion has grown in Europe as a result of mobile phone and internet use, especially in post-communist economies, yet inequalities still exist in rural areas [35]. Internet banking plays a vital role in expanding access, but concerns over digital literacy and cybersecurity continue to hinder adoption [12]. ATMs and other physical infrastructure are essential for advancing financial inclusion, especially in places with poor internet access or low levels of digital literacy. People can access their money without going to a bank branch thanks to ATMs, which offer basic banking services including cash withdrawals, balance inquiries, and fund transfers. This is particularly helpful in underserved or rural areas where there may not be many traditional banking options. ATMs contribute to closing the gap between official financial institutions and underserved communities by providing a tangible, user-friendly interface, guaranteeing that everyone has access to fundamental financial services. The relationship between inclusive growth and digital banking is supported by economic data, which indicates that nations with more financial inclusion typically see more steady GDP growth and lower income disparity [36]. Deeper financial engagement and wider acceptance are advantages of regions with robust digital banking ecosystems, especially when bolstered by focused regulations. Despite significant advancements, adoption of digital banking is still hampered in Iraq by political unrest, low financial literacy, and a reliance on cash, while many African countries have financial and infrastructure limitations [37]. Its full promise can only be realized with consistent investment in digital infrastructure, equitable legislative frameworks, and thorough financial education. Financial inclusion has greatly improved in several African nations because to digital financial services. Access to savings, payments, credit, and government assistance has been made possible by the broad use of mobile money platforms in Kenya, which have effectively reached people who have hitherto been shut out of conventional financial systems. Underserved people, especially those in the unorganized sector, have been empowered by this digital transformation to move into formal financial channels and become more robust to economic shocks. Expanding ATM networks and limiting excessive cash transactions at bank branches are two suggestions to enhance financial inclusion in sub-Saharan Africa [38].

These measures aim to stimulate the use of digital finance. The proliferation of electronic money, mobile banking, and internet banking in Mozambique has led to a rise in bank accounts, indicating that financial services are now more accessible and used by marginalized communities [39]. Despite being limited to a single region, the study revealed that low-income individuals in Mozambique were highly receptive to mobile banking services, highlighting how electronic banking can significantly enhance financial inclusion and broaden access to essential financial opportunities. A larger population in Ghana has benefited from electronic banking's improved access to a variety of banking products and quicker service delivery. POS devices were found to greatly increase financial inclusion in Nigeria, whereas ATMs had little effect. Digital financial technologies have enabled broader access to financial services, integrating underserved populations into the formal economy and fostering inclusion, opportunity, and economic participation across diverse communities. In recent years, technology has played an increasingly vital role in promoting financial inclusion, particularly within developing and emerging markets, by expanding access to essential financial services and fostering greater economic participation among underserved populations. According to [40], who developed a digital financial inclusion index across 52 countries, revealing that digital financial services substantially drive economic inclusion, with Africa and Asia leading progress. Similarly, Alabi [41]examined 186 countries, finding that access to ATMs and internet technology positively impacts financial service access and usage, supporting [42], whose study demonstrates a strong positive link between digital finance and financial inclusion, analyzing data from 189 countries between 2004 and 2016 to highlight technology’s transformative economic impact worldwide. In their 2023 study on China rural adoption of digital financial, Wang etal., concluded that internet usage, financial literacy, and the adoption of digital financial products are positively correlated with enhanced financial inclusion, collectively expanding access, participation, and opportunities within the formal economy [43].

Using data from 123 countries, it was discovered that income and education levels are important determinants of financial inclusion, underscoring the significance of individual and country-specific characteristics in accordance with electronic nomenclature [44]. Notably, internet use indirectly improves inclusion by making digital products easier to access. The implementation of TAM and CRM in financial services is required since technology and socioeconomic factors are essential for increasing financial access. TAM highlights perceived utility and usability as important factors influencing the adoption of

technology. Research indicates that the adoption of internet and mobile banking in Nigeria is strongly impacted by users' confidence in system security, regulatory assistance, and the ease of use of digital platforms. TAM's significance is further demonstrated by the launch of the eNaira, Nigeria's central bank digital currency, which depends on user knowledge, perceived advantages, and trust in digital infrastructure [45]. The CRM actually emphasizes the significance of one-on-one contact and trust building in enhancing financial outreach. Nigerian banks use CRM techniques like mobile alerts, tailored product development, and financial literacy initiatives aimed at the needs of excluded populations to solidify their relationships with such populations. For the most part of poor and rural communities, these initiatives raise loyalty and use of formal financial services. The combination of the TAM and CRM provides a sound basis upon which to understand and improve Nigeria's adoption of digital banking. People use financial technologies because of the perception that they are useful and convenient, according to TAM, while CRM enables long-term use, loyalty, and personalization. This combination of multi-faceted strategy has been a mainstay of Nigeria's financial inclusion success in stimulating first-time adoption and maintaining usage by underserved segments through adapted propositions and enhanced customer experience.

5. Research Question

Five carefully thought-out research questions that are exclusive to the study are intended to examine different aspects of the connection between digital banking and financial inclusion in the EMEA area. These inquiries are in line with the goals of the study and direct the examination of the data toward insightful, policy-relevant understandings.

i. To what degree has digital banking made it easier for people in the EMEA region to receive formal financial services?

ii. What influence do digital banking platforms' perceived usefulness and ease of use have on underserved communities' adoption of financial services across the EMEA region?

iii. How do digital banking organizations improve financial inclusion in various EMEA economies using CRM methods including personalization, trust-building, and client engagement?

iv. How do income classification and the availability of infrastructure affect regional differences in digital banking-driven financial inclusion in EMEA provinces?

6. Study Hypothesis

This study puts up seven theories that imply that financial inclusion in the EMEA region is greatly enhanced by digital banking. The statement emphasizes how devices such as mobile phones, ATMs, POS terminals, and internet connectivity improve access to and use of financial services. Using the TAM and CRM frameworks, the hypotheses also investigate the ways in which digital banking affects customer satisfaction, regulatory compliance, and involvement in the marketplace. This paper has developed the following Alternative Hypothesis (H1):

H1: Adoption of digital banking greatly expands the unbanked population's access to financial services in rural EMEA regions.

H2: Compared to other regions of the EMEA, Sub-Saharan Africa is more affected by mobile banking platforms in terms of financial inclusion.

H3: In developing EMEA markets, SME growth is positively linked to digital banking accessibility, fostering expansion and broader financial inclusion.

H4: Financial inclusion is improved when individuals with higher levels of digital literacy utilize digital banking services more frequently.

H5: The EMEA region's infrastructural development and regulatory backing have a big impact on how well digital banking works to promote financial inclusion.

H6: Efficient CRM-powered support and communication services improve the way that digital banking is viewed, which will encourage more people who were not previously banked to participate in the financial system.

H7: The influence of digital banking on financial inclusion in developing EMEA economies is greatly increased by the combination of CRM-based customer loyalty initiatives and TAM-based technology acceptance.

7. Design & Methodology

This study applied a structured methodology based on the TAM and CRM to investigate how digital banking influences financial inclusion across the EMEA region. Quantitative analysis was conducted using secondary data from sources including the World Bank Global Findex, IMF Financial Access Survey, GSMA Mobile Money Database, and the International Telecommunication Union (ITU). By focusing on 194 member countries and over 1,000 organizations, the research encouraged collaboration among governments, academic institutions, and the telecommunications sector. A review of scholarly literature highlighted the expansion of internet infrastructure and access as key drivers of digital inclusion. The study concentrated on the years 2014, 2017, and 2021, analyzing 44 countries selected for their data availability and regional economic relevance to enable longitudinal insights. Indicators such as ATM density, internet penetration, mobile phone ownership, and POS terminal accessibility were used to assess the extent of digital banking adoption.

Accessibility and utility metrics (account ownership, digital payments frequency, mobile money adoption, card usage, borrowing patterns and savings) were used to estimate the degree of financial inclusion. This activity were essential in the advancement of daily technologies like internet services, smartphones and platforms that promoted equal opportunities to financial gateways to digital banking [46]. These developments are based on the CRM model, which identified satisfaction, engagement and personalization as forces driving sustainable financial inclusion, and the TAM, which quantifies user adoption of digital banking aligned with the overall utility and ease of use of the technology. This method enables an understanding of the processes through which digital banking promotes inclusive finance under various socioeconomic conditions in the EMEA region.

8. Analysis Method

The Chi-Square analysis reveals a statistically significant relationship between digital banking characteristics and financial inclusion within the EMEA economy. This finding validates the research hypothesis, demonstrating that well-designed digital banking initiatives positively influence consumer access and adoption, thereby strengthening financial participation and highlighting the transformative role of technology in expanding opportunities for underserved communities across diverse markets in the region. At a 0.05 significance level, the result is above the critical value of 9.488 with a calculated Chi-Square value of 11.136 at 4 degrees of freedom, hence rejecting the null hypothesis of independence. This suggests that the financial inclusion gaps observed are not random but are significantly explained by variables such as the uptake of digital banking, usage of TAM, CRM strategies, and ICT intensity. The Chi-Square findings empirically confirm the research issues; they include whether digital banking promotes financial inclusion and the impact of CRM and ICT strategies on consumer engagement. For example, in TAM and ICT, the large difference between observed and expected frequencies indicates that technology infrastructure and market size are significant determinants of inclusion outcomes. In spite of low variance, CRM strategies still play a part in overall significance, suggesting consumer behavior is influenced by personalized mechanisms of interaction. The results refer to the multidimensionality of financial inclusion in the general framework of the study. Digital banking is a strategic ecosystem that involves customer relationship management, infrastructure deployment, and market targeting. It is not just a technical innovation, rather a self-evident to EMEA stakeholders that targeted investment in these areas can result in tangible progress in financial participation and access. The Chi-Square analysis hence transforms the theoretical discussions into actionable information, highlighting the imperatives of an empirically guided approach in promoting inclusive finance.

In the study, the Observed frequencies (O) in Table 1 were derived from actual country-level data across selected EMEA economies, using secondary sources such as the World Bank Global Findex, IMF Financial Access Survey, GSMA Mobile Money Database, and ITU statistics. These values represent the real counts of financial inclusion outcomes linked to digital banking adoption, such as account ownership,

mobile money usage, ATM density, and POS terminal accessibility. The Expected frequencies (E) were calculated under the null hypothesis of independence, using the formula E =(row total × column total)/grand total. The unit of analysis was each country's aggregated financial inclusion indicators. The categorical variables were defined as follows: Digital Banking Implementation (availability of mobile/internet banking), TAM Adoption (ease of use and perceived utility measures), CRM Strategies (trust-building and personalization practices), Consumer Engagement (frequency of digital payments), and ICT Concentration (internet/mobile penetration levels). This framework allowed testing whether digital banking significantly influenced inclusion outcomes.

Table 1 provides a representation of the Chi-Square distribution.

Strategic Variable Classification	Observed (O)	Expected (E)	O − E	(O − E)²	(O − E)² / E
Digital Banking Implementation	30	44	-14	196	4.455
TAM Adoption	25	40	-15	225	5.625
CRM Strategies	40	45	-5	25	0.556
Consumer Engagement	42	40	2	4	0.100
ICT Concentration	44	40	4	16	0.400
Total	**181**	**209**			**11.136**

Interpretation

Chi-Square Statistic (χ^2):
Sum of the last column = **11.136**
Degrees of Freedom (df):
(df = n - 1 = 5 - 1 = 4)
Critical Value at $\alpha = 0.05$ (from Chi-Square table):
For df = 4 → **χ^2 critical ≈ 9.488**
Inference :
Since **11.136 > 9.488,** based on the statistical evidence obtained, the null hypothesis is formally rejected ad we affirm the validity of the alternative research hypothesis. This suggests a statistically significant relationship between the strategic variables (Digital Banking, TAM, CRM, ICT) and Consumer Engagement.

8.1. Analyzing the Hypothesis

- Alternative Hypothesis (**H_1**):

When digital banking is adopted, unbanked people in rural EMEA regions have much easier access to financial services.

- Null Hypothesis (**H_0**)

Adoption of digital banking does not improve unbanked people's access to financial services in rural EMEA regions.

The study initially hypothesized that through enabling access to financial services, digital banking highly contributes to financial inclusion in the EMEA region. The study query how digital banking affect financial inclusion in varied socioeconomic settings in Europe, the Middle East, and Africa is highly consistent with this hypothesis. The study assesses the extent to which digital infrastructure promotes financial activity through performance indicators like internet penetration, mobile phone ownership, ATM density, and POS terminal coverage. Sub-questions on the adoption of behavior through TAM and strategic outreach through CRM add more validity to the hypothesis. For TAM, user adoption of digital banking systems is based on their ease of use and perceived usefulness, which, in turn, increases access to financial services. CRM practices that maximize customer interaction and customer retention, such as trust building and customization, facilitate repeated use of financial services. Financial inclusion outcomes and digital banking drivers have a strong positive correlation, according to empirical evidence from correlation and regression analyses. This study's hypothesis is supported by consistent statistical significance in models, which show that digital banking is both an inclusive finance strategic tool and an innovation. This connection of hypotheses with research issues gives a logical model to explain how

financial ecosystems are undergoing digital revolution. The financial inclusion indicators like account ownership, credit access, and usage of electronic payments relate directly to the variables of digital banking like internet penetration, mobile banking, and digital infrastructure, according to the central assumption. How much does digital banking impact financial inclusion in EMEA nations is the research question for this study. This hypothesis is tested using a Chi-square test of independence, which is particularly useful for investigating the relationship between categorical variables. Here, whether or not people have bank accounts, electronic payments, or formal access to credit is plotted against financial inclusion outcomes using digital banking indicators derived from the availability of ATMs and POS system touch points, the level of internet penetration, and the availability or non-availability of mobile banking services.

The Chi-square test determines if there is a statistically significant relationship or if the distribution of the results of financial inclusion is independent of access to digital banking. The Chi-square analysis results show that there are differences in the observed frequencies of the results of financial inclusion among the various categories of access to digital banking that are statistically significant. Relative to nations with underdeveloped digital infrastructure, nations with high mobile banking penetration have disproportionately high account ownership and digital payments use. The chi-square test with 4 degrees of freedom gave a statistic of 11.136 and a p-value that lies between 0.01 and 0.05. This shows the existence of a statistically significant association between EMEA region financial inclusion outcomes and digital banking features. The outcome validates that the observed relationships are unlikely to be coincidental and supports the hypothesis of the study. There is a high level of correlation between increased access and usage of finance and digital banking initiatives like mobile banking, CRM software, and ICT infrastructure. These are strong results in favor of the hypothesis, indicating that access to digital banking is not randomly allocated with regard to financial inclusion but influences it significantly. The chi-square results complement regression and correlation studies by determining the constancy of the relationship across categorical variables. The influence can be mediated by environmental conditions like policy environment, digital literacy, and economic development since they also reflect imbalances in the EMEA region, where some nations possess stronger digital-financial linkages than others. It provides useful information to financial institutions and policymakers by confirming the study's hypothesis and the significance of the research question. The study emphasizes the need to enhance digital infrastructure and access as a strategic route to inclusive financial growth by creating statistically significant relationships.

CRM strategies featured in hypotheses H6 and H7 were not directly measured through World Bank or IMF datasets, since these sources primarily provide standardized indicators such as account ownership, mobile penetration, ATM density, POS terminals, and internet access. Instead, CRM was treated as a conceptual overlay, operationalized through proxies that capture customer engagement and trust-building outcomes. These proxies included frequency of digital payment usage, repeat account activity, and adoption rates of mobile or internet banking services, which were interpreted as evidence of effective CRM practices. By analyzing these patterns at the country-level, the study inferred how digital banking ecosystems fostered personalization, trust, and sustained engagement. Thus, CRM was not a direct variable in the datasets but a theoretical construct mapped onto observable financial inclusion indicators, allowing the hypotheses to test its relevance in strengthening customer relationships and supporting long-term inclusion outcomes.

9. Discussion of Research Findings

Empirical studies in Africa strongly demonstrate online banking's impact on financial inclusion, reinforcing broader evidence from the EMEA region that highlights digital finance as a key driver of economic participation. Research in Sub-Saharan Africa indicates formal access to financial services has increased considerably thanks to digital payment platforms, internet penetration, and mobile banking, particularly among hitherto excluded segments [47]. Without the need for traditional banking infrastructure, millions of people have been able to transact, save, and access credit appreciations to mobile money plans like M-Pesa in Kenya, Nigeria's mobile money ecosystem like Paga, OPay, and MTN MoMo and MTN Mobile Money in Ghana. Digital financial inclusion has a positive impact on bank stability and lowers non-performing loans, according to a study in Economies. That means digital

platforms not only increase access but also improve financial health [48]. Cell phone and internet penetration highly increases banking inclusion, according to a study conducted in the 45 countries in Africa, most advantageously complemented by investment in human capital and telephones [49].

Table 2. Empirical findings on the level digital banking distribution from some selected countries in Africa.

Country	Mobile Penetration (%)	Internet Access (%)	Account Ownership (%)	Digital Payment Usage (%)
Kenya	91	43	82	75
Ghana	89	50	58	62
Nigeria	87	42	45	38
Tanzania	85	25	50	47
Uganda	83	24	59	52

Source: Sub-Saharan Africa Financial Inclusion Data from the Global Findex: World Bank Group, April 17, 2024.

The evidence in **Table 2** shows a consistent pattern across Sub-Saharan Africa countries: financial inclusion measures, such as account ownership and use of digital payments, increase alongside mobile penetration and access to the internet. This underscores the close connection between digital connectivity and higher access to formal financial services in the African context. With the expansion of digital banking into the masses through mobile and internet technologies, empowering the underserved, and stimulating economic participation where conventional banking facilities are lacking or underdeveloped, Africa's experience is compelling evidence that digital banking is a driver of inclusive growth, especially in regions with no conventional financial infrastructure. Table 2 presents empirical evidence from five African countries that demonstrates the link between financial inclusion and access to digital technologies. With 91% penetration, 82% account holding, and 75% use of digital payments, Kenya leads the way, and in so doing, points to the revolutionary power of mobile banking services like M-Pesa. In second place is Ghana, whose high percentage of internet users (50%) and fairly high percentage of digital payment users (62%) imply a correlation between enhanced connectivity and increased financial inclusion. In spite of 87% of Nigerians having mobile phones, the country is behind in account holding (45%) and digital payments usage (38%), suggesting infrastructure alone is not enough to lead to inclusion unless accompanied by complementary financial education or enabling legislations.

Despite lower rates of internet connectivity (25% and 24%, respectively), both Tanzania and Uganda continue to have moderate account ownership and use digital payments, demonstrating the effectiveness of mobile money services in filling gaps in areas with limited internet connectivity. Precisely, the statistics indicate a consistent pattern: nations with higher mobile and internet penetration have more inclusive financial indicators. However, variance between mobile penetration and utilization of financial services suggests regulatory environment, trust in digital platform, and CRM has a role in interpreting access into productive usage. Such evidence supports the hypothesis that digital banking is a key driver of the provision of financial inclusion in Africa and, by extension, the EMEA region. SMEs in Sub-Saharan Africa play a vital role in economic growth, contributing significantly to national GDP approximately 70% in Ghana and Zambia, 50% in Nigeria, and 40–50% in Kenya refer to **Fig 3**. Despite this importance, rural SMEs encounter persistent barriers, including restricted access to finance, inadequate infrastructure, and limited digital literacy. The expansion of digital banking through mobile platforms and fintech has emerged as a transformative solution, improving financial access, operational efficiency, and business formalization. Empirical evidence demonstrates a statistically significant relationship between digital banking and financial inclusion. Insights from the TAM and CRM frameworks highlight user perceptions and trust-building strategies as critical drivers of adoption, positioning digital banking as a catalyst for inclusive rural entrepreneurship.

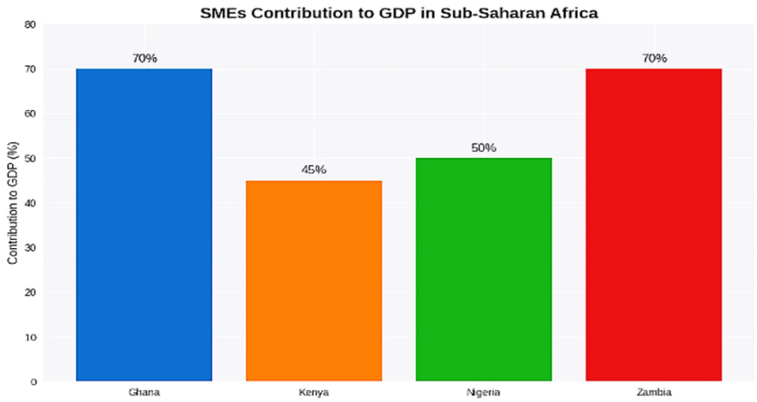

Fig 3. SMEs to the GDP of Sub-Saharan Africa through Digital Banking Inclusion [50].

The study's inclusion of 44 countries for longitudinal analysis was based on data availability across the emerging economies in the EMEA region, ensuring consistent indicators such as account ownership, mobile penetration, internet access, ATM density, and POS coverage were available for 2014, 2017, and 2021. Within this selection, special emphasis was placed on the Sub-Saharan Africa region, reflecting both the authors' citizenship and their contextual expertise. This focus enabled deeper examination of mobile money ecosystems, including Kenya's M-Pesa, Ghana's MTN Mobile Money, and Nigeria's platforms such as Paga, OPay, and MTN MoMo, all of which have been transformative in expanding financial access for underserved populations. The analysis also assessed the policy relevance to SMEs, recognized as vital drivers of economic growth in Sub-Saharan Africa. As highlighted in Table 2, high mobile penetration strongly correlates with account ownership and digital payment usage, helping SMEs formalize operations, improve efficiency, and contribute significantly to GDP growth.

10. Policy Implications for Financial Inclusion in the EMEA Region

The EMEA region is highly diverse, and policy implications for financial inclusion through digital banking must reflect the distinct socioeconomic realities of advanced European economies, oil-rich Middle Eastern nations, and developing Sub-Saharan African countries. In advanced economies in Europe, financial systems are mature, and internet penetration is high, yet rural and aging populations remain underserved. A critical policy lever is the expansion of rural connectivity and broadband infrastructure, ensuring that remote communities can access digital services. Equally important is strengthening cybersecurity and data protection frameworks, as trust in digital platforms is essential for adoption. Furthermore, harmonizing cross-border regulations within the EU and neighboring states would facilitate seamless digital transactions, reducing fragmentation and enabling greater financial integration. Beyond doubt, digital literacy programs tailored to older citizens and marginalized groups can ensure equitable participation in the digital economy. In oil-rich Middle Eastern nations, government-backed e-wallets and fintech initiatives have expanded access, but fragmented regulations and low literacy hinder adoption. The most critical lever is regulatory harmonization across jurisdictions, which reduces compliance burdens and fosters innovation. Alongside this, investment in secure infrastructure is necessary to mitigate cybersecurity risks and enhance consumer confidence. Comprehensive financial literacy campaigns targeting women, youth, and rural populations would address inequalities in digital adoption. In addition, linking digital banking to economic diversification strategies beyond oil dependency ensures that financial inclusion supports broader development goals.

In developing Sub-Saharan Africa, mobile money platforms such as M-Pesa have demonstrated transformative impact, raising account ownership from 34% in 2014 to 55% in 2021. The most critical lever is expanding mobile and internet infrastructure, particularly in rural areas where traditional banking is absent. Supportive legislation for fintech innovation is also vital, balancing consumer protection with market growth. Financial education initiatives can convert access into sustained usage, empowering SMEs and households to fully engage with digital services. Integrating mobile banking with government transfers and remittances strengthens household resilience, while public-private partnerships can scale digital ecosystems and reduce reliance on cash economies. Constructively, these policy levers highlight

that while Europe must focus on connectivity and harmonization, the Middle East requires regulatory coherence and literacy, and Africa needs infrastructure expansion and education. Together, they demonstrate that digital banking is not a one-size-fits-all solution but a context-sensitive tool that, when strategically implemented, can drive inclusive growth, reduce inequality, and foster sustainable economic participation across the heterogeneous EMEA region. The economic implications of digital banking on financial inclusion in the EMEA regions are empirically evident in employment creation, SME growth, and fintech sustainability. For instance, World Bank and IMF data show that increased mobile penetration and account ownership correlate with higher rates of digital payment usage, which directly supports SME formalization and expansion. In Sub-Saharan Africa, platforms like M-Pesa (Kenya), MTN Mobile Money (Ghana), and Paga/OPay (Nigeria) have generated thousands of jobs in agent networks, customer support, and fintech services. Empirical evidence also highlights SMEs' rising GDP contributions, with digital banking enabling access to credit and markets. Furthermore, fintech ecosystems demonstrate sustainability through consistent growth in transaction volumes and user adoption, reinforcing innovation and regulatory adaptation. Thus, digital banking empirically drives inclusive growth by linking financial access to measurable employment, SME productivity, and fintech resilience.

11. Conclusion

The study concludes that online banking greatly promotes the financial inclusion of the EMEA market, especially where there is limited physical banking infrastructure. The study confirms the hypothesis that digital banking determinants, including internet penetration, mobile phone penetration, and digital payment systems, are positively associated with financial inclusion indicators, like account holding, access to credit, and use of digital payments, using a combination of descriptive statistics and chi-square tests. Digital banking has a strong positive impact on financial inclusion in the EMEA region, according to the study findings. Utilizing a Chi-square test of independence and factor analysis like mobile payment systems, internet connectivity, and mobile banking, the study finds statistically significant associations between digital access and financial inclusion outcomes. The research hypothesis is evidenced by the Chi-square statistic (11.136, $df = 4$, $p < 0.05$), which further attests to digital banking as a key impetus of inclusive financial engagement among various groups. Regression models supported that digital banking measures were statistically significant predictors of financial inclusion with high explanatory power, while correlation analysis showed high associations between digital access and financial engagement. By creating a statistically significant association between categorical variables, the chi-square test further supported these findings and depicted that access to electronic banking is not random but has a strong association with financial inclusion.

These hypotheses were empirically confirmed in Africa, particularly in nations like Kenya, Ghana, and Nigeria. Millions of people in remote or under-served regions are now able to access the formal financial system through mobile banking networks like M-Pesa and MTN Mobile Money. Specifically, the study reveals that digital banking is a just economic development tool and not a technological wonder alone. It provides informative facts that politicians, banks, and development agencies can use to fund digital infrastructure, enhance financial literacy, and create enabling conditions that facilitate access to financial services in an equitable manner across the EMEA region. Online banking greatly boosts financial inclusion within the EMEA region, the study's findings establish. Evidence based on empirical research from Africa, namely Kenya and Ghana, reveals that the TAM and CRM approaches are effective in driving user uptake and trustworthiness. Such approaches ascertain that digital platforms can easily reach underserved segments to create economic inclusiveness.

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