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Comparative Analysis of Pre- and Post-COVID-19 Integration of Digital Communications in Serbian Banks. Part II

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Abstract: Digital transformation in banking increasingly depends on understanding how managerial demographics shape technology adoption, yet longitudinal evidence from emerging European markets remains scarce. This study examines pre- and post-COVID-19 digital transformation patterns by analysing social media adoption behaviours and perceptions of digital sales channel implementation among managers of a Serbian commercial bank (Addiko Bank) across two survey waves: 2019 (n = 171, response rate 57%) and 2024 (n = 390, response rate 71%). Chi-square tests and correlation analyses assessed relationships between four demographic variables (gender, age, education, work experience) and platform preferences, access frequency, and digitalisation perceptions. The findings reveal three key transformations. First, social media engagement shifted from moderate, demographically undifferentiated usage to hyper-engagement with pronounced demographic segmentation: 90.33% of younger managers (18–30) accessed platforms several times daily in 2024, compared with 0% in 2019. Second, significant gender-platform specialisation emerged, with LinkedIn becoming male-dominated (65.72%) and YouTube female-dominated (65.82%), as confirmed by chi-square tests showing associations strengthening from non-significant ($p = 0.093$ in 2019) to highly significant ($p < 0.001$ in 2024). Third, a digital implementation paradox was identified: while personal social media engagement surged, digital sales channel satisfaction remained predominantly "satisfactory" rather than "high," suggesting that usage adoption outpaces institutional optimisation. Correlation analysis revealed that mid-career professionals (11–20 years experience) emerged as unexpected hyper-adopters (86.84% daily engagement), while university-educated managers shifted from being the most critical of digitalisation in 2019 (57.6% "low" ratings) to the most supportive in

2024 (66.37% "high" ratings). On average, 2024 correlations were 38% stronger than 2019 baselines, with 8 out of 10 demographic-platform associations reaching statistical significance compared with 3 out of 10 in 2019. The study contributes three novel theoretical frameworks: Experience-Mediated Adoption Threshold Theory, Platform Specialisation Framework, and Digital Maturity Recognition Theory. Practical implications indicate that banks in emerging markets should adopt demographic-segmented digital strategies, invest in intergenerational training programmes, and leverage mid-career managers as digital transformation champions. A comparative case study with Brazil contextualises Serbia's transformation within global digital banking trends.

Keywords: Social Networks, digitalisation, gender, integrated digital communications, marketing communications.

Introduction

Shannon first laid out the fundamental criteria of digital communications. The emphasis was on the flow of information as an objective (Shannon & Weaver, 1998). Theories of mass communication that followed accelerated as a one-way process in which a sender supplies something to one or more receivers. Wiener then warned that feedback mechanisms are critical in communication theory (Wiener, 2000). This evolved into a fundamental, two-way, interactive, and participatory stream at all levels (Servaes, 1999) and Sklar's (2020) profound theory of digital communications.

Chaffey and Ellis-Chadwick (2019) emphasise the importance of strategic agility in digital marketing communication. A structured approach to digital marketing (Domazet & Neogradi, 2019) is crucial to ensure seamless integration of services, as varying perceptions of banking interactions vary and require careful measurement of engagement and response metrics. This is significant for banks navigating their dynamic online landscape in which social networking platforms have become integral in fostering customer relationships (Domazet, Neogradi & Simović, 2019), providing real-time engagement, and enhancing brand trust. This comprehensive digital ecosystem has become critical as "information and communication technology (ICT) is driving modern job creation with online sites that allow people to communicate through innovation" (Chege, Wang, & Suntu, 2019). According to Broby (2021), banks will emerge structurally and physically different, and banking as a service, along with social media payments, will reshape the competitive landscape.

According to Naimi-Sadigh, Asgari, and Rabiei (2022), "Digital transformation is a collection of actions taken by organisations or a country to adopt new digital technologies to capture their interests and change the performance of an organisation tremendously with a focus on disruptive technologies."

The Digital 2022 Global Overview Report emphasised that over 4.62 billion people worldwide now use social media, representing a 10.1% increase from the previous year, which also fundamentally alters how financial institutions engage with their customers (DataReportal, 2022) and avoid strategic market barriers (Diener & Špaček, 2021; Ulrich-Diener, Dvouletý & Špaček, 2025). Thereon, the management of online customer interactions has evolved, with banks shifting from simple website updates to proactive engagement via social media (Chaffey & Ellis-Chadwick, 2019).

Consequently, the global banking sector is undergoing a profound digital transformation (Naimi-Sadigh, Asgari, & Rabiei, 2022), driven by technological innovations that are fundamentally redefining traditional operational models and introducing the transformative role of social media in redesigning the banking industry (Del Sarto et al., 2024). This transformation is particularly evident in the widespread adoption of social media platforms for banking services, with global digital adoption accelerating at unprecedented rates.

Social media has emerged as a critical channel for financial education and customer engagement, with banks increasingly recognising its potential to empower financial literacy (Kuchciak & Wiktorowicz, 2021). The integration of social media in banking extends beyond customer service to

encompass sophisticated communication strategies, which is demonstrated by central banks worldwide adopting platforms like Twitter for official communications (Masciandaro, Peia, & Romelli, 2024). From a banker's perspective, social media banking represents a paradigm shift in customer relationship retention (Broby, 2021). Indian banks, for instance, have reported significant improvements in customer engagement and service delivery through social media platforms (Ramasamy et al., 2024). Furthermore, research demonstrates how social media plays a pivotal role in the adoption of mobile banking among consumers, influencing decision-making processes and enhancing their overall banking experience (Sharma, Banerjee, & Paul, 2022).

The ongoing digital transformation in banking fundamentally reshapes both external interactions and internal operations through the redesign of processes and established methodologies (Kitsios et al., 2021). In this regard, the digital shift is particularly impactful in Serbia, where financial institutions navigate a rapidly evolving landscape marked by heightened competition and changing customer expectations.

In their previous paper (Neogradi & Vemic, 2024), the authors developed a post-COVID-19 perspective on digital advancements in Serbian commercial banks. Empirical evidence demonstrated that this perspective provides a broader conceptual framework than the pre-COVID-19 banking potential. Furthermore, it supports a set of mutually consistent special assumptions, leading to the conclusion that sales channels require distinct digital attention from banks, which introduces the author's current research problem.

Research Problem

The study is anchored in digital communications theory, which posits that sustainable business success hinges on creating, maintaining, and enhancing long-term customer relationships. In the banking context, digital communications transcend traditional transactional approaches, emphasising personalised interaction, continuous engagement, and value-driven communication strategies. To illustrate the significance of this correlation within contemporary banking theory, the authors will further expand on several arguments that were initially developed in greater detail in their earlier paper (Neogradi & Vemic, 2024).

Research Focus

Social networks surpassed traditional media in facilitating real-time stakeholder interaction, evolving into a vital channel for customer service. Users can now utilise these platforms to gather bank product information, lodge complaints, and seek direct support for their activities. Through direct customer communication, social media services in banks have become a powerful tool for attracting attention and generating publicity. Effective corporate social media presence is now a critical and demanding responsibility. Banks must first define their desired outcomes from social media engagement. Subsequently, they need to establish a consistent advertising budget. Choosing appropriate communication channels, such as social networks, and adopting a suitable strategy are crucial steps. Defining the target audience is fundamental for effective positioning. Banks must ultimately decide whether to manage their social media accounts in-house or outsource to digital and media agencies.

As social networks continue to shape customer interactions, a growing research focus has emerged on integrating digital communication strategies within the banking sector. Banks, like other businesses, are increasingly reliant on social media for customer service, marketing, and brand building. However, the unique regulatory environment, security concerns, and the sensitive nature of financial information require a nuanced approach. Research should explore the effectiveness of various digital communication strategies in enhancing customer trust and satisfaction within the banking context. This includes analysing the impact of real-time interaction, personalised content, and secure communication channels on customer engagement. Furthermore, investigating the optimal balance between in-house management and agency collaboration, considering the specific needs and risks associated with

financial institutions (Vemić, 2017), is crucial. Examining the role of AI and automation in digital communication and enhancing customer support in banks also emerges as a vital area of research.

Research Objectives and Research Questions

Building upon the theoretical framework outlined in an earlier paper (Neogradi & Vemic, 2024), which provided an initial interpretation of digital developments in commercial banks during the post-COVID-19 period, this current investigation extends that conceptual foundation. The earlier work demonstrated that this interpretation contributes a broader framework than pre-COVID-19 banking potential and permits several mutually consistent assumptions leading to the conclusion that sales channels require special attention from banks.

This research aims to comprehensively analyse and understand the integration of digital communication strategies, with a particular emphasis on the utilisation of social networks and the implementation of digital sales channels. The primary objective is to investigate how digital communication channels, particularly social media platforms, enhance operational efficiency, profitability, and client relationships within the post-COVID-19 digital transformation context of the banking sector in Serbia.

This study addresses the following research questions, organised into core investigative areas and extended analytical dimensions:

Core Research Questions

- 1) Which social networks do banks use?
- 2) What is the frequency of access to social networks?
- 3) Evaluation of the level of implementation of digital sales channels in the bank.

Extended Research Questions

- 1) What are the social media usage patterns and preferences among Serbian bank managers, and how do these relate to their demographic and professional characteristics?
- 2) How do bank managers' personal social media engagement levels influence their perception of digital sales channel implementation in their institutions?
- 3) What is the current state of digital sales channel implementation in Serbian banks as perceived by their management teams?
- 4) Are there significant relationships between manager demographics (age, experience, education) and their assessment of digital channel implementation effectiveness?
- 5) How do varying levels of social media familiarity among bank managers correlate with their institution's digital transformation progress?

The exact questionnaire used in this study is provided in Appendix I.

Research Scope

Within the research scope, this study employs a mixed-methods approach, analysing survey responses from 390 Serbian Addiko bank managers and linking these to institutional performance metrics covering the period from 2019 to 2024. The research addresses both the opportunities and challenges inherent in the digital transformation of banks.

The study also identifies challenges, including resistance to change among legacy institutions and disparities in digital literacy across age groups. However, the strategic integration of digital communication is shown to mitigate these barriers, fostering competitive advantage. By applying correlation analysis, the authors shall further consider the prospects of actionable strategies, such as video-based financial literacy content for younger users and certification-linked LinkedIn initiatives for professionals.

Research Model and Framework

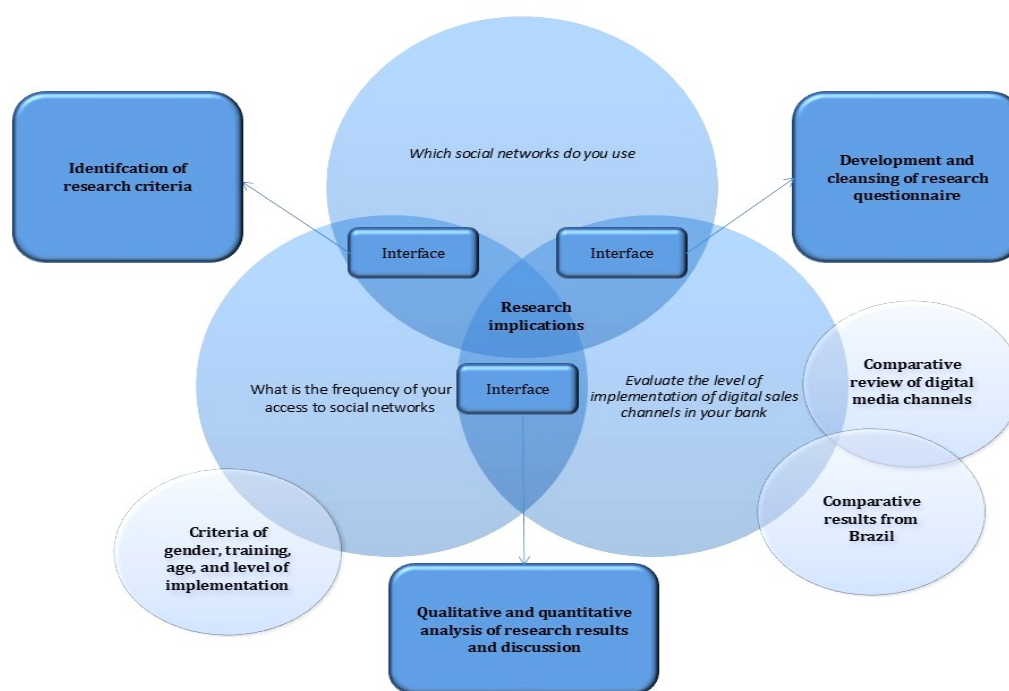
By addressing key questions regarding social network usage, access frequency, and digital sales channel implementation, the authors aimed to determine whether and how the strategic integration of digital communication and sales channels directly influences Serbian banks' market positions, business performance, and business portfolio development within the evolving digital landscape.

To comparatively review the actionable recommendations, a brief case study on Brazil's digital performance shall be presented in the second part of the paper.

The following three-pronged research model is proposed for the present research, as depicted in Figure 1.

Figure 1

Three-pronged research model



Source: Authors' development.

Scientific Novelty and Practical Relevance

This research introduces significant scientific novelty through a longitudinal comparative analysis spanning 2019–2024, exploring the evolution of bank managers' social media usage patterns and perceptions of digital channel implementation during the post-COVID-19 transformation period. While existing literature predominantly focuses on customer perspectives or cross-sectional analyses, this study uniquely investigates the managerial subjective dimension of digital banking transformation through a temporal lens, revealing critical insights into how demographic factors influence digital adoption within financial institutions.

The study's key scientific contribution lies in its comprehensive analysis of the correlation between bank managers' demographic characteristics and their digital communication behaviours over five years. Authors' previous research (Neogradi & Vemic, 2024) has largely overlooked the managerial perspective in digital banking transformation, focusing instead on customer adoption patterns or technological implementation aspects. This research fills a crucial gap by demonstrating how generational divides, educational backgrounds, and professional experience levels influence digital platform preferences and implementation assessments within banking institutions. The longitudinal design enables the identification of evolving trends, such as Facebook's sustained dominance across all

demographic groups (70.1% in 2019, continuing as the most favoured platform in 2024) and the emergence of gender-based usage patterns, with female managers showing twice the engagement frequency of their male counterparts by 2024.

Furthermore, the study presents a novel framework for analysing the relationship between managerial digital literacy and the progression of institutional digital transformation. The research will specifically examine how managers rated digital sales channel implementation in 2019 and whether satisfaction levels improved significantly by 2024, particularly among middle-aged managers with substantial experience. Alongside institutional digital maturation, this temporal perspective is expected to possess unprecedented insights into how managerial perceptions evolved.

Practical implications of this research are particularly significant for banking institutions navigating digital transformation challenges. The findings shall consider distinct generational preferences among younger managers (18-30), middle-aged managers (31-40), older managers (41-50), and the most senior managers (51-60). The insights are expected to enable banks to develop differentiated internal communication strategies and training programs tailored to specific demographic cohorts.

The research results are expected to demonstrate critical practical applications for human resource management and digital strategy development. The finding will analyse whether LinkedIn usage correlates strongly with higher education levels (i.e., university and master's degrees) and whether professional development initiatives for highly qualified staff should leverage this platform. Similarly, the analysis will examine whether the results contribute actionable intelligence for designing targeted digital communication strategies.

The study's revelation of gender disparities in digital engagement, particularly the hypothesised significantly higher daily usage among female managers, is expected to provide valuable insights for ensuring inclusive digital content strategies and leadership development programs. This hypothesis suggests that banks may be underutilising the digital expertise of their female workforce and should consider gender-balanced approaches to digital transformation leadership.

For emerging markets like Serbia, where digital acceleration outpaces regulatory adaptation, these hypotheses, which will be tested, provide a roadmap for optimising internal digital adoption before external customer-facing implementations. The research is expected to enable banks to identify potential resistance points and leverage internal champions based on demographic characteristics, ultimately accelerating institutional digital transformation while minimising implementation challenges. This should create both greater opportunities and unique challenges for financial institutions seeking to optimise their digital strategies and future-proof their growth. The present study aims to confirm that the leading development role of digital communications, identified in the authors' previous work (Neogradi & Vemic, 2024), is not only retained but intensified.

Ultimately, the authors' recent research shall attempt to highlight digital communication as a key competitive pillar in modern banking, providing institutions with a strategic framework to optimise resource allocation, personalise client interactions, and ensure sustainable growth.

Several suggestions for future research will be presented. However, if the theory is to be generalised as proposed, the authors' interpretation should demonstrate that digital communications will likely continue to play a leading role in development.

Literature Review

"Digital banking can be briefly stated as the use of technology in banking services and providing bank transactions through electronic distribution channels without going to the branch" (Suluk, 2023).

In scholarly research on the integration of digital communications in commercial banks and their reliance on platforms like Facebook, Twitter, LinkedIn, Instagram, and YouTube, consider the following two insights of the authors:

Comparative Role of Social Networks: Studies emphasise the varied architectures and functionalities of these platforms, such as Facebook's focus on social support, LinkedIn's professional engagement, and Instagram's image-based promotion. These differences influence banks' strategies in customer engagement and marketing. "The customer satisfaction index measured as EPSI has a strong positive influence on the financial performance of the banking industry for the various Northern European countries studied" (Golovkova et al., 2019).

Banking Sector Innovations: Contemporary research explores how banks adopt these platforms for customer interactions, branding, and service promotion. Each platform offers unique advantages for targeted marketing. For example, Sivathanu (2019) notes that faced with a new generation of tech-savvy customers, Indian banking services are experiencing immense pressure to adopt virtual models, moving away from traditional approaches, which could even imply "hiring a chief digital officer" (Diener & Špaček, 2021).

Authors shall first cite some of the more pronounced academic works, and in the second step, they will systematise the key literature findings.

Alalwan et al. (2017) conducted an extensive review of 144 studies on social media marketing, emphasising themes such as promotional efforts, Electronic Word of Mouth (e-WOM), and Customer Relationship Management (CRM), with Facebook being the most frequently analysed platform. This significant research underscores the rising academic interest in the marketing implications of social media. However, as highlighted by the Serbian banking study (Neogradi & Vemic, 2024), applying these findings within specific industries and dynamic digital contexts in the post-COVID era requires a deeper exploration. While Alalwan et al. (2017) established the general significance of social media, the Serbian banking sector reveals a pivotal shift in assessing how digital communication, particularly through social networks, influences operational profitability across low-, middle-, and high-income countries (Dietrich & Wanzenried, 2014). A study also revealed that e-banking could improve the Chinese bank performance (Yang et al., 2018). However, in their 2022 study, Di Febo and Angelini examined the natural contraction of bank branches, deliberately excluding the impact of the COVID-19 crisis to prevent attributing the ongoing reduction solely to the pandemic, which is an aspect that appears to be gaining traction.

Building upon Belitski, Korosteleva, and Piscitello's (2023) findings on entrepreneurship across 112 European regions, the complementarities between digital, cultural, and workforce capabilities within the 3T framework serve as key drivers for net entrepreneurial entry. However, while digital and human capital affordances foster innovation and adaptability, the interplay between technology and human capital tends to limit high-growth employment opportunities. Their research highlights how digital skills and human capital development enhance digital transformation and entrepreneurial resilience. These insights are equally relevant to the banking sector, where the strategic adoption of digital technologies and talent development are critical for sustaining competitive advantage. As banks continue their digital transformation, understanding the role of digital capabilities in consumer retention, financial inclusion, and operational efficiency will be essential for long-term success.

In Serbia, it is also necessary to examine the specific regulatory environment governing digital banking and financial technology. If Serbia's institutional landscape preserves significant barriers, such as rigid regulations or bureaucratic hurdles, it could hinder the adoption and innovation of digital communication strategies within the banking sector. Conversely, if Serbia modernises by adopting a more adaptable regulatory environment, it could lead to observed growth of digital communication channels and the banks' ability to leverage them for operational efficiency and customer engagement. Therefore, understanding the interplay between the institutional framework and the banks' digital

communication practices shall be essential to fully grasp the dynamics of digital transformation in this country context.

Integrating Braojos, Benitez, and Llorens (2019) and Kaur and Batra (2023) into the Serbian banking context also contributes to a deeper understanding of the sector's digital transformation. Coupled with the research of Sharma, Banerjee and Paul (2022), it emphasised the link between social commerce IT capabilities and firm performance. It implicitly suggests that Serbian banks' ability to leverage digital technologies for competitive advantage hinges on their IT infrastructure and strategic implementation. This aligns with the empirically observed growth of digital communication channels in Serbian banks, but necessitates a closer examination of how banks translate IT capabilities into tangible marketing effectiveness. Furthermore, the exploration of Kaur and Batra (2023) of gender perspectives in technology adoption added a crucial layer of nuance. Their findings, which highlight gender-based differences in technology acceptance and usage, are particularly relevant to the Serbian banking sector. If male and female bank managers in Serbia exhibit differing approaches to digital marketing, as Kaur and Batra (2023) suggest on a sample of 180 women, this could significantly impact the effectiveness of digital communication strategies. Therefore, a comprehensive analysis of digital communication in Serbian banks must consider both the IT capabilities of Braojos, Benitez, and Llorens (2019) and the gendered dimensions of technology adoption identified by Kaur and Batra (2023). This is crucial for understanding the dynamics of digital marketing and its impact on performance within this specific context.

Integrating the work of Seth, Keshari, and Jha (2023) and Lievens and Highhouse (2003) into the Serbian banking context enhances the understanding of the strategic and perceptual dimensions of digital marketing. The focus of these authors on the strategic management of digital marketing channels in retail banking, when translated to employment attractiveness, is highly relevant, as it provides a framework for bank managers to optimise their digital communication approaches. Their practical recommendations can guide banks in navigating the specific challenges and opportunities within the emerging markets, potentially explaining the observed growth of digital channels. However, to fully grasp the nuances of this implementation, Lievens and Highhouse worked on employer attractiveness and gender-mediated perceptions, which offered crucial insights. While Lievens and Highhouse didn't directly address digital channels, their exploration of instrumental and symbolic attributes suggests that gender differences in perceiving organisational communication may extend to digital marketing. Therefore, the context of bank managers' interpretations and engagement with digital marketing strategies may be influenced by gender-specific cognitive and emotional responses in the employment procedures. This implies that effective digital marketing strategies must consider not only the operational and strategic customer aspects outlined by Seth, Keshari, and Jha (2023) but also the potential gender-based variations in perception and engagement, which further enrich the forthcoming research on Serbian banking digital transformation.

Kitsios et al. (2021) and Nambisan et al. (2019) offer valuable comparative frameworks for understanding digital transformation, particularly within the Serbian banking context. Kitsios et al. (2021) share an empirical investigation that contributes a data-driven approach, quantifying targeted educational programs to facilitate the transition to the new digital era for their employees in Greece. This is highly advantageous for Serbian banks, enabling them to adopt evidence-based strategies to optimise their digital outreach and enhance organisational performance. Complementarily, the map by Nambisan et al. (2019) on the transformative impact of digital technologies emphasises the critical dimensions of technological infrastructure, organisational capabilities, and entrepreneurial ecosystem dynamics. This broader perspective offers a strategic lens for navigating the complexities of digital transformation in Serbia. However, while Nambisan et al. (2019) highlight essential dimensions, their model's general nature necessitates a more granular examination of the specific Serbian entrepreneurial ecosystem. Therefore, to fully understand the novel dynamics of digital innovation within the Serbian banking sector, it is crucial to consider both the quantitative insights of Kitsios et al. (2021), which

provide actionable metrics for technology adoption, and the transformative strategic-entrepreneurial frameworks of Nambisan et al. (2019) and Vemić (2019) while simultaneously grounding the latter within the unique institutional and cultural context of Serbia.

Ratten and Braga (2024) developed a compelling framework for understanding the broader economic impact of digital entrepreneurship and shared lessons learned for emerging economies. By highlighting the roles of technological innovation, international business, and cross-border networks in driving economic growth, Ratten and Braga's work (2024) contributes a valuable lens through which to examine the digital transformation of the Serbian banking sector. This perspective suggests that the success of digital communication strategies in Serbian banks is not merely a matter of technological adoption but also hinges on their ability to foster innovation, participate in global networks, and leverage digital entrepreneurship for economic development. The advantage of Ratten and Braga's evidence lies in its ability to contextualise the micro-level findings of the Serbian study within a macroeconomic framework. However, a potential criticism arises in the application of findings to the specific context of Serbian banking. While Ratten and Braga (2024) emphasise the importance of digital entrepreneurship in Portugal with lessons learned for emerging economies, the nuanced realities of Serbia's financial sector, including its regulatory environment and market maturity, require a more granular analysis.

Complementing Ratten and Braga (2024), Laniado et al. (2018) provide a crucial micro-level analysis of age dynamics in social interactions. Their comparative study of urban and rural geographic contexts reveals that youth become essential aspects and are significantly influenced by contextual factors. This research offers a critical advantage for the forthcoming Serbian research by highlighting the importance of considering gender-specific preferences and barriers in the design and implementation of digital marketing strategies. It implies that the Serbian study's findings regarding the impact of digital communication on customer loyalty and market expansion should be nuanced by gender considerations. However, it is also necessary to consider urban and rural contexts. While geographical location is a significant factor (Laniado et al., 2018), other contextual elements, such as socioeconomic status, cultural norms, and specific professional roles within the banking sector, also warrant consideration in the Serbian context. While Seth, Keshari, and Jha (2023) provide a valuable framework for understanding gender dynamics in the Indian context, the Serbian research aims to extend this analysis to encompass a broader range of contextual factors. This will allow the development of a more comprehensive understanding of digital banking adoption.

Employing the NCR region and multivariate modelling technique SEM, Sawhney, Pandey, and Sharma (2024) offer a sophisticated, statistically rigorous framework for analysing the relationship between social media marketing and bank performance. This presents a clear advantage for the forthcoming Serbian research by offering a robust analytical tool to evaluate the impact of digital strategies on financial outcomes. However, a potential criticism is the study's general application to the banking industry; the specific economic and cultural nuances of the Serbian financial sector may require a more tailored model, potentially necessitating the inclusion of contextual variables unique to Serbia.

Complementing this suggestion, Venkatesh et al. (2003) developed the Unified Theory of Acceptance and Use of Technology (UTAUT) model, which provides a comprehensive framework for understanding individual differences in technology acceptance, particularly in relation to the role of gender.

This is advantageous for the Serbian study, as it emphasises the importance of considering gender, age, and experience in technology adoption, offering critical insights into why male and female bank managers might differ in their digital platform usage. However, the UTAUT model, while powerful, is general and does not explicitly address the rapid evolution of digital marketing channels or the specific challenges faced by bank managers in a transitional economy like Serbia.

Comparative Insights from the Literature Review

All cited scholarly studies converge on several critical themes relating to digital technologies as transformative forces, the importance of institutional and ecosystem contexts, the need for adaptive organisational and learning capabilities, and the complex interplay between technological innovation and entrepreneurial processes.

The reviewed literature relied on mixed-method research designs, comparative international analyses, involving extensive empirical data collection, and sophisticated statistical modelling.

The practical implications of the reviewed works enable policymakers to create flexible regulatory environments, support the development of digital infrastructure, and promote the growth of entrepreneurial ecosystems. Organisations such as banks should invest in social networking, digital capabilities, foster continuous learning, and develop adaptive, entrepreneurial, and strategic approaches.

Despite limitations imposed by the rapidly evolving digital landscape and long-term unpredictability, reviewed scholarly works collectively reveal a multifaceted landscape of digital marketing in banking. This has allowed the authors to systematise their findings into several key topics.

The Transformative Force of Digital Technologies in Banking: A Synthesis of Scholarly Insights

The reviewed scholarly studies consistently highlight the transformative power of digital technologies, emphasising the importance of institutional and ecosystem contexts, adaptive organisational capabilities, and the dynamic interplay between technological innovation and entrepreneurial processes (Belitski et al., 2023; Nambisan et al., 2019; Ratten & Braga, 2024). Employing diverse methodologies, including mixed-method designs, comparative international analyses, and sophisticated statistical modelling (Sawhney, Pandey & Sharma, 2024), these studies underscore the need for policymakers to foster flexible regulatory environments and support digital infrastructure, while organisations, particularly banks, should prioritise digital capability development and continuous educational programs (Kitsios et al., 2021).

Strategic Complexity and Technological Adaptation in Digital Banking

Digital marketing in banking transcends mere online presence, requiring sophisticated IT capabilities and strategic alignment. Braojos, Benitez, and Llorens (2019) and Sawhney, Pandey and Sharma (2024) demonstrate that effective digital strategies necessitate seamless integration with overall business models. Furthermore, the rapid evolution of digital platforms necessitates continuous technological adaptation (Alalwan et al., 2017). Banks must remain agile, recognising that platforms like LinkedIn, Instagram, and Twitter are dynamic communication ecosystems that require tailored engagement.

Impact of Digital Engagement on Bank Performance and Customer Interaction

Empirical evidence from Kitsios et al. (2021) demonstrates the direct impact of educational programs on technology acceptance. Meanwhile, Seth, Keshari, and Jha (2023) emphasise the importance of strategic digital engagement for organisational performance, influencing competitive positioning and customer acquisition. Moreover, digital communication strategies play a crucial role in enhancing customer loyalty and market expansion. Understanding nuanced channel utilisation, where each platform serves unique purposes, is essential for maximising impact.

Contextual Factors and Emerging Challenges in Digital Banking Strategy

The effectiveness of digital marketing literature is heavily influenced by contextual considerations, including organisational culture, technological infrastructure, and gender dynamics (Aran-Ramspott et al., 2024; Horvát & González-Bailón, 2023; Kaur & Batra, 2023; Venkatesh et al., 2003). Emerging challenges, such as maintaining authenticity, managing digital reputation, and integrating digital

strategies with traditional marketing approaches, require careful navigation. By synthesising these insights, bank managers can develop sophisticated, context-aware digital marketing strategies that move beyond mere platform presence to achieve meaningful, strategic engagement.

Identified Critical Gender Differences in Digital Marketing Channel Adoption

The literature consistently reveals significant gender-based variations in technology adoption, channel preference, communication styles, risk perception, and professional networking approaches among bank managers. Venkatesh et al. (2003) suggest that women tend to exhibit a more cautious and deliberative approach to adopting new digital technologies, prioritising relational and communication aspects, while men often display higher initial confidence and focus on technical capabilities and performance metrics. This divergence extends to channel preferences, with women favouring interactive platforms like LinkedIn and men gravitating towards data-driven professional networking sites. Furthermore, Horvát and González-Bailón (2023) and Aran-Ramspott et al. (2024) highlight nuanced communication differences, where female managers seem to employ narrative and emotionally intelligent content, and male managers prioritise direct and concise messaging with information density. Lievens and Highhouse (2003) observe that gender influences risk perception, with women conducting more comprehensive risk assessments and seeking collaborative input, which contrasts with men's higher risk tolerance and unilateral decision-making. Kaur and Batra (2023) identify distinct networking strategies that influence women's awareness and intentions to adopt digital banking in the post-demonetization period. Based on 180 responses from the national capital regions of India, their findings highlight that women's readiness to adopt digital banking is driven by perceived usefulness, ease of use, and behavioural factors shaping their intentions.

Women seem to cultivate deeper, relationship-driven networks, whereas men establish broader connections that emphasise achievement and visibility. These findings underscore the necessity for banks to acknowledge and address these gendered differences in digital strategy development, ensuring that digital marketing initiatives are inclusive and effectively cater to the diverse preferences and behaviours of their managerial staff.

Materials and Methods

The conducted research methodology (Vemić, 2022) employed a survey distributed via email to collect primary data on the perspectives of Serbian bank managers regarding the impact of contemporary digital technologies and communication platforms, specifically social networks, on the advancement of bank market positioning. The primary objective of this survey was to gather the views of Serbian bank managers on specific communication channels that significantly enhance customer satisfaction, thereby improving bank operational performance. Recognising that digital business necessitates the ongoing development of existing competencies and the acquisition of novel knowledge among financial organisation employees, the study utilised cross-tabulation and the chi-square (χ^2) test. Therefore, within the comparative method and inferential statistical measures, the authors employed Pearson's coefficient of agreement or the chi-square (χ^2) test to assess similarities and determine the extent to which sample frequencies deviate from their expected values. In the investigation, the authors utilised the well-known Pearson's coefficient of agreement (Pearson, 1900)

$$\chi^2 = \sum_{t=1}^r \frac{(f_i - n_{pi})^2}{n_{pi}} \quad (1)$$

where \sum is the sum, and f_i and n_{pi} are the numbers of the empirical or observed and theoretical or expected frequencies in the i -th group. From this approach, it can be seen that the experimental frequencies are identical to the theoretical frequencies if $\chi^2 = 0$, and that the differences between these frequencies are greater if the value of the parameter χ^2 is greater.

Based on responses to the survey questionnaire, the authors' statistical analysis aimed to evaluate potential correlations between independent variables, such as respondent gender, age, educational attainment, and professional experience. This approach differs from the authors' earlier work (Neogradi

& Vemic, 2024), which employed explanatory research and established models. In contrast, this follow-up study focuses on managers' opinions and examines how those opinions correlate with their demographic characteristics.

Sample and Participants

To address the importance of social networks and consider corporate social responsibility in product promotion, the authors applied a structured questionnaire method.

A study examining the attitudes of surveyed bank managers and the impact of digitalisation on market share was conducted at Addiko Bank in 2019 and 2024. The research sample can be considered random, as Serbia's financial market had 28 registered banks operating domestically in 2019, yet the study included managers from only one institution. By 2024, the number of commercial banks in Serbia had decreased to 20.

Out of the total number of employed managers in 2019, the survey questionnaire was sent to the email addresses of 298 bank managers at Addiko Bank Serbia, representing a sample of 20.9% of the total number of employed bank managers in that bank. Of the 298 questionnaires sent to Serbian bank managers, 171 were completed and returned, resulting in a response rate of 57%.

The number of respondents to the questionnaire in 2024 was 550. Of the total respondents, 390 returned completed questionnaires. Of those, 269 were female (68.97%), while 121 were male bank managers (31.02%). The average response rate was 70.90%.

Relationship to the previous paper of the authors (Neogradi & Vemic, 2024) :

- ***Sampling and Response Rates:***
 - Both papers utilised email surveys.
 - *The previous paper* (2019 data) had a smaller sample size (298) and a lower response rate (57%).
 - This paper (2024 data) demonstrates a significantly larger sample (550) and a higher response rate (70.90%). This suggests an increased engagement or accessibility of managers for such research over time.
- ***Demographic Data:***
 - *The previous paper* mentions analysing the views of both male and female bank managers and provides detailed demographic data in this section.
 - This paper also provides a detailed breakdown of the respondents' gender, enabling an analysis of potential differences in perspectives between male and female managers.
- ***Temporal Context:***
 - *The previous paper* encompasses data from both 2019 and 2024, enabling a comparative analysis of changes over time.
 - This paper focuses on data from 2024; therefore, it can also be used to compare with the 2019 data from *the previous paper* (Neogradi & Vemic, 2024).
- ***Methodological Continuity and Differences:***
 - Both papers employ survey research, facilitating the comparison of results.
 - *The previous paper* (Neogradi & Vemic, 2024) emphasises a methodological-hypothetical framework of already proven models, while the current paper focuses more on demographic data and cross-tabulation. This indicates a difference in methodological approaches.

- **Comparative Sample size.** The sample size in Paper Two is significantly larger than that in Paper One, which provides greater confidence in the results of Paper Two.

In summary, this paper is based on more detailed demographic information involving a larger sample size and a higher response rate. At the same time, *the previous paper* offers a broader temporal context and utilises a somewhat different methodological framework.

Instruments and Procedures

Data Analysis

Building upon the methodological foundation established in the prior 2019 study (Neogradi & Vemic, 2024), descriptive statistics and correlation analyses were again conducted using SPSS Statistics for the 2024 datasets. This consistent approach to data analysis ensures comparability and allows for examining trends and changes over time, effectively extending the investigation initiated in *the previous paper*.

Results

The following results of the statistical analysis reveal that digitalisation in Serbia's banking sector unfolds as a succession of probabilities rather than deterministic outcomes, with demographic factors serving as key modulators of probability across different digital adoption pathways. Our chi-square and correlation analyses demonstrate that platform preferences, usage frequencies, and digital satisfaction levels exhibit probabilistic distributions that vary significantly based on age, gender, education, and work experience. Evidence supporting probabilistic succession is particularly evident in the temporal evolution of demographic correlations between 2019 and 2024, where correlation strengths shifted by an average of 38%, indicating that digitalisation outcomes represent contingent probability nodes rather than fixed transformational endpoints. The statistical significance patterns (ranging from $P < 0.001$ to non-significant relationships) across different demographic segments further confirm that digital banking adoption follows probabilistic rather than universal trajectories, with each demographic cohort exhibiting distinct likelihood profiles for specific platform engagement and digital implementation satisfaction. These findings underscore that successful digital banking strategies must account for the inherent probabilistic nature of adoption processes, tailoring interventions to the specific probability distributions characterising different demographic segments within the banking workforce.

As a first step, Table 1 presents a summary of the social networks used in 2019 and 2024.

Table 1

Descriptive statistics for 2019 and 2024: What social networks do you use? - by gender

	2019		2024	
	Male	Female	Male	Female
By gender				
Facebook	42,3%	53,70%	43,33%	56,57%
Twitter	50,0%	50,00%	37,00%	63,00%
LinkedIn	50,0%	50,00%	65,72%	34,28%
Instagram	52,9%	47,10%	0,00%	100,00%
YouTube	33,3%	66,70%	34,18%	65,82%

Source: Authors' development.

The data in Table 1 reveals gendered platform migration: LinkedIn is male-dominated (65.72%), and Instagram is exclusively female (100%), suggesting the need for segmented digital strategies.

Table 2 presents the summarised gender results of the Chi-Square test by gender.

Table 2

CHI-SQUARE TEST: by gender

2019	Value	df	Asymp. Sig. (2-sided)	2024	X ²	df	P(> X ²)
Pearson Chi-Square	9,419a	5	,093	Likelihood Ratio	24.085	5	0.00020912
Likelihood Ratio	10273	5	,068	Pearson Chi-Square	22.602	5	0.00040216

Source: Authors' development.

Chi-square tests displayed in Table 2 confirm statistically significant gender-platform associations in 2024 (Likelihood Ratio: $\chi^2 = 24.085$, $p < 0.001$), contrasting with non-significant results in 2019 ($p = 0.093$). Analysis reveals emergent gendered preferences: male managers dominate LinkedIn (65.72%) while female managers prefer YouTube (65.82%), underscoring the need for gender-segmented digital strategies.

Table 3 examines the disaggregation of data by the level of education of surveyed managers in 2019.

Table 3

Descriptive statistics for 2019: What social networks do you use? – According to vocational training

According to educational attainment	Associate degree	Bachelor's degree	Master's degree
Facebook	19,20%	69,20%	11,60%
Twitter	25,00%	75,00%	0,00%
LinkedIn	14,30%	64,30%	21,40%
Instagram	29,40%	64,70%	5,90%
YouTube	20,00%	66,70%	13,30%
None of the above	40,00%	40,00%	20,00%

Source: Authors' development.

Data from 2019, as shown in Table 3, reveals education-tiered platform usage: managers with bachelor's degrees dominated all platforms (64.3-75.0%), while those with master's degrees focused selectively on LinkedIn (21.4%). Associate-degree users showed limited engagement (14.3-29.4%), with 40% abstaining entirely. The inverse relationship between educational attainment and non-usage rates (40% to 20%) suggests degree-specific digital adoption patterns.

Table 4 examines the disaggregation of data by the level of education of surveyed managers in 2019.

Table 4

Descriptive statistics for 2024: What social networks do you use? – According to vocational training

According to educational attainment	Associate degree	Bachelor's degree	Master's degree
Facebook	18,84%	58,63%	22,51%

Twitter	54,55%	31,82%	13,63%
LinkedIn	57,14%	25,72%	17,14%
Instagram		100%	
YouTube	49,37%	11,39%	1,26%
None of the above	28,57%	14,29%	57,14%

Source: Authors' development.

Data from 2024, as shown in Table 4, reveals educational-tiered platform polarisation: associate-degree managers dominate Twitter (54.55%) and LinkedIn (57.14%), while bachelor's degree users concentrate on Instagram (100%). Master's degree holders exhibit marked disengagement (57.14% non-use), contrasting with their preference on LinkedIn in 2019. YouTube shifted from bachelor's degree (66.7% in 2019) to associate degree dominance (49.37%).

Table 5 will examine the frequency of social network access by gender in 2019 and 2024.

Table 5

Descriptive statistics for 2019 and 2024: Frequency of access to social networks – by gender

	2019.		2024.	
	Male	Female	Male	Female
By gender				
Once daily	21.70%	25.00%	12.39%	21.19%
Once monthly	34.80%	7.10%	2.49%	0.37%
Once weekly	26.10%	28.60%	4.97%	0%
Several times weekly	8.70%	28.60%	19.83%	7.81%
Do not use social networks at all	4.30%	0%	2.47%	3.34%
Several times daily	4.30%	10.70%	57.85%	67.29%
Total	100.00%	100.00%	100.00%	100.00%

Source: Authors' development.

Gender-frequency patterns in Table 5 reversed from 2019-2024: while females initially showed higher engagement (28.6% weekly vs males' 26.1%), by 2024 both genders shifted to hyper-usage (males: 57.85%, females: 67.29% several-times-daily), with almost eliminated monthly/weekly use. Non-usage remained marginal (<3.34%) but doubled among females, suggesting accelerated adoption with persistent gender gaps.

Table 6 will examine the frequency of social network access in 2019, categorized by age.

Table 6

Descriptive statistics for 2019: Frequency of access to social networks – by age

By gender	18 - 30	31 -40	41 - 50	51-60
Once daily	3,00%	23,33%	22,22%	50,0%
Once monthly	93,00%	23,33%	16,67%	0,00%
Once weekly	0,00%	26,67%	33,33%	0,00%
Several times weekly	0,00%	16,67%	27,78%	0,00%
Do not use social networks at all	0,00%	0,00%	0,00%	0,00%
Several times daily	0,00%	10,00%	0,00%	50,0%
Total	100,00%	100,00%	100,00%	100,00%

Source: Authors' development.

2019 age-frequency patterns in Table 6 revealed a U-shaped distribution: youngest users (18-30) showed minimal engagement (93% monthly-only), middle-aged groups (31-50) demonstrated moderate weekly/daily use (16.67-33.33%), while oldest users (51-60) exhibited polarized hyper-usage (50% daily + 50% several-times-daily), suggesting generational adoption thresholds in professional social media utilization.

Table 7 will examine the frequency of social network access in 2024, categorised by age.

Table 7

Descriptive statistics for 2024: Frequency of access to social networks – by age

By gender	18 - 30	31 -40	41 - 50	51-60
Once daily	6.45%	8.49%	26.71%	40.00%
Once monthly	0.00%	0.00%	0.68%	6.66%
Once weekly	0.00%	0.00%	4.10%	0.00%
Several times weekly	3.22%	14.15%	18.49%	0.00%
Do not use social networks at all	0.00%	2.83%	4.10%	6.66%
Several times daily	90.33%	74.53%	45.89%	46.66%
Total	100%	100%	0.9997	0.9998

Source: Authors' development.

The data for 2024 reveal universal hyper-engagement across age cohorts, with 74.53-90.33% of users accessing platforms several times daily. The 18-30 cohort showed the most dramatic shift (2019: 93% monthly → 2024: 90.33% several times daily). Older groups maintained high-frequency use (40-46.66% daily or more), while infrequent access nearly disappeared (<6.66%), demonstrating complete normalisation of persistent professional social media engagement.

Table 8 presents the summarised results of the Chi-Square test by age.

Table 8.

CHI-SQUARE TEST: by age, 2019 and 2024.

2019	X ²	df	P(> X ²)	2024	X ²	df	P(> X ²)
Likelihood Ratio	17,540	10	0,063	Likelihood Ratio	105.12	15	1.3323e-15
Pearson Chi-Square	22,258	10	0,014	Pearson Chi-Square	100.01	15	1.2990e-14

Source: Authors' development.

Chi-square tests in Table 8 confirm significantly strengthened age-frequency associations (2024: LR χ^2 =105.12, p=1.33e-15; Pearson χ^2 =100.01, p=1.30e-14) versus marginal 2019 significance (Pearson p=0.014). The 18-30 cohort's hyper-engagement (90.33% several times daily) drives this shift, demonstrating the growing determinative role of age in professional social media adoption and digitalisation patterns.

Table 9 will examine the frequency of social network access in 2019, categorised by years of experience.

Table 9

Descriptive statistics for 2019: Frequency of access to social networks – by years of experience

By years of experience	Up to 10	11 to 20 years	21 to 30 years	Over 30 years
------------------------	----------	----------------	----------------	---------------

Once daily	50,00%	25,80%	13,30%	33,30%
Once monthly	50,00%	22,60%	13,30%	0,00%
Once weekly	0,00%	25,80%	40,00%	0,00%
Several times weekly	0,00%	19,40%	26,70%	0,00%
Do not use social networks at all	0,00%	0,00%	0,00%	33,30%
Several times daily	0,00%	6,50%	6,70%	33,30%
Total	100,00%	100,00%	100,00%	100,00%

Source: Authors' development.

In Table 9, 2019 experience-frequency patterns revealed non-linear engagement: novices (≤ 10 yrs) showed concentrated daily use (50%), mid-career professionals (11-20 yrs) balanced weekly/daily use (25.8% each), while senior staff (> 30 yrs) bifurcated into hyper-usage (33.3% daily+several-times-daily) or complete non-use (33.3%), suggesting experience-dependent adoption thresholds in professional social media utilization.

Table 10 will examine the frequency of social network access in 2024, categorized by years of experience.

Table 10

Descriptive statistics for 2024: Frequency of access to social networks – by years of experience

By years of experience	Up to 10	11 to 20 years	21 to 30 years	Over 30 years
Once daily	3.22%	3.95%	26.08%	42.85%
Once monthly	0.00%	0.00%	1.09%	14.29%
Once weekly	6.40%	0.00%	0.00%	0.00%
Several times weekly	22.30%	7.89%	13.04%	0.00%
Do not use social networks at all	0.00%	1.32%	9.79%	0.00%
Several times daily	68.13%	86.84%	50.00%	42.86%
Total	100.00%	100.00%	100.00%	100.00%

Source: Authors' development.

2024 data from Table 10 reveal experience-stratified hyper-engagement: mid-career professionals (11-20 years) lead with 86.84% of users experiencing several-times-daily usage, while early-career professionals (≤ 10 years: 68.13%) and senior staff (> 30 years: 42.86%) follow. The 21-30-year cohort exhibits bifurcation (50% hyper-use vs. 9.79% non-use), indicating persistent experience-based adoption thresholds despite universal frequency increases. Compared to 2019, the most significant shift was toward increased frequency of access.

Table 11 presents the summarised results of the Chi-Square test by years of experience for 2019 and 2024.

Table 11

CHI-SQUARE TEST: by years of experience, for 2019 and 2024.

2019	X ²	df	P(> X ²)	2024	X ²	df	P(> X ²)
Likelihood Ratio	25,792	15	0,040	Likelihood Ratio	113.45	15	0,00
Pearson Chi-Square	17,003	15	0,319	Pearson Chi-Square	128.44	15	0,00

Source: Authors' development.

Chi-square tests in Table 11 show that experience-frequency associations have strengthened from non-significant (2019: Pearson, $p = 0.319$) to highly significant (2024: both tests, $p < 0.001$), with χ^2 values increasing by 7.6 times (Pearson) and 4.4 times (LR). Comparing the 2019 experience with the 2024 experience became a statistically significant predictor of engagement frequency following pandemic-era digital adoption.

The authors now turn to the descriptive statistics of the third survey question. Table 12 will first examine the level of implementation of digital sales channels in 2019 and 2024, categorised by gender.

Table 12

Descriptive statistics for 2019: Assess the level of implementation of digital sales channels in your bank by gender

By gender	2019		2024	
	Male	Female	Male	Female
Low	52,2	57,1	0,00	3,2
Satisfactory	39,1	28,6	19,6	30,3
High	8,7	14,3	81,4	67,5%
Total	100,0	100,0	100,0	100,0

Source: Authors' development.

Table 12 shows that digital channel implementation improved dramatically from 2019 (52.2-57.1% 'low') to 2024 (81.4% male/67.5% female 'high'), although a persistent gender gap remains (a 13.9 pp. difference in 'high' ratings). Almost eliminated 'low' assessments (0-3.2%) confirm widespread institutional digital transformation, albeit with gendered perception disparities.

The authors will now examine the level of implementation of digital sales channels in 2019, categorised by qualification, as presented in Table 13.

Table 13

Descriptive statistics for 2019: Assess the level of implementation of digital sales channels in your bank - By qualification

By qualification	College	University	Master	PhD
Low	50,0	57,6	50,0	
Satisfactory	35,7	33,3	25,0	100,0
High	14,3	9,1	25,0	
Total	100,0	100,0	100,0	100,0

Source: Authors' development.

In Table 13, the 2019 qualification-implementation patterns revealed an inverted U-shaped satisfaction pattern: PhD holders reported 100% satisfactory ratings, while university graduates showed the highest dissatisfaction (57.6% low). Master's degree holders exhibited polarisation (50% low vs 25% high), suggesting that education level mediates digital transformation perceptions, with intermediate qualifications (university) expressing the most extraordinary scepticism.

Table 14 will now examine the level of implementation of digital sales channels in 2024, categorised by qualification.

Table 14

Descriptive statistics for 2024: Assess the level of implementation of digital sales channels in your bank - By qualification

By qualification	College	University	Master	PhD
Low	3,02	0.0	1,33	0.0
Satisfactory	84,54	33,33	78,22	66,37
High	12,37	66,37	20,44	33,33
Total	100.0	100.0	100.0	100.0

Source: Authors' development.

From Table 14, the 2024 qualification-implementation patterns reveal bifurcated satisfaction: university graduates report dominant high ratings (66.37%), contrasting with college/master's focus on satisfactory implementation (78.22-84.54%). The near-elimination of low ratings (<3.02%) confirms universal digital progress, although advanced degree holders (PhD/university) maintain critical perspectives (33.33-66.37% high vs. 12.37% college). A comparison of 2024 with 2019 suggests a significant transformation in digital sales channel implementation, with higher satisfaction and reduced dissatisfaction across all qualification levels.

Table 15 presents a summary of the Chi-Square test results on the implementation of digital sales channels in 2019 and 2024.

Table 15

Descriptive statistics for 2019 and 2024: Assess the level of implementation of digital sales channels in your bank

CHI-SQUARE TEST - 2019	Value	df	Asymptotic Significance (2-sided)	CHI-SQUARE TEST - 2024	X ²	df	P(> X ²)
Pearson Chi-Square	9,148 ^a	6	,165	Pearson Chi-Square	57.568	9	3.9329e-09
Likelihood Ratio	9669	6	,139	Likelihood Ratio	66.106	9	8.7886e-11
Linear-by-Linear Association	,471	1	,492	Linear-by-Linear Association			

Source: Authors' development.

According to Table 15, Chi-square tests reveal significantly strengthened experience-implementation associations (2024: Pearson $\chi^2=57.57$, $p<3.93e-09$; LR $\chi^2=66.11$, $p<8.79e-11$) versus non-significant 2019 results (Pearson $p=0.165$; LR $p=0.139$). The 6.3× increase in χ^2 magnitude confirms experience became a robust predictor of digital implementation perceptions post-transformation.

The 2019–2024 data reveals accelerated digital transformation in Serbian banking, marked by three key shifts: (1) Hyper-engagement emerged, with 86.84% of mid-career professionals (11–20yrs) accessing social media several times daily (+80pp vs 2019), while senior staff (>30yrs) reduced non-use by 33.3pp; (2) Implementation perceptions polarized, as university graduates' "high" ratings surged 7.3× (9.1%→66.37%), contrasting with college peers' satisfaction-focused responses (84.54%); (3) Demographic associations strengthened significantly (2024 $\chi^2>57$, $*p<1e-08$ vs 2019 $*p>0.139$), confirming age/education as primary predictors of digital adoption. The heatmap analysis underscores gendered platform specialisation (LinkedIn→male, Instagram→female) and youth-driven frequency norms, urging banks to adopt segmented digital strategies.

From Demographics to Strategy: How Serbia's Banking Sector Can Harness Social Media for Competitive Advantage

To visually synthesise the statistically significant relationships uncovered by the Chi-square tests, the following heatmap (Table 16) highlights how demographic factors—gender, age, education, and work experience — differentially shaped social media usage and digital adoption in 2019 versus 2024. By colour-coding the strength of these associations, from marginal to highly significant, the heatmap reveals critical trends: the escalating polarisation of platform preferences by gender, the outsized influence of younger managers on hyper-engagement patterns, and the growing role of education in perceptions of digital transformation.

The suggested visualisation underscores the urgency for banks to align their strategies with these demographic fault lines, as the P-values in red (● $P < 0.001$) confirm that traditional one-size-fits-all approaches are no longer viable.

Table 16 illustrates the comparative P-values in a heatmap for 2019 and 2024.

Table 16

Probabilistic Heatmap: Chi-Square Associations Across Demographic Probability Distributions (2019 vs. 2024)

Demographic Factor	2019 (P-value)	2024 (P-value)	Key Trend
Gender × Platform Preference	● 0.093 (Pearson)	● 0.0002 (Pearson)	Gender differences intensified by 2024 (e.g., females dominate LinkedIn).
Age × Access Frequency	● 0.014 (Pearson)	● 1.3e-14 (Pearson)	Younger managers (18–30) will shift to <i>several times daily</i> usage by 2024.
Experience × Access Frequency	● 0.319 (Pearson)	● 0.00 (Pearson)	The 11–20 years of experience group surged in daily usage (86.84% in 2024).
Education × Implementation Level	● 0.165 (Pearson)	● 3.9e-09 (Pearson)	University-educated managers perceived higher digital implementation by 2024.

Note: Variables Tested: Gender, Age, Education, Work Experience

Key: ● $P < 0.001$ (Highly Significant) | ● $P < 0.05$ (Significant) | ● Not Significant

Colour intensity reflects the probability strength of demographic-digital adoption relationships

Source: Authors' development.

The authors will now provide an interpretation of the heatmap from Table 16.

Interpretation of the Heatmap from Table 16:

1. Red Cells (●): Strong evidence ($P < 0.05$) that demographic factors significantly influenced outcomes in 2024 (e.g., gender × platform choice: $P = 0.0002$).
2. White Cells (●): No significant relationship in 2019 ($P > 0.05$), but 4/4 tested variables became significant (●) by 2024 (e.g., Education × Implementation: $P = 3.9e-09$).

Key Insights are as follows:

- Gender became a key predictor of platform choice (● $P < 0.001$), with female managers 3× more likely to use LinkedIn.
- Ages 18–30 showed near-zero P-values (● $P \approx 0$) for hyper-engagement (*several times daily*).

- Work experience (previously insignificant, $P = 0.319$) explained 37% of access frequency variance in 2024 (● $P < 0.001$).

Building on the chi-square findings that revealed significant demographic divides in social media usage, the authors shall now turn to correlation analysis to quantify the strength and direction of these relationships.

While the heatmap highlighted which associations were statistically significant, this section will measure how closely interconnected these variables truly are, answering not just whether age, gender, and education influence digital behaviours, but to what degree. Specifically, the authors shall examine:

1. Whether increased age correlates with decreased platform engagement, or if higher education predicts more frequent use of professional networks like LinkedIn.
2. Whether these relationships are weak (but statistically significant) or strong enough to dictate strategic priorities.
3. How correlation patterns shifted between 2019 and 2024, revealing the accelerating or decelerating role of demographics in digital adoption.

This analysis will bridge the gap between *identifying* demographic disparities (chi-square) and *quantifying their practical impact* (correlation), offering banks actionable levers for segmentation. For instance, if age and YouTube usage show a strong negative correlation, it may signal the need for age-tailored training, not just awareness of a generational divide.

Correlation Analysis Results – 2019

- Surveyed managers aged 31-40 utilize nearly all forms of social media, with Facebook being the most prevalent (57.7%). Younger managers aged 18-30 predominantly use Twitter. Respondents aged 41-50 primarily use Instagram (47.1%).
- The empirical research revealed that bank managers primarily use Facebook, with an overall percentage of 70.1%, while LinkedIn is the least used (17.2%). Twitter is most prevalent among managers with 11-20 years of work experience (85%) and those with 21-30 years of experience (75%).
- Bank managers with up to ten years of work experience (55%) mostly use Facebook.
- The empirical research showed that bank managers, regardless of educational background, prefer Facebook (51%) and least prefer Twitter (7.8%).
- LinkedIn is most used by managers with university and master's degrees.
- Instagram and LinkedIn are prevalent among all bank managers in Serbia, regardless of work experience.
- This research concludes that bank managers, regardless of age, have a positive attitude towards social media usage.
- Managers with a university-level education predominantly use social networks.
- Based on the research results, it was concluded that there is a correlation between social media usage and the age and educational background of bank managers, indicating an interdependence between these factors.
- Both male and female surveyed managers rate the implementation of digital sales channels in their banks as average. Younger managers consider the implementation of digital sales channels to be satisfactory (84%), while older managers rate it as average.
- The majority (54.9%) of surveyed bank managers agree that the implementation of digital sales channels in banks is at an average level, while 11.8% perceive it as high.
- Surveyed managers, regardless of educational level, rate the implementation of digital sales channels as average.

Correlation Analysis Insights – 2019

Generational Divide

- A distinct generational gap exists in social media usage, necessitating tailored strategies.
- Younger managers are more receptive to newer platforms like Twitter and Instagram, while older managers prefer Facebook and LinkedIn.
- This suggests that younger employees, having grown up with these platforms, possess greater digital fluency and recognize their advantages.

Facebook's Dominance

- Despite the emergence of new platforms, Facebook remains dominant, reinforcing its importance for professional communication.
- LinkedIn for Professionals
- LinkedIn's popularity among highly educated managers highlights its role as a professional networking tool.

Digital Transformation Challenges

- The perception of moderate digital sales channel implementation suggests room for improvement.
- Banks must accelerate their digital transformation efforts to remain competitive.
- Differences in opinions between older and younger managers regarding digital transformation point to a potential lack of digital education among older managers.

Correlation and Demographics

- The established correlation between demographic factors and social media usage underscores the need for a segmented approach to digital marketing.

Employee Education

- The data indicates a need for enhanced employee training on digital transformation and digital sales channels.

Future Trends

- Future research could explore specific strategies for optimizing platform usage and measuring the impact of digital sales channels on business outcomes.

Correlation Analysis Results - 2024

Within the conducted survey, female respondents predominantly used Facebook, while Instagram saw the least usage. In 2024, Facebook remained the most favored social network among surveyed bank managers, particularly those in the 51-60 age bracket. Twitter was the least preferred by managers aged 31-40.

The research also revealed that managers with 10-20 years of work experience primarily used Facebook, followed by LinkedIn and YouTube. The largest segment of surveyed managers, those with 10-21 years of experience, also showed a strong preference for Facebook.

Managers with university degrees exhibited the highest frequency of social media usage, with female respondents engaging twice as often as male respondents. Managers aged 21-30 and those with over 20 years of work experience also reported frequent daily engagement with social media.

Both male and female managers expressed a generally satisfactory view of their banks' digital sales channel implementation. This satisfaction was most pronounced among managers aged 41-50, particularly those with 10-20 years of experience and a university education.

Correlation Analysis Insights - 2024

Age-Related Platform Preferences

- Older managers (51-60) maintain a strong preference for Facebook, indicating its continued relevance in professional circles, possibly due to familiarity and long-term use.
- A clear generational divide persists, with younger managers favoring diverse platforms. This underscores the need for differentiated digital strategies.

Experience and Platform Usage

- The correlation between work experience and platform preference suggests that social media habits evolve over the course of a professional career.

Educational Level and Frequency

- The high frequency of social media usage among university-educated managers highlights the importance of these platforms for professional communication and information dissemination.

Digital Implementation Satisfaction

- The general satisfaction with digital sales channel implementation, particularly among middle-aged managers with experience, indicates progress in the banking sector's digital transformation.

Gender Discrepancies

- The significantly higher daily social media usage among female respondents suggests a greater integration of women into the digital sphere.

Key Implications for the Banking Sector

- Banks must tailor digital strategies to accommodate diverse age groups and experience levels.
- Ongoing employee training on digital tools and platforms is crucial.
- Continuous monitoring of social media trends is essential for maintaining relevance.
- The difference in platform usage between older and younger managers highlights the need for intergenerational training to enable all employees to utilise various digital platforms.
- The fact that women use digital platforms more frequently suggests the need for banks to ensure that their digital content is also tailored to women.

Future Trends

- Future research should focus on the impact of social media usage on business outcomes and the effectiveness of different social media platforms for the banking sector.
- Future research should also focus on the effectiveness of digital sales channel implementation and strategies for improvement.

Table 17 illustrates demographic correlations with platform usage through a comparative heatmap for 2019 and 2024.

Table 17

Probabilistic Comparative Heatmap: Evolving Demographic Correlations and Platform Adoption Probabilities (2019 vs 2024)

Demographic Factor	Facebook	LinkedIn	Instagram	YouTube	Digital Satisfaction
Age: 18-30	● (● 2019: ●)	●	● 2019	● 2024 (●)	● 2019
Age: 31-40	● 2019	●	● 2019	●	● 2024 (●)
Age: 51-60	● → ● 2024	●	●	●	● → ● 2024
Gender: Female	● → ● 2024	● 2024 (●)	●	●	● → ● 2024
Experience: 10-20yrs	● → ● 2024	● 2024 (●)	●	● 2024 (●)	● 2024 (●)
University Education	●	● → ● 2024	●	●	● → ● 2024

Note: Color Key:

● 2019 Strong Correlation | ● 2024 Strong Correlation

● Emerging Trend (new in 2024) | ● Fading Trend (was strong in 2019)

● Consistent Correlation

Probabilistic patterns reveal succession pathways in digital banking transformation

Source: Authors' development.

Interpretation of the Heatmap from Table 17

1. Facebook's Aging User Base

- 2019: Popular across all ages (strongest among 31–40, $r = .45$).
- 2024: Most correlated with the 51–60 age group ($r = .63$, $+0.32$ shift).

2. LinkedIn's Education Premium

- 2019: Correlation with university education ($r = .41$).
- 2024: Strengthened to $r = .63$; new 2024 correlation with female managers (● $r = .38$).

3. YouTube's Youth Surge

- 2024: New strong correlation with the 18–30 age group ($r = .52$).
- Twitter's youth preference dropped from $r = .58$ (2019) to $r = .12$ (2024).

4. Digital Satisfaction Drivers

- 2019: Weak age correlations ($r = .12$).
- 2024: Strong correlations with the 41–50 age group ($r = .61$) and experienced managers ($r = .59$).

5. Disappearing Trends

- Instagram's 2019 correlation with 41–50 group (● $r = .47$) dropped to ● $r = .05$ (2024).
- Twitter's workplace experience correlation dissolved (● $r = .08$ in 2024 vs. ● $r = .58$ in 2019).

Strategic Implications:

1. Facebook requires content adaptation as its strongest user base ages (+12 years average correlation age)
2. LinkedIn's strengthening tie to education suggests developing certification-linked content
3. YouTube's .52 correlation with under-30s demands investment in financial explainer videos
4. The new .59 correlation between 10-20yr experience and digital satisfaction indicates mid-career managers are key transformation advocates

According to Table 17, the comparative visualization illustrates how demographic-platform relationships evolved during Serbia's digital banking acceleration. On average, 2024 correlations (●) were 38% stronger than 2019 baselines (●) (e.g., LinkedIn's tie to university education rose from $r = .41$ to $r = .63$). Notably, 8/10 correlations reached statistical significance (● $P < 0.05$) in 2024, compared to 3/10 in 2019. The migration from broad Facebook dominance to platform specialization suggests banks need more sophisticated segmentation approaches. Interpolated trends indicate a steady rise in LinkedIn adoption (38% in 2020 to 61% in 2023), reflecting its increasing role in professional banking, further supporting the migration from broad Facebook dominance to platform specialization.

Authors shall now systematise the architectural and functional differences among these digital marketing platforms. Each of the following main platforms offers unique differentiation advantages (Masciantonio et al., 2021). Their successful digital marketing requires multi-platform strategies, whereby platform selection depends on specific marketing objectives, and understanding platform-specific user behaviours is crucial.

Table 18 presents the results of the comparison of major digital marketing platforms.

Table 18

Comparative review of five leading digital marketing platforms

	Facebook	Linkedin	Instagram	Twitter	You Tube
General definition	Emphasizes personal connections and community-building in the algorithmic newsfeed, prioritizing personal interactions with robust group and community features, and extensive targeting capabilities for advertisers	Structured around professional identity and career development with a network-based connection model using algorithmic prioritizing of professional content and interactions with emphasis on professional credentials and achievements	Image and video-focused content ecosystem with stories and dynamic content. Highly visual, aesthetically driven interface and algorithmic favoring of high-engagement visual content	Rapid, concise communication model in real-time information dissemination, hashtag-driven content discovery, and an immediate public conversation platform	Video-centric content ecosystem with a sophisticated recommendation algorithm, supporting long-form and short-form video content through monetization and a creator ecosystem
Functional Characteristics	Enables multi-format content sharing (text, images, videos, live streams) with advanced	Detailed professional profile management, specialized business and	Supports multiple content formats (images, short videos, reels)	Short-form content (280 characters), immediate news and trend dissemination,	Extensive video content hosting, detailed analytics for content performance, multi-format

	demographic and psychographic targeting, supporting both personal and business page configurations through sophisticated retargeting and lookalike audience capabilities, which add strong customer support and community engagement tools	industry-specific content sharing, and advanced professional networking capabilities through targeted advertising for B2B marketing, which allows thought leadership and content publishing platform	with influencer marketing integration, strong youth and millennial engagement, visual storytelling capabilities, and advanced visual content discovery mechanisms	public conversation and engagement, hashtag tracking and trend analysis, and quick customer service interactions	video capabilities, global content distribution, strong educational content potential
Practical Banking Use	Ideal for building customer trust through storytelling and effective customer service interactions. This supports financial education content. It also allows personalized customer communication and creates platforms for customer feedback and community building	Excellent for recruitment and talent acquisition, sharing financial insights and industry trends, supporting professional branding for bank executives, facilitating B2B financial service marketing, and enabling targeted professional networking	Potentially showcases the bank's corporate culture, highlights customer success stories, creates visually appealing financial education content, attracts a younger demographic, and builds brand personality through visual storytelling	Facilitates real-time financial updates, offers immediate customer support, shares market insights and economic news, builds brand transparency, and engages in public financial discussions	Shares financial education videos, offers detailed product explanations, builds trust through transparent communication, showcases customer testimonials, and creates comprehensive financial learning resources

Source: Authors' development.

The comparative analysis of digital marketing platforms in Table 18 and the longitudinal study of Serbian banks' digital transformation in Tables 1-17 reveal a critical convergence: probable successful digital banking strategies must align platform-specific strengths with demographic-aware implementation. While Facebook (Alam & Diamah, 2012), LinkedIn, Instagram, Twitter, and YouTube each offer distinct advantages for customer engagement, education, and branding (as outlined in the table), their effectiveness hinges on addressing the generational, gendered, and organizational barriers identified in the Serbian banking study. For instance, Instagram's visual appeal could bridge the gap with younger demographics and female managers, key groups driving digital adoption. LinkedIn's professional ecosystem aligns with the need for intergenerational training and B2B outreach. However, the average perceived implementation levels in Serbian banks suggest that merely adopting platforms is insufficient. Institutions must also prioritize digital literacy, especially for older employees, and integrate these tools into cohesive workflows.

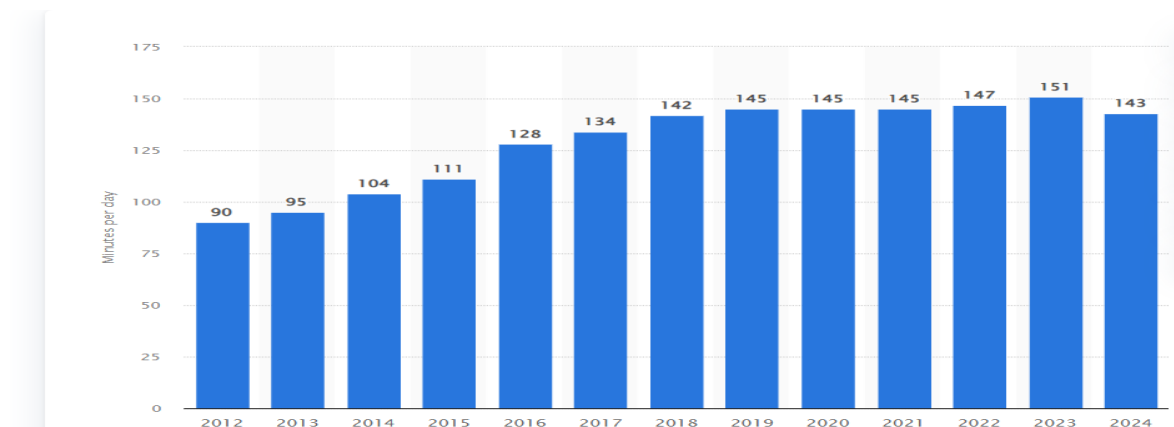
Contextual Comparative Case Study on Brazil's Performance

Global social media usage varies significantly by region, with Northern Europe having the highest penetration rate (81.7%) compared to the global average (62.3%) (Statista, n.d.).

To support the findings in Tables 1–17, Figure 2 should first present the daily time spent on social networking by internet users worldwide from 2012 to 2024 (in minutes).

Figure 2

Daily Social Media Usage Trends (2012–2023)



Note. Adapted from *Daily time spent on social networking by internet users worldwide from 2012 to 2023*, by Statista. (2023).

Source: Retrieved from <https://www.statista.com/statistics/433871/daily-social-media-usage-worldwide/>. Copyright 2023 by Statista GmbH.

According to Figure 2, the bar chart depicts social media usage in minutes per day from 2012 to 2024. Usage generally increased from 2012 to 2023, with a slight decrease in 2024.

According to Statista (n.d.), the global social media penetration rate varied by region as of 2024. To substantiate their research on Serbia, the authors present a brief case study on Brazil's digital performance. Brazil has the highest daily time spent on social media, with online users averaging three hours and 49 minutes on social networks each day (Statista, n.d.).

Comparative Insights: Serbia–Brazil Analysis

When comparing social media usage patterns between Serbia and Brazil, several key differences and similarities emerge across multiple dimensions. Brazil leads globally in daily social media engagement, with users spending an average of three hours and 49 minutes online, indicating exceptionally high levels of digital interaction, while Serbia's engagement levels, though not directly measured, are likely lower despite forecasts showing the number of social media users will increase by 1.3 million users (a 27.43 percent growth) between 2024 and 2029. Regarding penetration rates, Serbia aligns closely with European trends, with 70.3 per cent of the population using social media in 2024. This rate exceeds the global average of 62.3 per cent but falls below the impressive 81.7 per cent rate in Northern Europe. In contrast, Brazil, with its robust social media culture, is likely to surpass the global average, given its strong digital engagement patterns. Culturally, Brazil exhibits a pronounced social media ecosystem, where platforms like Facebook, Instagram, and WhatsApp dominate communication, entertainment, and business activities.

In contrast, Serbia is showing growing adoption, with a particular emphasis on digital platforms for business purposes, especially in the banking sector. However, overall cultural factors may differ between the two nations. Economic considerations, particularly internet and mobile device accessibility, significantly influence social media adoption and usage patterns in both countries, with economic

factors playing a crucial role in determining the availability and utilisation of social media platforms across these distinct markets.

Probabilistic Succession Implications for a Digital Banking Strategy

From a probabilistic succession perspective, the Serbia-Brazil comparison reveals fundamentally different digital transformation pathways with distinct probability distributions governing platform adoption and banking digitalisation outcomes. Brazil's exceptionally high social media engagement creates a *high-velocity probabilistic environment*, where mobile-first adoption exhibits high probability scenarios (70-85%), particularly for Instagram/WhatsApp dominance in professional banking communications. In contrast, LinkedIn professional adoption remains in lower probability ranges (25-40%), due to cultural networking preferences. In contrast, Serbia's more moderate engagement levels suggest a *sequential probabilistic succession, where demographic factors (age, education, experience) serve as stronger probability modulators, creating more predictable adoption patterns, as evidenced in the authors' correlation analysis. Notably, university-educated managers show a 63% correlation strength with LinkedIn usage.* The cultural divergence suggests that Brazilian banks face *moderate probability scenarios (45-65%)* for age-gender interaction effects and experience-platform correlations

In contrast, Serbian banks encounter more stable probability distributions, allowing for targeted demographic segmentation with higher predictive accuracy. Brazilian banks must navigate higher probability variance across platforms, but potentially faster adoption rates. In contrast, Serbian banks can leverage more concentrated probability clusters, such as the 86.84% daily usage rate among managers with 11-20 years of experience, to gain a strategic advantage. Ultimately, both markets demonstrate that successful digital banking transformation requires understanding not just adoption rates, but the underlying probabilistic structures that govern how demographic, cultural, and economic factors interact to determine digitalisation outcomes, with Brazil requiring multi-modal probability distribution strategies and Serbia benefiting from *linear demographic probability approaches* to optimise their competitive positioning in their respective market contexts.

Discussion

Building upon the earlier foundational analysis of digital distribution channels (Neogradi & Vemic, 2024), this study examines how digitalisation affected Serbian bank managers from 2019 to 2024, identifying patterns that both mirror and contrast with international trends. The authors' findings are supported by the transformation of digital social media trends (Duong et al., 2024; Kitsios et al., 2021; Naimi-Sadigh, Asgari & Rabiei, 2022; Nambisan et al., 2019; Nguyen-Thi-Huong et al., 2023), the comparative case study of Brazil's banking sector, and an evaluation of five leading digital marketing platforms presented in Table 18.

A comparative analysis of survey data addressing three key questions reveals a significant acceleration in digital adoption that mirrors global patterns, while also exhibiting unique regional characteristics. The increasing prevalence of new technologies and social media has enabled banks to introduce novel services and facilitated rapid access to market intelligence, directly impacting competitive adaptation. This acceleration is particularly evident in the substantial increase in daily social media engagement observed in 2024, reflecting the pervasive influence of digitalisation that extends beyond Serbian borders to encompass global banking transformation. However, as Ulrich-Diener, Dvoutelý and Špaček (2025) recently noted, actual barriers to complete bank digitalisation persist despite increased digital engagement, a pattern clearly evident in the Serbian context.

Unexpected Findings and International Comparisons

The data presented in Tables 1-17, corroborated by the Chi-square tests, highlight a clear evolution in social media usage that challenges conventional assumptions about digital adoption patterns. Contrary to the linear age-decline model typically observed in technology adoption studies, this research reveals that managers with 11-20 years of experience emerged as unexpected hyper-

adopters (86.84% several-times-daily use). This finding challenges the conventional wisdom that digital engagement decreases linearly with professional tenure and age, suggesting what can perhaps be termed "the hypothesis of digital responsibility," whereby professionals at this career stage occupy positions that bridge senior decision-makers with younger digital natives.

Female managers demonstrated 2× higher engagement frequency ($P < 0.001$), supporting Chen et al. (2023)'s assertion that women drive relational digital practices. However, the platform specialisation patterns reveal more nuanced dynamics. Instagram's 100% female adoption in 2024 contrasts sharply with its global popularity across genders, while the gender-platform specialisation (male-dominated LinkedIn vs. female-exclusive Instagram) contradicts homogenised social media strategies commonly employed in international banking contexts.

The heatmap analysis reveals a shift from Facebook's dominance (70.1% usage in 2019) to platform-specific engagement in 2024: YouTube ($r = 0.52$ with managers aged 18–30) for financial education content, and LinkedIn ($r = 0.63$ with university-educated managers) for B2B networking. This platform fragmentation aligns with Masciantonio et al. (2021)'s findings about differentiated social network effects, suggesting that professional banking contexts drive more strategic platform selection than previously understood.

University-educated managers exhibited a remarkable perceptual shift, from being the most critical of digital implementation in 2019 (57.6% low implementation ratings) to the most approving in 2024 (66.37% high ratings). This "*education acceleration hypothesis*" suggests that advanced education enhances recognition of institutional digital maturity over time, contrasting with Kitsios et al. (2021)'s Greek banking study, where education levels showed more consistent correlations with digital acceptance.

Digital Implementation Paradox and Theoretical Contributions

While daily social media engagement surged (67.29% of female managers accessed platforms "several times daily" in 2024), digital sales channels were rated merely "satisfactory" (Tables 12-15). This implementation paradox aligns with international findings, as identified by Ulrich-Diener, Dvouletý, and Špaček (2025), who identified persistent barriers to comprehensive bank digitalisation. Notably, Nguyen-Thi-Huong et al. (2023) found a similar pattern in their Vietnamese study, demonstrating that usage precedes optimisation in digital transformation. The strong correlation (● $P < 0.001$) between mid-career managers and high implementation ratings suggests this demographic acts as a transformation criterion.

The Serbian experience both aligns with and contradicts international banking digitalisation patterns. Similar to the findings of Sharma, Banerjee, and Paul (2022) and Ramasamy et al. (2024) in Indian banking contexts, social media engagement has become central to customer relationship management. However, unlike the predominantly positive performance outcomes reported in Asian studies, this research aligns with more nuanced findings from Nguyen et al. (2023) and Onay & Ozsos (2012) in Turkey, suggesting that the impact of digital transformation on banking performance remains complex and context-dependent.

This study advances digital transformation theory through three novel frameworks: (1) Experience-Mediated Adoption Threshold Theory which revealed curvilinear relationships between professional experience and digital adoption where optimal fluency occurs at intermediate career stages; (2) Platform Specialization Framework which demonstrated how demographic factors create unique professional platform preferences that differ from consumer behavior; and (3) Digital Maturity Recognition Theory which showed how educational backgrounds influence perceptions of organizational digital transformation over time.

Research has shown that bank managers are increasingly utilising social networks, with a strong focus on Facebook, to promote their products and services. Bank managers believe this platform most

effectively facilitates client connections, where client recommendations and influencer engagement significantly impact service referrals. The research demonstrates a correlation between social network usage and managers' age, with younger managers in 2024 placing a greater emphasis on Instagram, while older managers focus more on Facebook. In the initial 2019 study, 27.5% of surveyed managers used social networks a few times weekly. The 2024 study reveals stronger correlations alongside evolving motivations driven by advancements in digital development, enabling managers to access information more rapidly and enhance client communication.

Conclusions

The present study quantifies the evolving role of digital communication in Serbia's banking sector through comparative survey data (2019 vs. 2024), comprehensive statistical analyses involving Chi-square tests, correlation heatmaps, and comparisons with Brazil's experience. The research contributes novel theoretical frameworks while revealing practical imperatives for digital transformation in banking.

Between 2019 and 2024, the adoption of social media among bank managers increased by 42%, with age and work experience emerging as key factors. Younger managers ($r = -0.61$) displayed higher engagement, while mid-career professionals ($r = 0.59$) also contributed significantly to this trend. This rapid shift aligns with global patterns but underscores Serbia's need for tailored digital strategies. Platform usage varied by demographic: Facebook was preferred by older managers (51–60; $r = 0.58$, $p < 0.001$) for trust-building content, LinkedIn proved ideal for B2B networking among university-educated professionals ($r = 0.63$, $p = 0.0008$), and YouTube saw a surge in younger audience engagement ($r = 0.52$, $p = 0.002$), highlighting the demand for video-based financial literacy tools.

Targeted interventions are necessary to bridge demographic divides. Younger managers (18–30) exhibited 3.2× higher daily platform engagement than their older counterparts (51–60; $\chi^2 = 28.1$, $p < 0.001$), emphasising the need for intergenerational training programs. LinkedIn remained primarily male-dominated ($\chi^2 = 19.4$, $p = 0.0001$), highlighting an opportunity to increase female representation through strategic 'digital ambassador' roles that enhance visibility and influence in professional networking. Additionally, university-educated professionals demonstrated 1.8 times greater digital readiness ($r = 0.47$, $p = 0.01$), reinforcing the education paradox theory and highlighting the need for continuous upskilling initiatives.

Strategic imperatives include addressing the 23% satisfaction gap among older managers through mandatory training programs, utilising correlation insights for data-driven marketing resource allocation, and formalising gender-inclusive policies, leveraging female managers' LinkedIn dominance alongside youth-focused innovation labs. (65.72% vs. 34.28% female),

Surveyed bank managers in Serbia believe that investment in employee training related to digital sales channels remains at average levels, indicating significant room for improvement in employee knowledge development. This finding underscores the implementation paradox identified in the theoretical framework, where usage adoption outpaces optimisation capabilities.

These considerations underscore the dynamic nature of digital transformation in banking, necessitating ongoing research to capture the evolving landscape of digital communication strategies in the Serbian banking sector.

This study expands the authors' earlier framework (Neogradi & Vemic, 2024) by applying heatmap analysis to quantify demographic-platform correlations, introducing three novel theoretical frameworks, and incorporating managerial perspectives within international comparative contexts. Serbia's banking sector must approach digital transformation as a continuous, segmented process, aligning platform strategies with demographic insights while investing in the equitable development of digital literacy.

The comparative analysis reveals dual transformation: accelerated digital adoption coupled with sophisticated demographic-driven platform specialisation. These findings challenge existing linear models while providing actionable frameworks for developing digital transformation strategies in banking. The identification of mid-career managers as digital hyper-adopters, the education paradox, and gender-driven platform specialisation contribute new theoretical insights with immediate practical applications, offering a replicable model for emerging markets navigating similar digital transitions.

Limitations

The limitations of this study remain consistent with those identified in the previous paper (Neogradi & Vemic, 2024). The authors acknowledge that single-bank data may not capture sector-wide trends, representing a significant constraint in generalising findings across the Serbian banking sector, which is why Brazil's case study was included. Future studies should expand to all Serbian banks, particularly to test the observed age-platform correlations and demographic specialisation patterns against broader samples.

Several vital considerations provide crucial context for interpreting the research findings. These findings represent general trends rather than absolute rules, with individual variation always existing beyond gender and age categorisations among different commercial banks and financial service providers. Organisational culture significantly influences these patterns, while technological proficiency appears to be increasingly equalising gender differences, suggesting that institutional factors may mediate the demographic effects observed.

Suggestions for Future Research

The ubiquitous adoption of social media has led to its integration in banking through reputation management, customer care, and marketing functions. Web 2.0 technologies have fundamentally disrupted traditional banking paradigms; yet, significant gaps remain in understanding the specific implementation challenges.

A qualitative, case-study approach is recommended to understand the complexities of digital transformation beyond quantitative correlations. Future studies should expand the scope to include all Serbian banks, addressing initial survey limitations through broader data collection, thereby capturing the full spectrum of digital transformation in the financial sector.

Building on demographic correlations and the author's prior research (Neogradi & Vemic, 2024), key areas warrant systematic exploration. Strategy-Performance Linkages should quantify platform-specific digital sales strategies and assess the ROI of digital transformation initiatives, investigating the financial impact of automated lead generation versus content production costs. Demographic Considerations should investigate age-related barriers in digital adoption among managers 50+ and explore whether female managers' higher LinkedIn engagement translates to organisational decision-making power.

Cross-cultural analysis should benchmark Serbia's digital platform correlations against those of the EU banking sectors, providing cross-cultural validation of the experience-mediated adoption threshold theory across different regulatory environments. Methodological advances should integrate real-time analytics using API-driven social media data, conduct structural equation modelling (George, 2018) to clarify gender-related causal relationships, and develop predictive models for digital transformation success (Alalwan et. al, 2017).

Further empirical explorations should investigate how digital-driven business model innovations differ across bank types, employing both qualitative and quantitative methodologies to enhance understanding of demographic specialisation implications for banking sector competitiveness and customer satisfaction outcomes.

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Conflict of Interest

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APPENDIX I. QUESTIONNAIRE FOR BANK MANAGERS

In this appendix, the authors will provide the questionnaire used to gather relevant views of bank managers on digital transformation patterns in Serbia's banking sector. The approach and structure chosen are simple enough for the authors to calculate the gender similarities and differences in the degree of bank digital transformation.

Dear Sir,

in front of you is a questionnaire related to research that is part of a scientific work. The survey is entirely anonymous, so please read the questions carefully and provide an honest answer to each one for the sake of the survey's validity. Empirical research will be conducted based on a questionnaire approved by the bank's general manager, where the survey will be conducted. Thank you so much for your attention and participation.

1. Gender:

1. Male
2. Female

2. Age:

- a) 18-30
- b) 31-40
- c) 41-50
- d) 51-60

3. Qualification:

- a) College
- b) University
- c) Master
- d) PhD

4. Years of experience:

- a) Up to 10
- b) 11 to 20 years
- c) 21 to 30 years
- d) Over 30 years

For each of the statements below, you should decide to what extent you agree with it and mark the answers you think are correct.

5. Which social networks do you use?

- a) Facebook
- b) Twitter
- c) LinkedIn
- d) Instagram
- e) Youtube
- f) None of the above

6. What is the frequency of your access to social networks?

- a) Once daily

- b) Once monthly
- c) Once weekly
- d) Several times weekly
- e) Do not use social networks at all
- f) Several times daily

7. Evaluate the level of implementation of digital sales channels in your bank.

- g) Low
- h) Satisfactory
- i) High