Navigating Digital Transformation in Banking: Unraveling the Nexus of Capabilities, Technologies, and Regulatory Realities

By

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Abstract

This thesis explores the pivotal role of capabilities and technologies in the digital transformation of the banking sector, with a focus on identifying optimal strategies within diverse regulatory environments. Utilizing a Delphi study approach, it offers theoretical insights into the contextual impacts on performance, comparing Canada and Iran. Integrating Dynamic Capability theory at the micro-level and the Systems of Innovation approach at the macro-level, the research employs a variety of methodologies including systematic literature review, Delphi method, SEM, and the rarely used fsQCA. By delving into regulatory environments and key capabilities, while recognizing capital as a paramount resource, the study enriches understanding of digital transformation dynamics. Notably, it advances theoretical foundations by integrating insights from Dynamic Capability Theory and System of Innovation theory, emphasizing the importance of aligning strategic initiatives with regulatory frameworks. Through comparative analysis between Canada and Iran, nuanced differences in regulatory impacts on crucial capabilities are highlighted. Additionally, the study introduces innovative methodologies like fuzzy set qualitative comparative analysis (fsQCA), expanding the methodological repertoire in management science. Furthermore, practical implications guide practitioners, policymakers, and industry stakeholders in aligning strategies with regulatory landscapes.

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Chapter1: Introduction

1.1. Overview

The introduction chapter of this dissertation provides an overview of the significance of digital transformation in the banking industry and the need for organizational capabilities to succeed in this process. The chapter begins by discussing the importance of digital transformation as a vital component for businesses that seek to expand, improve quality, sustain themselves, and provide better service to customers. The banking industry has been heavily influenced by digital transformation, leading to the emergence of new electronic platforms such as e-banking, virtual banking, and points of service.

The chapter then goes on to highlight the research problem and gaps in the literature, arguing that there is still insufficient discussion on the capabilities and competencies required for the rising digital economy, with a focus on the banking industry. The study proposes that the building block for core competencies in the banking industry to endorse digital transformation is organizational capabilities, and there is a need to identify the most critical capabilities that impact banks' performance in digital transformation.

Moreover, there is a scarcity of studies investigating the role of regulatory environment in the digital transformation of the banking industry. In this research, we aim to explore the potential impact of regulatory environment on the capabilities that influence the performance of the banking industry in the context of digital transformation. The study considers regulatory environment as crucial conditions that may shape and determine these capabilities. To address these research problems, the chapter outlines two research questions, which aim to identify the most critical capabilities that impact banks' performance in digital transformation and the combinations/configurations of capabilities that lead to banks' high performance under different regulatory environments' approaches to digital banking. Since the problem needs to be addressed from a multilevel perspective, i.e. firm level (micro-level), and country level (macro-level), to answer these research questions, the study employs the Dynamic Capability Theory at the micro-level, and the Systems of Innovation (SI) approach at the macro-level.

The chapter also provides a brief overview of the research methodology and analysis that will be employed, which includes a systematic literature review, the Delphi method, Structural Equation Modeling (SEM), and Fuzzy-Set Qualitative Comparative Analysis (fsQCA). Finally, the chapter concludes by highlighting the main results of the study, its significance, and the major areas of contribution to the existing literature on digital banking.

1.2. Background of the study

Digital transformation has garnered significant attention from researchers and practitioners across various domains, including management, business, information technology (IT), and marketing (Diener & Špaček, 2021). Digital transformation is considered a vital component for businesses that seek to expand, improve their quality, and sustain themselves (Gebayew et al., 2018). It involves strategies that aim to change business models in order to deliver a variety of tangible products to customers using new or existing technologies (Dyk & Belle, 2019). Digital transformation refers to the ongoing evolution of leveraging digital capabilities and technologies to drive innovation and value creation within organizations (Kraus et al., 2021). It involves the comprehensive integration of digital tools and processes across various aspects of business operations, including business models, operational processes, and customer experiences. This transformation is not limited to mere technological advancements; it entails fundamental shifts in how businesses operate, interact with customers, and deliver value (Kraus et al., 2021). Digital transformation enables new types of invention and creativity by taking advantage of opportunities and changes offered by digital technologies in a prioritized way (Dyk & Belle, 2019; Gebayew et al., 2018). Various sectors, including government agencies, educational institutions, the manufacturing sector, the service sector, and the financial sector, have been affected by digitalization in some manner (Diener & Špaček, 2021).

The banking sector has experienced significant influence from digital transformation, evidenced by the emergence of new electronic platforms such as e-banking, virtual banking, and points of service. By strategically reducing physical branches and personnel, banks achieve cost savings while enhancing customer services, thereby establishing a compelling business case for digital transformation within the industry. Furthermore, digital technology empowers banks to prioritize customer-centric development methods and introduce innovative services, including digitization, electronic transaction signatures, teleconferencing, online trading platforms, digital storefronts, e-statements, and mobile payments. Notably, the banking industry allocates substantial financial resources to IT investments, surpassing other sectors globally (Broby, 2021; deloitte, 2021; Kazim, 2023; Kitsios et al., 2021b; Osei et al., 2023; Papathomas & Konteos, 2023).

However, the impact of technological advancements on the banking industry is not limited to cost savings and new services, as digital transformation also leads to a profound reshaping of the industry, introducing new players and disrupting traditional banking services (Mbama & Ezepue, 2018; Omarini, 2017). The significance of digital transformation in banking cannot be overstated. This paradigm shift entails the widespread adoption of contemporary methods for service provision, leading to a noticeable decline in the number of traditional bank branches. Concurrently, a multitude of services is migrating to online platforms, particularly in areas such as lending and investing. Notably, a substantial portion of customers across various regions, including 77% in Canada, 71% in the United States, and 69% in Spain, actively engage with online banking services on a monthly basis, as reported by Forrester (2022).

Indeed, digital transformation is imperative for banks striving to maintain their position as industry leaders. In the United States, the forecasted increase in digital payments from 10% of total payment volume in 2017 to 15% by 2020 underscores the urgency of embracing digitalization (BCG, 2017). Successful examples abound, particularly among banks with a first-mover advantage or those adept at effective collaboration. For instance, DNB bank's Vipps P2P payment app, introduced just over two years ago, has achieved remarkable popularity, with half of Norway's consumers now utilizing it. Similarly, Singapore's PayNow initiative, a collaborative endeavor among the nation's major banks, attracted over 500,000 users within its inaugural month, representing a notable fraction of the adult population (BCG, 2017).

Nevertheless, despite these success stories, the majority of bank-led digital initiatives have struggled to gain traction. This highlights the critical importance of digital transformation in banking. Stakeholders, including banks, policymakers, and various industry players, must recognize the urgency of exploring and investing in this domain to remain competitive and relevant in an ever-evolving financial landscape.

1.3. Research problem and gaps in the literature

In today's turbulent business environment where change is constant, a fundamental issue for management is understanding what separates successful businesses from those that fail (Marx et al., 2021). These changes affect both internal and external corporate processes and structures, highlighting the importance of digital capabilities (Junior et al., 2016). It is widely accepted that new resources and competencies are required to effectively compete in the digital age (Mbama & Ezepue, 2018). Technological skills and competencies are crucial resources needed for the innovation process (Khin & Ho, 2020). However, there is still insufficient discussion on the capabilities and competencies required for the rising digital economy, which can assist businesses in addressing new challenges.

This research study argues that the building block for core competencies in the banking industry to endorse digital transformation are organizational capabilities. Adapting organizational capabilities can be time and resource-intensive since they are embedded in the organization's path dependency. Organizational capabilities are defined as the organization's ability to use tangible or intangible assets to achieve a specific goal or improve performance (O'Regan & Ghobadian, 2004). They include the company's physical facilities and employees' skills, as well as the capabilities and expertise of its top management (Chandler, 1990). In addition to leadership, organizations need other capabilities to execute their missions, such as talent, speed, a shared mindset and cohesive identity, accountability, and collaboration (Ulrich & Smallwood, 2004).

Some studies have examined organizational capabilities in the context of digital transformation. For instance, Osei et al. (2023) underscores the pivotal role of leadership, organizational culture, and technological enablers as key drivers of innovation and competitiveness within the banking sector.

Moreover, previous studies have reported valuable results on how IT and digital capabilities impact performance in other industries. For example, a meta-analysis of data from 2001 to 2009 found that IT resources, capabilities, IT/business alignment, and external factors influence productivity, profitability, and intangible benefits (Jacks et al., 2011). Sabai Khin and colleagues confirm this observation in Malaysian IT organizations and recognize how digital innovation mediates the impact of technology orientation and digital competence on financial and non-financial efficiency (Khin & Ho, 2020). However, a review of the literature shows that many of these studies focus on other industries from a conceptual perspective (e.g., Jacks et al., 2011; Liang et al., 2010; Lim et al., 2011) or empirical perspective (e.g., Junior et al., 2016; Khin & Ho, 2020; Mogoale et al., 2021; Wielgos et al., 2021). Few studies have investigated the capabilities necessary to endorse digital transformation in the banking industry (e.g., Luo et al., 2021). Furthermore, there is still a knowledge gap in identifying these capabilities related to the banking industry under different regulatory environments, empowering businesses to thrive in a rapidly changing market. Regulatory environments play a critical role in digital transformation for businesses, influencing their innovativeness, performance, and overall success. Stringent or outdated regulatory environments can hinder firms' adoption of digital technologies, limiting their ability to innovate and compete effectively. Conversely, well-crafted and flexible regulatory environments create an environment conducive to innovation and digital transformation, empowering businesses to thrive in a rapidly changing market (Anning-Dorson et al., 2017; Ramakrishnan et al., 2017; van Beers & Zand, 2014).

1.4. Research purpose and research questions

To address the existing knowledge gap, this research aims to delve deeper into the key capabilities required by banks to succeed in digital transformation under different regulatory environments. The banking industry operates within a highly regulated environment, underscoring the significance of studying organizational capabilities across diverse regulatory environments. Specifically, this study addresses one main research question and four sub-questions:

Main Research Question:

In the landscape of digital transformation within the banking industry, what is the interplay between key capabilities, digital technologies, regulatory environments, and their respective impacts on banks' performance, with a focus on variations across different regulatory contexts?

> *Sub-Question 1: What are the pivotal capabilities that exert the most substantial influence on banks' performance within the realm of digital transformation, and how does the significance of these capabilities vary across countries with distinct regulatory contexts?*

Sub-Question 2: Which key digital technologies wield the most substantial influence on banks' performance during the process of digital transformation, and in what manner does the significance of these technologies vary across countries with different regulatory contexts?

Sub-Question 3: What specific combinations of capabilities are identified as optimizing the performance of banks in the context of digital transformation, and how do these combinations demonstrate variation across diverse regulatory environments?

Sub-Question 4: How does the regulatory framework and extent of regulation in digital transformation affect the relationship between key capabilities and bank performance? How does this impact vary across countries with different regulatory environments?

This research seeks to go beyond the fragmented literature on digital transformation capabilities and performance (e.g., D. Y. Liu et al., 2011; Manser Payne et al., 2021; Suandi et al., 2022). The study explores crucial capabilities for successful digital transformation in banking. It aims to identify the optimal combination of these capabilities, considering different regulatory environments, with emphasis on the regulator's role as a critical environmental factor. This study aims to provide valuable insights for academics, banking leaders, and policymakers. The ultimate objective of this study is to enhance the understanding of the capabilities required for successful digital transformation. Focused specifically on the banking industry, the study delves into the critical capabilities and key digital technologies essential for achieving successful digital transformation. By identifying and analyzing the pivotal capabilities, key digital technologies, and optimal combinations of capabilities, the research takes into account the influence of diverse regulatory environments, with a particular emphasis on the regulatory environment as a key factor. This study aspires to offer comprehensive insights beneficial for academics, banking leaders, and policymakers. The ultimate goal is to contribute to a heightened understanding of the capabilities and digital technologies necessary for achieving successful digital transformation within the banking sector in different regulatory environments.

1.5. Theoretical foundations

At the micro-level, this research employs the Dynamic Capability theory to analyze the internal resources and capabilities of banks that are critical for digital transformation. The Dynamic Capability theory, developed by Teece et al. (1997), is a strategic management framework that focuses on a firm's ability to adapt, innovate, and reconfigure its resources and capabilities in response to changing market conditions and technological advancements. This study utilizes this theory to identify the distinctive resources and capabilities that contribute to certain banks outperforming others in digital transformation as one of the changing conditions.

At the macro level, this study uses the Systems of Innovation (SI) approach proposed by Edquist (2010) to analyze the external factors that influence the digital transformation of banks. The SI approach emphasizes the influence of external factors such as government policies, industry collaborations, market demands, and societal trends on innovation. Digital transformation in banks is significantly impacted by the external environment, including regulatory changes, competition, and evolving customer preferences. Utilizing the SI approach enables a thorough analysis of these external factors and their role in driving or hindering digital transformation. By using the SI approach, this study aims to identify the regulatory regimes and institutional factors that affect the digital transformation of banks and how these factors interact with the internal resources and capabilities of banks. This helps to provide a more comprehensive understanding of the digital transformation of banks and the role of external factors in shaping their performance.

1.6. Research method and analysis

This study aims to explore the best combinations of capabilities that can increase banks' performance in digital transformation under different regulatory regimes, using a multimethod research approach (Creswell, 2015). The various stages of the research are as follows:

First, we conduct a systematic literature review to identify the digital capabilities that affect banks' performance in digital transformation. Inclusive and exclusive criteria established, and well-known databases will be selected. The review is conducted according to the scoping literature review protocol, and the capabilities and types of performance described in the literature will be categorized using thematic analysis. Afterwards, we delve into the regulatory regimes literature to investigate the role of the regulator in digital transformation.

Second, we use the Delphi method to achieve two objectives. The first is to identify any digital capabilities that were not covered in the literature. The second is to prioritize all the identified digital capabilities within the categories or subcategories established in the first stage. As we aim to investigate various countries and their distinct regulatory frameworks, our research will be conducted in two different geographical contexts. Based on the information obtained from the central banks' websites of Iran and Canada, these countries exhibit contrasting approaches to regulatory approval in the banking industry. Iran's regulatory regime focuses primarily on domestic standards and regulations, whereas Canada adopts a more global and international perspective. The difference in approach between these two countries makes them suitable and relevant samples for our study. Accordingly, our target population for this second stage will be IT managers from Iranian and Canadian banks. To ensure the selection of experienced managers in digital banking, we will employ a purposive sampling method.

Third, fuzzy-set qualitative comparative analysis (fsQCA) is employed to identify the combinations (configurations) of the most important digital capabilities that lead to high performance in different situations. Moreover, to understand the impact of the regulatory environment on the most important capabilities for digital transformation within the banking industry across different countries, this study employs Structural Equation Modeling (SEM). Questionnaires are distributed to managers with specific roles and expertise, including IT managers, innovation managers, marketing managers, strategy and development managers, HR managers, and risk managers.

Finally, the research findings are analyzed to answer the research questions and draw conclusions. For the systematic review analysis, we import the data into the Hubmeta[1] infrastructure and subsequently synthesize the results. For analyzing the Delphi findings, we utilize both interpretive and quantitative approaches, employing Excel, STATA, and SPSS software. For fsQCA, we will use the fsQCA Software provided by the University of California. For SEM, we will utilize Smart PLS 4. The results provide valuable insights for academics and practitioners by determining whether the most critical capabilities for digital banking differ according to the regulatory regimes.

1.7. Significance of the study and main contributions

This study presents a valuable opportunity to enhance the comprehension of the best combination of capabilities to improve a bank's performance in digital transformation under different regulatory regimes. This topic is relevant to academics, practitioners, bank managers, and policymakers, since the adoption of digital technologies is crucial for banks to remain competitive, as digital transformation grows rapidly in the banking industry (Winasis et al., 2020). Furthermore, banks play a vital role in economic growth (Akhter, 2018) by providing credit, facilitating payments, serving as a safe haven for deposits, and offering financial services to consumers and small businesses (Omarini, 2017). Therefore, analyzing the capabilities that impact banks' performance is crucial, as it enables managers to evaluate the return on their investment in digital transformation, leading to increased efficiency and a better economic situation for the country. In recent

[1] https://hubmeta.com/ HubMeta is the first free web-based data entry system for correlational Meta-Analysis.

years, the imperative for digital transformation within the banking industry has become increasingly apparent. The relentless progress of technology and the swift pace of innovation have profoundly altered customer expectations, industry dynamics, and competitive landscapes. According to a report by Markets and Markets (2021), the global digital banking platform market is projected to expand significantly, with its size forecasted to surge from USD 8.2 billion in 2021 to USD 13.9 billion by 2026, reflecting a compound annual growth rate (CAGR) of 11.3%. This growth trajectory underscores the critical importance of embracing digitalization within the banking sector to remain competitive and relevant in the evolving global marketplace.

The research offers significant theoretical advancements in understanding the dynamics of digital transformation within the banking sector. By integrating insights from Dynamic Capability Theory and System of Innovation theory, the study emphasizes the importance of aligning strategic initiatives with broader institutional contexts, such as regulatory frameworks. Through a comparative analysis between Canada and Iran, the research highlights nuanced differences in the impact of regulatory environments on various capabilities crucial for digital transformation success. Additionally, the study introduces innovative methodologies like fuzzy set qualitative comparative analysis (fsQCA), expanding the methodological repertoire in management science and offering a unique lens to examine complex relationships among variables. Furthermore, the research identifies capital as a paramount resource for enhancing non-financial performance and provides insights into the readiness of digital technologies, offering practical guidance for banking practitioners and policymakers.

From a practical standpoint, the study's findings hold significant implications for decision-makers in the banking industry. The recognition of capital as a crucial resource underscores its strategic importance in digital transformation, while insights into the impact of capabilities on financial performance provide a strategic roadmap for navigating the complexities of digital banking. Practical implications also extend to regulatory environments, where understanding the associations between regulations and capabilities aids in aligning strategic initiatives with regulatory landscapes. Moreover, the identification of technology readiness gaps between different regions offers guidance for strategic planning and investment initiatives, enabling informed decision-making in technology adoption and resource allocation. Overall, the research equips industry professionals and policymakers with actionable insights to navigate the evolving landscape of digital banking effectively.

In essence, this comprehensive research not only enriches theoretical foundations in digital banking, but also provides invaluable practical implications for industry practitioners, regulators, and policymakers, fostering a deeper understanding of how to navigate and optimize strategies within the ever-evolving digital banking landscape across different national contexts.

1.8. Summary

This study aims to investigate the organizational capabilities necessary for successful digital transformation in the banking industry, with a focus on identifying the best combination of capabilities that banks need to develop and leverage to enhance their performance under different regulatory regimes. To address the research questions, a multimethod research approach is used, including a systematic literature review, a Delphi method, Structural Equation Modeling, and fuzzy-set qualitative comparative analysis. The study contributes to the existing literature by identifying the critical capabilities for digital transformation and their combinations that lead to high performance in different regulatory situations. The findings of this study can provide insights for academics, banking leaders, and policymakers to develop effective strategies for promoting digital innovation in the banking sector. The thesis comprises a comprehensive exploration of the research questions, including a literature review, methodology, findings, discussion, and conclusions.

This dissertation is organized into the following chapters. Chapter 2 provides a detailed overview of the real-world context. Chapter 3, "Theoretical Foundation and Terms Definitions," lays down the theoretical groundwork and furnishes precise definitions of pivotal terms. Moving on to Chapter 4, "Literature Review and Conceptual Framework," an extensive review of the literature concerning digital transformation capabilities in the banking sector is conducted. This chapter accentuates research gaps and introduces a research model alongside concept definitions. Chapter 5, "Methodology," elaborates on the research methodology employed in this study, encompassing research design, data collection methods, and analysis techniques. In Chapter 6, "Findings," the research findings are presented, offering an analysis of the key capabilities crucial for digital transformation and identifying optimal combinations of these capabilities to enhance bank performance. Chapter 7, "Discussion," serves as the conclusion of the study, engaging in a detailed discussion of the findings and delineating implications for practitioners and policymakers. Additionally, it provides insightful suggestions for future research. Finally, Chapter 8, presents a summary of the research, encapsulating the conclusions, limitations, and recommendations for future research.

Chapter 2: Context

2.1. Overview

Chapter 2 provides a comprehensive exploration of the context surrounding digital transformation, with a specific focus on the banking industry and the role of digital technologies within it. The chapter delves into two key aspects: digital transformation in the banking industry and the involvement of the regulatory environment in steering this transformation.

Firstly, the chapter offers a thorough examination of digital transformation, highlighting its significance within the banking sector. It delves into how modern advancements in technology have spurred a paradigm shift in the way banks operate and deliver services. Furthermore, the chapter explores digital technologies and categorizes them based on a popular framework.

Secondly, the chapter delves into the crucial role played by regulatory environments in shaping the course of digital transformation within the banking industry. It reviews the regulatory landscape at a global level, emphasizing the diverse approaches and priorities adopted by regulators across different regions. Specifically, the chapter scrutinizes the roles of regulators in Iran and Canada in driving and overseeing digital transformation within their respective banking sectors. This includes an analysis of the scope of focus of these regulators concerning digital banking and their regulatory strategies.

By providing a thorough understanding of digital transformation and the regulatory environment in the banking industry, Chapter 2 sets the stage for a more in-depth analysis in the subsequent chapters. It establishes a foundational knowledge base that aids in comprehending the complexities and nuances of digital transformation within the banking sector, essential for the comprehensive exploration carried out throughout the dissertation.

2.2. Digital transformation

Digital transformation (DT) is the integration of digital technologies into all areas of a business, revolutionizing the way it operates and delivers value to customers (Basrowi & Utami, 2020). The rapid penetration of new technologies in economic, social, political, and cultural structures, and the provision of digital networks, have made digital transformation a necessity (Busca & Bertrandias, 2019). By taking advantage of digital transformation and transformative technologies, organizations can improve customer service by accelerating business processes, which has led to the development of the business environment, building culture in society, and facilitating the benefits of smartness in providing services to customers (Westerman et al., 2014). Creating enabling infrastructures such as legal infrastructure, identity, security and protection, literacy and digital skills, open data, and transparency, as well as technology and governance infrastructure, is crucial to enjoying the economic, social, and environmental effects of digital transformation (Vieira et al., 2019).

Globalization and pressure to digitize before others have led organizations to face tougher competition and seek to gain competitive advantages in the digital era. Digital transformation has been widely studied in various academic fields, but a complete definition of the digital transformation of business models is still not fully agreed upon (Vial, 2019). To understand the concept of digital transformation, we must first understand the digital era and its main features. In today's digital age, technology has become an integral part of our lives, and organizations need to devise strategies to foster innovation by embracing the implications of digital transformation and delivering more effective operational performance (Van Veldhoven & Vanthienen, 2021).

A general framework for creating digital transformation in business processes includes understanding the situation, analysis, and diagnosis. To successfully implement a digital transformation strategy, businesses must have a clear understanding of their organization's working methods, changes, and events. They should also be aware of their competitors and analyze their business situation from a competitive perspective (Konopik et al., 2022). Organizations should make the most of existing mechanisms and processes and identify their technology strengths to identify and apply technological advances for positive changes in the business (Vial, 2021). Organizations in the field of digital transformations in Business Process Management (BPM)[2] should identify possible changes to optimize business processes, including studying existing business processes, identifying how to delete input data, output data, confirmations, and paper reminders, and identifying technologies and technical products that can be used in business (Ulas, 2019).

2.2.1. Digital transformation in the banking industry

The influence of digital technologies has had a significant impact on various industries and traditional businesses, including the banking industry. However, banks must now compete with innovative and agile startups in the field of banking services to keep up with the rapid pace of technological developments. In recent years, the banking industry has

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[2] Business process management

undergone fundamental changes in various sectors under the influence of different drivers, such as fintech, blockchain and cryptocurrencies, the rule of regulators, and demographic changes (Cuesta et al., 2015; Kitsios et al., 2021a).

Digital transformation has become a crucial topic in the banking industry worldwide, with many banks planning to develop their digital banking roadmap to survive in the future (Tsindeliani et al., 2021). In the digital era, customer expectations have changed, and the emergence of the internet and social networks has increased the need for personalized daily services, which digital banking must address (Boudlaie, 2021; Naimi Sadigh et al., 2022). Digital banking, which involves moving from a physical structure to a digital one, is one example of digital transformation in banking, which aims to enhance the customer experience (Akhter, 2018). With the increase in competition, enhancing customer satisfaction through digital technologies, such as online services and reducing the need to visit physical branches, can increase customer loyalty and improve a bank's position in the market (Boudlaie, 2021).

Moving to the digital platform is no longer an opportunity for the future, but a necessity for the survival of organizations in the present. The changes required for this transformation are complex, and many influential components are required for banks to succeed in this path (Abdulquadri, 2021; Tsindeliani et al., 2021). Banks must not only enter each transformation topic but must also do so gradually by involving different levels of the bank and its subsidiaries (Borges, 2020). While many banks worldwide have started making changes in their operating models, they tend to focus on tactical transformation programs, which can ultimately lead to increased costs and inefficiencies due to the accumulation of several silo operating models (Boulmakoul & Khanboubi, 2019).

Moradi et al. (2020) suggest that there are three types of digital strategies that banks can adopt to achieve digital transformation, including digital customer strategies, digital organizational strategies, and digital operational strategies. Digital customer strategies aim to provide customers with multiple options for interacting with the bank through digital channels, while digital organizational strategies require banks to adopt new capabilities in architecture, process digitization, digital collaboration tools, and digital culture to become fully digital organizations. Finally, digital operational strategies involve the transformation of information technology into an open architecture and flexible technology platform to create efficiency and enable new business models in the future.

2.2.2. Digital banking technologies

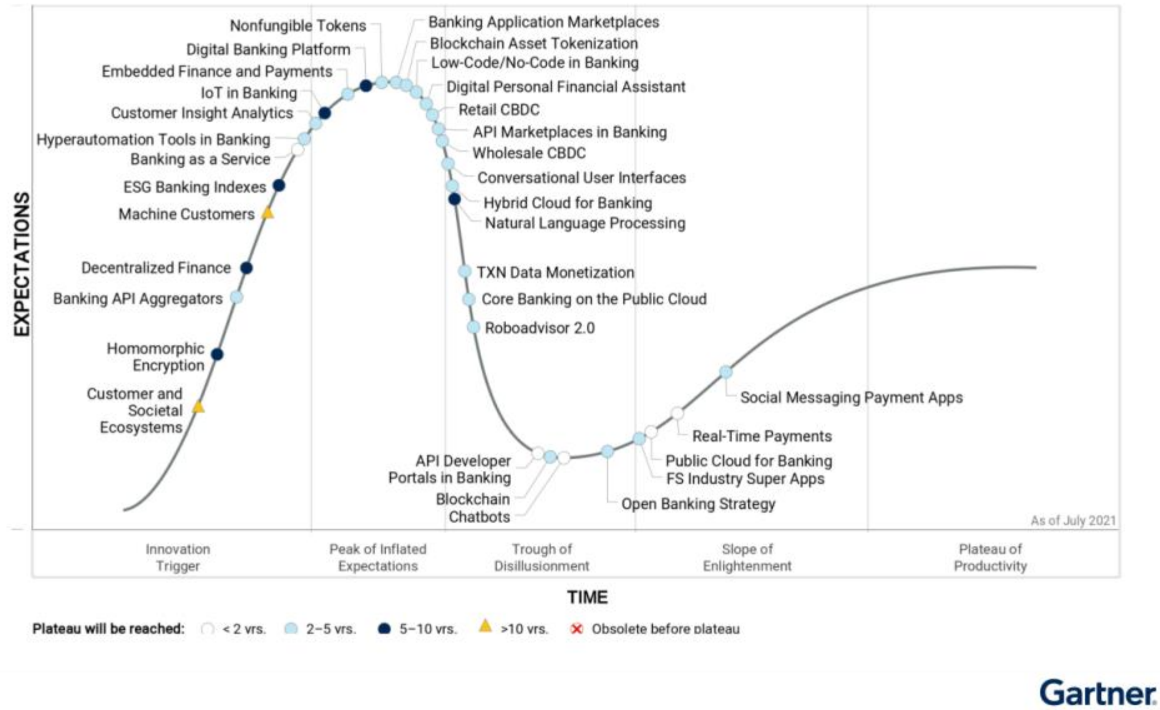
The Gartner Hype Cycle for Digital Banking Transformation, as shown in Figure 1, is a visual representation of the expected evolution of digital banking innovations over time. The cycle is divided into five stages: innovation trigger, peak of inflated expectations, trough of disillusionment, slope of enlightenment, and plateau of productivity. According to Gartner:

- The first stage, innovation trigger, marks the point at which a new technology or innovation emerges that has the potential to transform the banking industry. This stage is characterized by high expectations and excitement about the new technology.

- The second stage, the peak of inflated expectations, is where the hype around the technology reaches its peak, and unrealistic expectations are created. This stage is often marked by over-optimism and overinvestment in technology.
- The third stage, through disillusionment, is where the hype around the technology subsides, and disillusionment sets in as the limitations and challenges of the technology become apparent. This stage is often characterized by a decrease in investment and interest in technology.
- The fourth stage, the slope of enlightenment, is where a more realistic understanding of technology is achieved, and the potential benefits and limitations of the technology are better understood. This stage is often marked by a focus on practical applications of the technology and experimentation with different use cases.
- The final stage, plateau of productivity, is where the technology reaches its full potential and becomes widely adopted. This stage is marked by widespread adoption, and technology becomes an integral part of the banking industry.

Overall, the Gartner Hype Cycle for Digital Banking Transformation provides a useful framework for understanding the evolution of digital banking innovations and the challenges and opportunities that they present for the banking industry. It helps banks navigate the complex landscape of digital transformation and make informed decisions about which technologies to invest in and how to deploy them effectively to meet the evolving needs of their customers (Newton, 2022). In this research, conducted within the timeframe of data collection, we utilized the Hype Cycle for 2022. It's worth noting that there are continuously emerging cycles that companies can consider. Later, in Chapter 4, we will use the technologies available in this cycle to frame our research model.

Figure 1- Hype Cycle for Digital Banking Transformation



Source: **Newton (2022)**

New digital products are being developed by banks, mainly within the retail payments sector, including digital wallets, near-field technology (NFC) payment solutions, or P2P services similar to those offered by FinTech companies (Cuesta et al., 2015). According to Melnychenko et al. (2020), digital banking has evolved through three stages. The first stage involved the introduction of ATMs and call centers, which enhanced customer service. In the second phase, banking institutions began personalizing their banking services using cloud technology, social networks, analytics, and mobile access. The third stage involves the use of artificial intelligence, blockchains, programming interfaces, and the roboticization of individual business processes. This shows that digital transformation in the banking industry is an ongoing process that constantly introduces new technologies and services to the market.

Skinner (2018) categorizes digital banking technologies into six categories:

- Infrastructure technologies: Infrastructure technologies serve as the backbone of digital banking operations, providing the necessary foundations for seamless functionality, such as cloud computing,
- Artificial Intelligence and Analytics technologies: These technologies involve the use of machine learning, natural language processing, and data analytics to make sense of customer data and provide personalized services, such as homomorphic encryption, natural language processing, AI technology infrastructure,
- Digital engagement technologies: These technologies include digital banking platforms, digital personal financial assistants, chatbots, social messaging payment apps, banking application marketplaces, low-code/no-code in banking, financial industry super apps, open banking, omnichannel, and machine customers that enable banks to engage with customers through various channels.
- Payment and transaction technologies: These technologies facilitate payments and transactions, including embedded finance and payments, nonfungible tokens, decentralized finance technologies, central bank digital currencies (CBDC), blockchain asset tokenization, real-time payments, and data monetization.
- Security and privacy technologies: These technologies help banks protect customer data and prevent fraud, including banking APIs and platforms.

- Automation technologies: These technologies enable banks to automate back-office processes, such as account opening, loan processing, and customer onboarding, to improve efficiency and reduce costs. This includes IoT in banking, hyperautomation tools in banking, autoadapting and autocomposing products, roboadvisor 2.0.

This research uses Skinner's categorization of digital banking technologies because it provides a comprehensive framework for understanding the various technologies that banks use to deliver their services. It covers the fundamental categories that are essential for digital banking, such as infrastructure, security, and automation, as well as newer categories that are becoming more important, such as AI and analytics. Moreover, the categorization is well-structured, making it easy to understand and apply. It is based on the different functions that each technology serves, which enables banks to identify the areas where they need to focus their technology investments. Overall, Skinner's categorization of digital banking technologies is beneficial because it helps banks identify the most critical technologies, they need to have in place to deliver a successful digital banking service.

2.3. Regulatory environments in the digital transformation

The current industrial revolution has spurred policy changes in many social institutions as the development of information technology has led to the emergence of the digital economy, fundamentally transforming the financial sector. However, gaps in the regulation of financial technology cause legal uncertainty that slows down growth, necessitating special regulations or amendments to existing legislation. Tsindeliani et al.

(2021) argue that traditional regulations in this area may not be adequate to address the transformative effects of new financial technologies.

The advent of digital technology has disrupted the business landscape and society, with digital transformation affecting the way companies and citizens work. Consequently, regulatory bodies have had to create regulations for this phenomenon to ensure society benefits from digitalization while minimizing potential risks. Regulatory institutions play a vital role in promoting the digital economy, but the speed of digital transformation often outpaces the speed of regulatory measures. This issue is prevalent in almost all countries. Marano (2021) notes that regulatory bodies face challenges in formulating rules for sectors due to the blurring of traditional boundaries between customers and producers.

In the digital economy, product pricing is affected by various rules, further necessitating regulatory interventions to monitor the digital market. By emerging co-creation, the distinction between customers and producers has become challenging (Prahalad & Ramaswamy, 2004), making it difficult for regulatory bodies to formulate sector-specific rules. Therefore, regulatory bodies need to keep up with the speed of digital transformation to ensure regulations remain relevant and effective.

2.3.1. Regulatory environments across the world

In the existing literature, the role of regulatory frameworks in digital banking has been extensively explored. For instance, Tsindeliani et al. (2021) assess the legal regulation needs and investigates the potential for digitalization within the banking sector while implementing prudential rules. Notably, this work underscores the critical importance of effective regulatory cooperation and harmonization of legislation in the rapidly evolving landscape of digitalization and globalization. In another study by Baskerville et al. (2020), the focus shifts to regulatory agility—a crucial factor for navigating the digital revolution. These studies collectively highlight the multifaceted role of regulatory environment in shaping the future of digital banking. As technology continues to disrupt traditional financial services, regulatory bodies play a pivotal role in ensuring a dynamic yet secure environment for both incumbents and emerging players.

Over the past few decades, regulatory environments across various sectors and regions have undergone evolution and change (Bloomberg, 2023; MCO, 2022). The beginning of this evolution started with the formation of the regulatory framework of telecommunications. Then the scope of regulatory interventions reached ICT (Internet-based technologies and services). Currently, the scope of the regulatory framework is moving from ICT to digital. Digital regulation is different from that of ICT and includes issues such as cloud computing, the Internet of Things, online platforms, 5G, etc.

Also, some countries have developed strategies related to specific digital technologies such as robotics, automation, the Internet of Things, etc. For example, in 2017, Malaysia started a program called National IoT Strategic Roadmap, which aims to develop the Internet of Things ecosystem, strengthen the technological power of entrepreneurs, and create a regional IoT hub. In Germany, digital strategies have been developed for artificial intelligence. Also, countries such as Singapore, England, and Australia have started 5G policies. In Japan, since 2015, policies have been started to develop the use of robotics (ITU, 2020).

The current industrial revolution has spurred policy changes in many social institutions as the development of information technology has led to the emergence of the digital economy, fundamentally transforming the financial sector. However, gaps in the regulation of financial technology cause legal uncertainty that slows down growth, necessitating special regulations or amendments to existing legislation. Tsindeliani et al. (2021) argue that traditional regulations in this area may not be adequate to address the transformative effects of new financial technologies.

Traditionally, financial regulators have played a vital role in ensuring the stability of the banking industry by establishing and enforcing rules and regulations that mitigate risks, protect customer interests, and uphold the integrity of the financial system. This oversight encompassed critical areas such as capital adequacy, risk management, anti-money laundering, consumer protection, and prudential supervision. The primary objective was to strike a balance between fostering innovation and competition while safeguarding against systemic failures and ensuring consumer welfare (Alatovic et al., 2021).

With the rapid ascent of digital banking, the role of regulators has evolved to tackle the unique challenges and opportunities presented by the digital landscape. The shift to digital banking introduces new dimensions such as online customer onboarding, remote transactions, open banking, and the use of advanced technologies like AI and blockchain. Regulators must now adapt traditional regulations to accommodate these technological advancements and the unique operational characteristics of digital banking (Alatovic et al., 2021). In this evolving digital banking landscape, regulators remain crucial for managing challenges from new entrants like FinTech firms and tech giants. These disruptors leverage technology to process extensive consumer data, underscoring regulators' roles in ensuring fair competition and consumer protection. Regulatory coordination across borders becomes pivotal due to geopolitical risks and regulatory divergence. The democratization of data introduces both opportunities and concerns, necessitating global governance. Moreover, operational resilience gains prominence in the face of rising cyber threats, while regulators also drive agility to enable effective adaptation and competition. Amid this digital transformation, regulators skillfully maintain a balance between promoting innovation, competition, and stability (OECD, 2020).

As both digital and conventional banks face similar risks like operational and credit-related challenges, the transition to digital banking maintains the core regulatory purpose – addressing credit and counterparty risks, maintaining sufficient capital reserves, managing risks, and ensuring compliance adherence. In this evolving digital landscape, regulators are pivotal in managing the challenges posed by new entrants such as FinTech firms and tech giants. These disruptors employ technology to process extensive consumer data, prompting regulators to uphold fair competition and consumer protection. Regulatory oversight is extended to encompass these new players, formulate rules for cryptocurrencies and digital assets, and balance innovation with risk management. Due to geopolitical risks and regulatory divergence, cross-border regulatory coordination becomes essential. As data democratization brings opportunities and concerns, global governance becomes crucial. Additionally, operational resilience gains significance in the face of escalating cyber threats. Regulators also encourage banks to embrace agility to effectively adapt and compete. Within this digital transformation, regulators maintain a delicate equilibrium between promoting innovation, competition, and overall stability (Alatovic et al., 2021).

According to EY (2022), in the dynamic digital transformation of banking, regulators are expanding their traditional roles to tackle new challenges and opportunities. This expansion includes a broader regulatory reach encompassing non-traditional players like FinTechs and tech giants, to ensure consumer protection. Cryptocurrency regulation has emerged in response to the rise of digital assets, guided by frameworks like MICA in Europe and US stablecoin regulations. Regulators navigate digitalization by balancing innovation and risk management, especially with technologies such as AI, adapting to varying regional approaches. Global financial institutions grapple with geopolitical tensions and regulatory variations, necessitating cross-border coordination in areas like sustainable finance and data governance. The democratization of data offers efficiency but raises ethical and compliance concerns, demanding a unified governance framework to prevent financial sector fragmentation. As cyber threats escalate, the significance of operational resilience intensifies, particularly concerning outsourcing and ecosystem dependencies. To enhance agility, banks are encouraged to adopt agile governance and change management strategies, embedding compliance into new service development and emphasizing ongoing control testing.

As banks undergo a digital transformation, reimagining their operations and solutions in a data-driven environment, the need for regulatory adaptation becomes evident. Conventional regulations might hinder progress, exemplified by reliance on physical audits for cloud-stored data. Addressing challenges like GDPR's impact on blockchain and accommodating AI-driven processes would facilitate the secure exploration of these technologies. Achieving global regulatory alignment is crucial to unlocking the full potential of global technological solutions while allowing for jurisdiction-specific flexibility.

Initiatives such as global sandboxes could foster collaborative regulatory solutions. As technology rapidly evolves, industry practices should lead in shaping these collaborative regulatory approaches. With the ascent of technologies like Open APIs, cloud computing, blockchain, and AI, regulators across the globe are closely scrutinizing their transformative impact and associated risks on the banking sector (Deutsche Bank, 2018).

The advent of digital technology has disrupted the business landscape and society as a whole, with digital transformation affecting the way companies and citizens work. Consequently, regulatory bodies have had to create regulations for this phenomenon to ensure society benefits from digitalization while minimizing potential risks. Regulatory institutions play a vital role in promoting the digital economy, but the speed of digital transformation often outpaces the speed of regulatory measures. This issue is prevalent in almost all countries. Marano (2021) notes that regulatory bodies face challenges in formulating rules for sectors due to the blurring of traditional boundaries between customers and producers.

In the digital economy, product pricing is affected by various rules, further necessitating regulatory interventions to monitor the digital market. The distinction between customers and producers has become challenging, making it difficult for regulatory bodies to formulate sector-specific rules. Therefore, regulatory bodies need to keep up with the speed of digital transformation to ensure regulations remain relevant and effective.

The shifting landscape of financial service providers and the ever-evolving competitive environment highlight the pressing need for a reevaluation of our regulatory boundaries and supervisory methodologies. In this context, it becomes increasingly crucial to formulate policies that effectively address these trade-offs and enable us to pursue our key objectives to the fullest extent possible. This section will provide a comprehensive examination of the implications for the regulatory perimeter.

While the specific principles, their implementation, and their prioritization may differ, at least three fundamental principles have surfaced across various jurisdictions and are widely embraced by regulators: ensuring legal certainty, maintaining technology neutrality, and applying proportionality (often also described as risk-based) (Nielsen, 2018). Kurniati and Suryanto (2022) emphasized the need for government rules to cover four key elements: maintaining impartiality, adaptively responding to shifts, collaborating with external parties, and having widespread relevance in different situations. According to the Competition Bureau Canada, effective regulation should embrace technology neutrality to foster innovation and be outcome-based to allow flexibility in achieving desired results. It should apply uniform regulations to all firms, tailored to the level of risk they pose while ensuring consistency across borders (Government Of Canada, 2017). Collaboration among regulators is essential for clarity, and a specialized regulatory resource can aid in information dissemination and investment promotion. Access to core infrastructure and open data via APIs encourages innovation. Digital ID verification reduces costs and enhances efficiency, and ongoing regulatory adaptation ensures regulations stay aligned with evolving technology trends.

Digital financial services (DFS) differ significantly from conventional financial services, particularly in the context of financial inclusion. These differences include (i) the emergence of new providers like e-money issuers (EMIs), (ii) a strong dependence on digital technology, (iii) the pivotal role played by agents as the primary link to customers, and (iv) the utilization of these services by individuals who are typically excluded or underserved by traditional financial services. Each of these aspects carries implications for both digital financial inclusion strategies and the regulatory framework governing DFS (CGAP, 2018).

In response to the emergence of FinTech and the need to adapt to changing financial landscapes, various countries have adopted diverse regulatory approaches, as highlighted by the OECD (2020):

- European Union (EU) - Payment Services Directive II (PSD2) (2015): This directive aims to enhance competition by granting open access to certain customer banking data, allowing nonbank licensed providers to offer payment initiation and account information services, and fostering innovation and competition in the EU financial sector.
- Japan - Banking Act Revision (2017): This revision encourages banks to open their APIs and collaborate with FinTech firms, aiming to promote innovation and efficiency within the Japanese banking sector.
- Canada - Competition Bureau Review (2017): The Canadian authorities conducted a review of payment services, lending, crowdfunding, and investment sectors, aiming to assess competition and potentially address market issues.
- Mexico - FinTech Law (2018): Mexico introduced novel regulatory models, including a regulatory sandbox, granting third parties' access to data via APIs, with the possibility of fees subject to regulatory approval. This was designed to balance innovation with consumer protection.

- Australia - Consumer Data Rights Initiative: The Australian government plans to enforce data-sharing rights for consumers, starting with the banking sector. This initiative allows customers to share their data with trusted third parties, aiming to give consumers more control over their financial data.

The UK has asked the CMA (the country's nine largest banks) to share their data based on open API standards. Since 2018, the Japanese government has required banks to declare their support for open APIs. In the banking system of this country, third-party services are needed to conclude banking contracts. Hong Kong also adopted smart banking laws in 2018, following the open API standard. In the US, there is still a lot of debate between banks, fintech startups and regulators regarding data sharing. It should be noted that some American banks have already started the API regime. The European Union also supports API-based banking data sharing. The monetary authority and the Singapore Bankers' Association have also issued an Open-API playbook to encourage banks to share data. In Australia, since 2017, a law has been passed that allows customers to freely access data; obviously, banks were the first target of this law (Deloitte).

Assessment of the global approach to open banking reveals distinctive strategies in various countries (Deloitte). Singapore is actively promoting a "Smart Nation" vision, exemplified by its Open API initiative driven by the Monetary Authority of Singapore (MAS) and the Association of Banks in Singapore (ABS), encouraging financial institutions to openly develop and share APIs. On the other hand, Australia has instituted the Consumer Data Right through legislation, granting consumers open access to diverse data domains such as banking, energy, phone, and internet since 2019. In Canada, discussions on open banking gained momentum after the 2018 federal budget, culminating in the establishment of an advisory committee and the initiation of consultation processes. The United States witnesses ongoing discussions among key stakeholders, including banks, fintechs, intermediaries, and regulators, aiming to define a data-sharing framework. Notably, certain banks in the US, like Citi, have proactively embraced API regimes, such as Plaid, and developed Open APIs for verified third parties. Across the Atlantic, the UK mandates specific banks to share banking data and facilitate payment initiation using open API standards, as enforced by the Competition and Markets Authority (CMA) since January 2018. Japan and Hong Kong have also embraced open API approaches, with Japan setting a timeline for API support and Hong Kong aligning its strategy with the "New Era of Smart Banking" concept. Meanwhile, in the European Union (EU), the Payment Services Directive 2 (PSD2) has directed banks to share banking data and enable payment initiation, emphasizing a technology-neutral approach since January 2019 (Deloitte).

The regulatory environment's focus areas in the digital transformation of banking are illustrated in Table 1 according to research by Deutsche Bank (2018).

Table 1 - Regulators' focus on digital banking

Area of regulatory focus	**Regulatory objectives**	**Regulatory response**
Data usage	• Protect individual privacy • Ensure data is not misused or manipulated • Prevent data leakage • Prevent unethical use of data	• Data protection and data privacy requirements • Advice on ethical aspects of using data
New market players and business models	• Support competition and innovation • Set a level playing field for fintech firms and banks • Secure the safety of the financial system as a whole	• Opening client data to fintech firms in a secure manner • Licensing and authorization of fintech firms

		• Same services, same rules" approach • Encouraging responsible innovation • Technology-neutral rules
New cyber threats	• Ensure cyber security and client protection	• Customer awareness • Secure communication • Strong customer authentication • Technical preventive measures • Fraud monitoring and detection

Source: Deutsche Bank (2018)

Table 2 provides a comprehensive review of different regulatory environments ' scope of focus in digital banking.

Table 2- Scope of focus of different regulatory environments in digital banking

Groups	**Subgroups**
Risk management and compliance	• AML (Anti-Money Laundering) (Buckley et al., 2015) • Risk management (investments, portfolios, etc.) (Izraylevych, 2021) • Risk-Based Customer Due Diligence (CDD) (CGAP, 2018) • Consumer and investor protection (AML and combating the financing of terrorism) (Forgione, 2023) • Security and risk management (CBI, 2013, 2023; Nasir, 2023)
Cybersecurity	• New cyber threats (Nielsen, 2018) • Digital ID (Forgione, 2023) • Cybersecurity (Forgione, 2023; Kurniati & Suryanto, 2022) • E-signature(CBI, 2013, 2023)
Data protection	• Data leakage (Kurniati & Suryanto, 2022) • Data usage (Nielsen, 2018) • Data Protection and Privacy (CGAP, 2018; Forgione, 2023; Nasir, 2023; Natarajan, 2023) • General Data Protection Regulation (GDPR) • How customer information is processed (Izraylevych, 2021) • Data reliability (Izraylevych, 2021) • Ethics and conduct (Izraylevych, 2021)
Consumer protection	• Consumer protection (Buckley et al., 2015; CBI, 2013, 2023; Nasir, 2023)

	• Protecting consumers from product push (Retail Banker International, 2020) • Protecting consumers from hidden fees and punitive charges (Retail Banker International, 2020) • Credit scoring (CBI, 2013, 2023)
Market dynamics and new players	• New market players and business models (Kurniati & Suryanto, 2022; Nielsen, 2018) • Competition and Innovation (Natarajan, 2023) • Nonbank E-Money Issuance (CGAP, 2018) • Use of Agents (CGAP, 2018) • Regulating third parties (Buckley et al., 2015; Kurniati & Suryanto, 2022; Natarajan, 2023) • Licensing (CBI, 2013, 2023; Forgione, 2023) • Digital inclusion (Retail Banker International, 2020)

Iran and Canada's Banking Industry

The selection of Iran and Canada for this study stems from a deliberate intention to delve into the realm of digital banking capabilities across diverse regulatory, socioeconomic, and geographical landscapes. Iran and Canada offer unique contexts that enrich our exploration of digital transformation in banking.

Iran, as a developing nation, confronts distinctive challenges and opportunities in embracing digital banking technologies. Shaped by a rich history and intricate geopolitical dynamics, Iran's banking sector operates amidst sanctions, political intricacies, and rapid technological advancements. Despite these hurdles, Iran experiences a burgeoning digital adoption propelled by a tech-savvy populace and a burgeoning fintech ecosystem. The recent introduction of the "digital rial" exemplifies Iran's commitment to modernize its financial infrastructure (Motamedi, 2022).

Conversely, Canada, as a developed economy, boasts a more mature digital banking infrastructure. With a stable economy, robust regulatory institutions, and a well-established banking system, Canada's digital transformation journey is characterized by a blend of innovation, consumer demand, and prudent regulation. Canadian banks have made significant investments in digital transformation, spurred by escalating consumer expectations (Leibovitz et al., 2022) .

These disparities between Iran and Canada underscore their distinctiveness and contribute to a comprehensive understanding of digital transformation in banking. Through this comparative approach, we aim to explore different context in digital era.

As the focus of this study encompasses both Iran and Canada, it is important to review the available data, reports, documents, and articles that discuss the banking industry and the regulators in Iran and Canada. This will provide a comprehensive understanding of the current state of these two countries and help identify any similarities, differences, challenges, and opportunities that may exist.

FATF and BCBS and digital banking

Both the Financial Action Task Force (FATF) and the Basel Committee on Banking Supervision (BCBS) have addressed certain aspects of digital transformation in the banking sector:

- FATF and Digital Transformation: The FATF primarily focuses on combating money laundering, terrorist financing, and proliferation financing rather than specifically guiding digital transformation. However, the FATF has recognized the importance of addressing risks associated with virtual assets and digital banking activities. It has developed recommendations and guidelines related to virtual assets, including the regulation of Virtual Asset Service Providers (VASPs) and the implementation of the "Travel Rule," which requires the collection and transmission of customer information during cryptocurrency transactions. The FATF's guidance aims to ensure that digital transactions are subject to appropriate regulatory oversight to prevent illicit activities (FATF, 2021).
- Basel Committee and Digital Transformation: The BCBS, on the other hand, is more directly involved in setting global banking standards and guidelines, including those related to digital transformation. While the BCBS does not have specific

requirements solely dedicated to digital transformation, it recognizes the impact of technology on the banking sector. The BCBS has provided guidance on various aspects of technology and digital innovation in banking, including risk management, cybersecurity, operational resilience, outsourcing, and cloud computing. The BCBS emphasizes the need for banks to effectively manage the risks associated with digitalization and technology adoption while ensuring compliance with existing regulatory requirements (BIS).

2.3.2. Iranian banking

There are currently 30 banks operating in Iran of which 22 are private banks and 8 are government banks. The Iranian banking sector is regulated primarily by the Central Bank of Iran (CBI), which serves as the main regulatory authority overseeing banking activities. The CBI plays a crucial role in setting policies, regulations, and guidelines to ensure the stability, efficiency, and proper functioning of the banking system. It also oversees monetary policy, supervises financial institutions, and monitors various aspects of the banking industry.

Iran is a country that has experienced significant growth and development in its banking sector over the past few decades. With the advancement of technology, digital banking has emerged as a new trend in Iran, bringing various benefits to both customers and banks. The banking system in Iran has unmistakably entered a phase of digital transformation, a subject extensively examined in various studies. Abdollahi Poor (2022) underscores digital transformation as a pivotal stride for enhancing the competitiveness of the Iranian banking industry. Abdollahi Poor (2022) delves into the application of blockchain technology within this sphere, while Goumeh and Barforoush (2021) propose a digital maturity model tailored for the ongoing digital banking revolution in Iranian banks. Hosseini et al. (2022) conducted a comprehensive two-dimensional analysis, contrasting customer behavior in both traditional and electronic banking realms. Furthermore, Arsanjani et al. (2019) extensively explore the challenges confronted by the Iranian e-banking business model amidst the paradigm shift of digital transformation.

In Iran, the FinTech sector is in its nascent phase, with regulatory bodies such as the central bank yet to define precise and standardized guidelines for managing financial technologies. This absence of clear regulations poses a considerable hurdle for companies operating within this domain, as they must contend with emerging obstacles and adhere to evolving legislation while striving for expansion, market promotion, and talent acquisition, thereby constraining their business prospects (Gholami et al., 2023).

the Central Bank of Iran (CBI) serves as the main regulatory authority overseeing the banking sector. The CBI plays a crucial role in setting policies and regulations to ensure the stability and efficiency of the banking system. It establishes guidelines and frameworks for various aspects of banking operations, including digitalization.

The CBI has taken steps to promote digitalization in the banking sector. For example, it has made efforts to enhance the security and reliability of digital banking services, such as online banking and mobile banking. This includes implementing measures to combat fraud and protect customers' financial information. The CBI has also encouraged the use of financial technology (FinTech) solutions, contributing to the digital transformation of Iranian banks. Gholami et al. (2023) delve into an examination and assessment of the factors influencing the integration of FinTech within Iran's banking sector. Their investigation aims to offer comprehensive solutions for mitigating obstacles and fostering the growth of this industry within Iran by thoroughly grasping the current landscape. Their findings underscore the necessity within the banking sphere for legal alignment and synchronization with overarching regulations, alongside the imperative requirement for foundational infrastructure and tools pivotal in devising strategies for FinTech implementation. Such endeavors are envisioned to pave the way for enhanced transparency, cost reduction, swift service provision, and the transition towards a digitally driven economy.

Moreover, the CBI has introduced initiatives to improve financial inclusion and access to banking services through digital channels. These efforts aim to expand the reach of banking services to underserved populations and remote areas through digital means. The article by Salehi and Alipour (2010) on e-banking in an emerging economy in Iran could provide more insights into these initiatives.

The Central Bank of Iran (CBI) is not a member of the Basel Committee on Banking Supervision (BCBS) or the Bank for International Settlements (BIS), which is located in Basel, Switzerland. The BCBS is a committee of banking supervisory authorities that sets global standards for banking regulation and supervision, while the BIS serves as an international financial institution that fosters cooperation among central banks worldwide. Also, Iran is currently on the FATF (Financial Action Task Force) blacklist. The FATF blacklist is a list of countries that are deemed to have inadequate measures in place to combat money laundering and terrorist financing. Being on the blacklist can have significant economic implications for a country, as it may face increased scrutiny and restrictions on conducting international financial transactions. Iran has been on the FATF blacklist since 2008, and efforts are ongoing to address the concerns raised by the FATF and improve its compliance with international standards in this area.

Iran does not have direct involvement with the Basel Committee on Banking Supervision (BCBS) and membership with the Financial Action Task Force (FATF), it can have several effects on the regulation of digital transformation in the country's banking sector including Lack of Global Standards, Limited Access to International Networks, Domestic Regulatory Autonomy.

2.3.3. Canadian banking

In Canada, the banking industry consists of a variety of institutions, including both large and small banks, as well as credit unions. The “Big Five” banks, which are the largest and most influential banks in Canada, are the Royal Bank of Canada, Toronto-Dominion Bank, Bank of Nova Scotia, Bank of Montreal, and Canadian Imperial Bank of Commerce.

Apart from the Big Five, numerous smaller banks and credit unions are operating in Canada. While it is challenging to provide an exact number of these institutions as it can vary over time, Canada has a considerable number of smaller banks and credit unions spread across the country.

It's important to note that the majority of banks in Canada are privately owned entities, meaning they are not government-owned. However, some banks in Canada are crown corporations or have government ownership stakes, indicating some degree of government involvement in those banks.

The Canadian banking industry is regulated by government agencies to ensure stability and protect consumer interests. These regulations aim to maintain a robust financial system and provide a safe environment for banking customers.

Canada is currently experiencing a significant shift in its banking sector with the emergence of digital banking and the concept of open banking. Digital banking refers to the use of digital technologies to provide financial services, while open banking refers to the sharing of financial data between different financial institutions and third-party providers through the use of open Application Programming Interfaces (APIs) (Deloitte, 2020). These changes are being driven by advancements in technology, consumer demand for more personalized and efficient financial services, and the need for increased competition and innovation in the banking industry (Deloitte, 2020).

Canada has been relatively slow in adopting open banking compared to other countries such as the UK and Australia. However, the Canadian government has recognized the potential benefits of open banking and has taken steps to create a regulatory framework to support its implementation (Deloitte). In 2018, the Canadian government launched a review of open banking and appointed a committee to explore its potential benefits and risks. The committee released its final report in 2019, recommending that Canada implement a phased approach to open banking, with a focus on customer control over their data, and the establishment of a framework for third-party providers (Deloitte).

In order to implement open banking, several key design choices must be made, such as the scope of data sharing, the role of third-party providers, and the governance and oversight of the system (Deloitte). The Canadian government has yet to make final decisions on these design choices, but the recommendations of the committee and ongoing consultations with industry stakeholders suggest that a phased approach to open banking will likely be adopted in Canada (Deloitte).

Meanwhile, the digital banking landscape in Canada is rapidly evolving, with traditional banks facing increased competition from digital-only banks and fintech startups. This competition is driving innovation in the banking industry, with new products and services being introduced to meet the changing needs and preferences of consumers (Crawford, 2008). However, the emergence of digital banking also brings new challenges related to cybersecurity, data privacy, and consumer protection (Ducas & Wilner, 2017).

One technology that has the potential to transform the banking industry is blockchain, a distributed ledger technology that allows for secure and transparent transactions. While Canada has been relatively slow in adopting blockchain compared to other countries such as the US and China, there has been increasing interest and investment in blockchain-related initiatives in recent years (Ducas & Wilner, 2017). In addition, the Bank of Canada has been exploring the potential of a central bank digital currency (CBDC), which would use blockchain technology to provide a secure and efficient payment system (Zelmer & Kronick, 2021).

The Canadian banking system is evidently in the midst of a digital transformation, a focal point of numerous studies. Bordeleau et al. (2009) offer insights into regulatory constraints on bank leverage within Canada. Clements (2021) delves into the challenges and opportunities surrounding fintech regulation in both Canada and the United States. Crawford (2008) specifically examines the digitalization of cheque payments in Canada, emphasizing electronic presentment. Ducas and Wilner (2017) stress the necessity for effective regulatory frameworks governing emerging technologies like blockchain. Mohsni and Otchere (2018) spotlight the impact of regulatory actions on banks' risk appetite, emphasizing the importance of robust risk management frameworks. McKeown (2017) provides a comprehensive overview of the Canadian banking system's evolution and adaptability spanning from 1996 to 2015.

Overall, the Canadian banking system is experiencing significant advancements in the digital domain, with a growing emphasis on open banking, fintech innovation, and blockchain technologies. Regulatory bodies actively formulate policies and frameworks to ensure the security, stability, and competitiveness of the financial industry amidst the evolving digital landscape.

The banking system in Canada has experienced remarkable progress in the realm of digitalization, with concerted efforts from the government and regulatory bodies to create an enabling environment for digital banking and fintech innovation. Regulatory bodies, such as the Office of the Superintendent of Financial Institutions (OSFI), play a pivotal role in ensuring the safety and stability of financial institutions, even amidst the advent of digital banking.

Furthermore, Canada's engagement with the Basel Committee on Banking Supervision (BCBS) and membership in the Financial Action Task Force (FATF) significantly impact the regulation of digital transformation in the country's banking sector. These engagements ensure alignment with global standards, strengthen risk management practices, support effective anti-money laundering measures, promote international cooperation, and foster a conducive environment for digital banking innovation.

Regulator structure in Canada

The three principal federal regulators of financial institutions are the Office of the Superintendent of Financial Institutions ("OSFI"); the Canada Deposit Insurance Corporation ("CDIC"); and the Financial Consumer Agency of Canada ("FCAC").

Policy surrounding federal financial services legislation is driven by the Department of Finance and, although they work independently from the Department, OSFI, CDIC, FCAC and the Bank of Canada ("BOC") contribute to the development of Canada's federal financial services legislative and regulatory framework. OSFI, CDIC, FCAC, and the Bank of Canada are all financial regulatory bodies in Canada.

According to Forgione (2023), OSFI (Office of the Superintendent of Financial Institutions) oversees banks, insurance companies, and other financial institutions. CDIC (Canadian Deposit Insurance Corporation) provides deposit insurance to protect depositors in case of bank failure. FCAC (Financial Consumer Agency of Canada) advocates for the interests of consumers and provides education on financial products. The Bank of Canada is the central bank of Canada and sets monetary policy. The Bank's role in Canada's payment systems is poised to further expand with the introduction of the new retail payment oversight framework which is examined in more detail below.

The Financial Transactions and Reports Analysis Centre of Canada (“FINTRAC”): Canada’s financial intelligence unit, FINTRAC, focuses on detecting, preventing, and deterring money laundering and the financing of terrorist activities (Forgione, 2023).

Office of the Privacy Commissioner of Canada (“OPC”): The Office of the Privacy Commissioner of Canada (OPC) is an independent agency that oversees the protection of personal information in Canada. The OPC investigates privacy complaints, provides guidance on privacy laws, and promotes privacy awareness. The OPC also monitors and reviews government departments and agencies to ensure they are complying with privacy laws (Forgione, 2023).

There are Provincial regulators as well in Canada that are out of the scope of this study.

Canadian regulation

The role of regulators in digital banking is to ensure the safe, fair, and transparent operation of fintech businesses within the financial ecosystem. Fintech businesses offering services like banking, consumer credit, insurance, or capital-raising, are subject to the same regulations as traditional businesses in those sectors. Additionally, fintech businesses are typically subject to broader business regulations, including privacy laws, anti-money laundering laws, and consumer protection laws (ICLG, 2023).

In order to reduce reliance on bilateral contracts and enable secure, efficient consumer-permissioned data sharing among participants in the open banking system, common rules are required. The main objective of the common rules is to protect consumers, including from bad actors who might seek access to their data. In addition, a positive consumer experience will be essential to ensuring that Canadians choose open banking over less safe methods of data transfer. To achieve this, the system design needs to place the consumer at the center with the rules governing the areas of liability, privacy and security (Government Of Canada, 2021).

Data protection

The role of the regulator in digital banking is to ensure that fintech businesses operating within their jurisdiction adhere to relevant laws and regulations, particularly those related to privacy, data protection, cybersecurity, anti-money laundering (AML), and consumer protection. In Canada, the regulator oversees various aspects of digital banking operations to ensure compliance with the law. The relevant regulatory bodies include the Office of the Privacy Commissioner of Canada, the Financial Transactions and Reports Analysis Centre of Canada (FINTRAC) for AML, and the Canadian Competition Bureau for competition-related matters (ICLG, 2023).

Regarding the collection, use, and transmission of personal data, Canada has legislation in place to regulate these activities. The Personal Information Protection and Electronic Documents Act (PIPEDA) governs the collection, use, and disclosure of personal information by private sector organizations in Canada. Additionally, provinces like Alberta, British Columbia, and Quebec have their own substantially similar legislation applicable to those regions (ICLG, 2023).

As of June 16, 2022, the proposed Digital Charter Implementation Act, 2022 ("Bill C-27") aims to replace certain parts of PIPEDA with new legislation, including the Consumer Privacy Protection Act (CPPA) and the Artificial Intelligence Data Act (AIDA). If enacted, these new laws would significantly impact privacy and data protection regulations in Canada, especially concerning personal information collection and AI systems.

Cybersecurity

In the context of cybersecurity, regulatory bodies like the Office of the Superintendent of Financial Institutions (OSFI) and the Investment Industry Regulatory Organization of Canada (IIROC) have issued guidelines and advisories to address cyber risks faced by financial institutions, including fintech businesses. These guidelines emphasize the need for strategic plans, risk assessment, and incident reporting to relevant regulatory bodies (ICLG, 2023).

AML

Furthermore, fintech businesses are subject to anti-money laundering (AML) regulations in Canada. The Proceeds of Crime (Money Laundering) and Terrorist Financing Act (PCMLTFA) establishes requirements for reporting entities, including fintech companies, to establish compliance regimes, conduct risk assessments, report suspicious transactions, and ensure proper client identification (ICLG, 2023).

2.3.4. Comparison between Iranian banking and Canadian banking contexts

Canadian banks operate under a conventional banking model, with interest rates playing a central role in lending and savings. They offer competitive interest rates on loans, mortgages, and savings accounts, adapting to global economic changes to optimize these rates for consumers and businesses alike (Brinks R. , 2024) .

In addition to conventional banking, there is a growing sector of Islamic banking in Canada, catering to the needs of the Muslim community by offering Sharia-compliant products that avoid conventional interest (riba), replacing it with profit-sharing or fee-based structures (creditpicks, 2024)

Conversely, the Iranian banking system adheres strictly to Islamic banking principles, where the concept of interest is replaced by profit-sharing agreements to comply with Sharia law. This fundamental difference shapes the entire banking structure in Iran, focusing on risk-sharing and avoiding speculation. Iranian banks engage in activities like Mudarabah (profit sharing), Wadiah (safekeeping), and Ijarah (leasing), which define the unique character of financial transactions in the country.

The purpose of banking in Iran extends beyond economic transactions to promote social justice and equity, integral to Islamic financial principles. This leads to a banking environment that not only supports financial transactions but also aligns with religious and ethical values, fostering a financial system that is deeply intertwined with the cultural and religious fabric of the country.

The contextual differences between Canadian and Iranian banks are stark:

- **Regulatory Environment**: Canada's banks are regulated under a system that promotes transparency and stability, allowing them to be significant players on the global stage. In contrast, Iranian banks operate under a national regulatory regime that aligns with Islamic law, which limits their interaction with the global banking system, particularly due to international sanctions.

- **Purpose and Ethical Considerations**: Canadian banks primarily aim to maximize shareholder value with a strong focus on profitability. Iranian banks, however, prioritize compliance with Islamic laws, which inherently includes considerations for social and ethical impacts on the community.
- **Technological and Service Diversity**: Canadian banks offer a broad array of technologically advanced services catering to a diverse clientele. Iranian banks' offerings are more specialized, focusing on services that comply with Islamic principles, which may limit their scope compared to their Canadian counterparts.

In summary, while both countries provide unique banking services that cater to their populations' needs, the fundamental principles and goals behind these services vary greatly due to differences in regulatory frameworks, cultural values, and the role of religion in financial activities. In this study we focus on the regulatory environment and explore different contexts from this point of view.

2.4. Summary

Overall Chapter 2 provided a comprehensive exploration of the context surrounding digital transformation in the banking industry, with a specific focus on the role of digital technologies and regulatory involvement. This chapter served as the foundational knowledge base for the subsequent sections of the dissertation.

The chapter introduced the concept of digital transformation (DT), emphasizing its integration of digital technologies into all aspects of a business, resulting in a fundamental shift in operations and customer value delivery. Modern technological advancements drove this transformation, reshaping how banks operated and provided services. Digital technologies were categorized using a recognized framework.

Furthermore, the chapter highlighted the essential role of regulators in shaping digital transformation within the banking industry. It explored the global regulatory landscape, showcasing the diverse approaches and priorities adopted by regulators across regions. Specific attention was given to the roles of regulators in Iran and Canada, examining how they drove and oversaw digital transformation within their respective banking sectors. This analysis delved into the scope and strategies of these regulators concerning digital banking.

In addition to regulatory insights, the chapter delved into the specific focus areas of regulators in the digital transformation of banking, emphasizing the need for adaptability in traditional regulations to accommodate technological advancements and the operational characteristics of digital banking.

A comparative perspective was also presented, offering an overview of the banking industries in both Iran and Canada. This comparative analysis covered regulatory authorities, the number and types of banks, and the digital transformation trends in each country's banking sector. The goal was to identify commonalities, disparities, challenges, and opportunities between these two regions.

In summary, Chapter 2 provided a comprehensive foundation for subsequent sections, offering a deep understanding of digital transformation and the regulatory landscape within the banking industry. It paved the way for an in-depth analysis of how digital transformation and regulatory involvement influenced the banking landscape in Iran and Canada, shedding light on the complexities and unique characteristics of these regions.

Chapter 3: Theoretical Foundation and Terms Definitions

3.1. Overview

In this pivotal chapter, we establish the theoretical underpinnings that guide this dissertation. We thoroughly explore two critical theoretical frameworks: dynamic capability theory at the firm level, and the system of innovation framework at the country level. By delving into these frameworks, we lay the foundation for the research and elucidate their significant roles in shaping the study's approach.

Furthermore, this chapter furnishes clear and succinct definitions of the key terms frequently employed throughout the study, ensuring a solid understanding of the concepts essential to our research. The comprehensive definitions provided here will facilitate a cohesive and accurate discourse throughout the subsequent chapters, enhancing the overall coherence and rigor of the dissertation.

3.2. Theoretical framework

The present study aims to utilize the dynamic capability theory introduced by Teece et al. (1997) to examine the internal resources and competencies of banks that are crucial for achieving successful digital transformation. The dynamic capability theory offers a framework for analyzing a company's internal resources and competencies as sources of competitive advantage in dynamic environments. By employing this theory, the study aims to identify the distinctive resources and competencies that enable certain banks to excel in digital transformation compared to others.

In addition, at the macro-level, the study will adopt the Systems of Innovation (SI) to analyze the external factors that impact the digital transformation of banks. Lundvall

(1992) and Freeman (1995) are recognized as the originators of the phrase "national system of innovation ". Later, Systems of Innovation (SI) was proposed by Edquist (2010). The SI approach acknowledges that innovation is a complex, systemic process that involves various actors, institutions, and social practices, and it emphasizes the importance of interactions and knowledge flows among these elements. By using the SI view, the study aims to recognize the regulatory and institutional factors that influence the digital transformation of banks and how these factors interact with the internal resources and capabilities of banks. This approach will provide a more comprehensive understanding of the digital transformation of banks and the role of external factors in shaping their performance.

3.2.1. Dynamic Capability Theory

This theory posits that a firm's capacity to adapt and evolve its resources and capabilities over time is a pivotal determinant of competitive advantage (Teece et al., 1997). This theory shares a close connection with the Resource-Based View (RBV) as it underscores the significance of a firm's internal resources and capabilities in attaining sustained competitive advantage. By continually adjusting and reshaping their assets and competencies in response to changing market conditions and technological advancements, organizations can fortify their market position and stay ahead of competitors.

The Resource-Based View (RBV) is a theoretical framework that emphasizes how a company's competitive advantage and overall performance are influenced by its resources and capabilities. This theory asserts that a company's distinct collection of resources and capabilities, including knowledge, skills, technology, and relationships, are the key factors that set it apart from competitors (Barney, 1991). Furthermore, the theory proposes that a company's resources must fulfil specific requirements to qualify as valuable, rare, difficult to imitate, and non-substitutable, which are referred to as VRIN characteristics (Barney, 1991).

According to the RBV theory, resources refer to "all of the assets, capabilities, organizational processes, firm attributes, information, knowledge, etc., that a company controls, which enable it to devise and implement strategies that enhance its efficiency and effectiveness" (Barney, 1991, p. 101). Capabilities, on the other hand, refer to "a company's capacity to perform a set of tasks or an activity in an integrated manner" (Barney, 1991, p. 102). Lastly, performance is the "ultimate outcome of a company's resource deployment and capability utilization" (Barney, 1991, p. 102). In simpler terms, Barney (1991) noted that RBV emphasizes the importance of firm-specific resources and capabilities in generating sustained competitive advantage and superior performance. Resources are the various inputs a company has at its disposal, including physical and financial assets, knowledge, and human resources. Capabilities refer to the company's ability to combine and make use of these resources to achieve a desired outcome, such as a competitive edge. Performance, meanwhile, is the end result of a company's use of its resources and capabilities, such as financial success, market share, or customer satisfaction. Overall, the RBV theory emphasizes that a company's distinctive resources and capabilities are key factors in achieving better performance, and it presents a structure for managers to recognize and cultivate these resources and capabilities to obtain a competitive advantage in their particular industries.

Barney's approach to the RBV theory centers on the internal aspects of the firm, such as its resources and capabilities, as opposed to external factors such as market conditions or industry structure. He believes that a firm's resources and capabilities are the most significant drivers of competitive advantage and that the strategy should aim to cultivate and exploit these resources and capabilities to generate value for the firm and its stakeholders. In essence, Barney (1991) has identified the framework of the resource-oriented view, which examines whether resources are valuable, rare, costly, and non-substitutable. Resources and capabilities that answer all questions in the affirmative are sustainable competitive advantages. This framework was later modified by Johansson (2008) from VRIN to VRIO as follows (see Figure 2).

- Value: Resources are valuable if they help organizations increase the value proposition to customers. This is done by increasing differentiation or reducing production costs. Resources that fail to meet this condition result in competitive disadvantages.
- Rarity: A resource that can only be obtained by one or more firms is considered scarce. When more than a few organizations share the same resources or capabilities, this leads to competitive parity.
- Imitability: An organization that has valuable and scarce resources can achieve at least a temporary competitive advantage. However, if an organization is to achieve a sustainable competitive advantage, this resource must also be costly to imitate or replace.
- Organization: If the resources are not organized to gain value from them, they do not create any advantage for the organization by themselves. Only an organization

that can use valuable, scarce, and imitative resources can achieve a sustainable competitive advantage.

Figure 2- Vrio framework

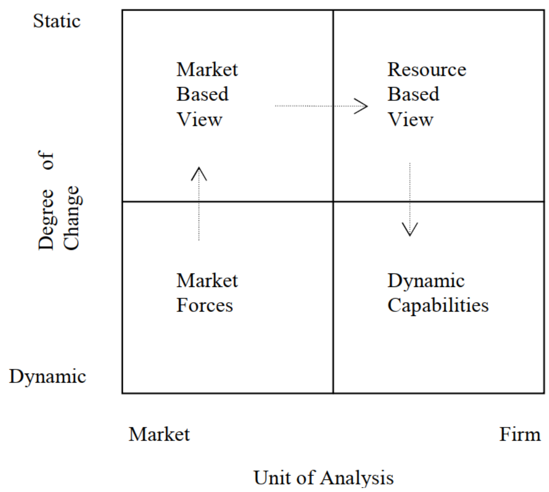
Is a resource or capability…					
Valuable?	Rare?	Costly to Imitate?	Exploited by Organisation?	Competitive Implications	Economic Performance
No	---	---	No	Competitive Disadvantage	Below Normal
Yes	No	---	↑	Competitive Parity	Normal
Yes	Yes	No	↓	Temporary Competitive Advantage	Above Normal
Yes	Yes	Yes	Yes	Sustained Competitive Advantage	Above Normal

Source: Johansson (2008)

The Resource-Based View (RBV) perceives resources and competencies as stable entities that can be identified and remain constant over a specific time frame. The central idea is that possessing valuable, rare, inimitable, and non-substitutable resources empowers firms to devise unique strategies that are difficult for competitors to replicate (Barney, 1991; Wernerfelt, 1984). However, given the dynamic nature of the market, a firm's resources must also evolve over time to remain relevant in changing market conditions. This perspective is rooted in the concept of dynamic capabilities and is an extension of the Resource-Based View (RBV) theory (Teece et al., 1997). Dynamic capabilities refer to a firm's processes that involve integrating, reconfiguring, acquiring, and releasing resources. While RBV primarily focuses on identifying valuable resources and capabilities for strategic purposes, dynamic capabilities emphasize the need to continuously adapt and update these resources and capabilities to maintain their relevance in the ever-changing marketplace.

As shown in Figure 3, RBV, MBV, and dynamic capabilities perspectives all examine different units of analysis and levels of change.

Figure 3- Characteristics of RBV, MBV, and Dynamic Capabilities



Source:Madhani (2010a)

Several other theories are rooted in RBV, including:

- Market-Based View (MBV): From an MBV perspective, firms are considered relatively homogenous, and their marketing efforts are part of what drives market competition. According to MBV, finding alternative markets is a critical strategic issue as defined by Michael Porter's five forces model. MBV does not consider whether firms have the resources and capabilities to compete effectively in the market (Madhani, 2010a).
- Knowledge-Based View: The Knowledge-Based View (KBV) suggests that a firm's ability to create, transfer, and leverage knowledge is critical to achieving sustained

competitive advantage (Grant, 1996). This theory is rooted in RBV because it emphasizes the importance of intangible resources such as knowledge, which are difficult to imitate by competitors.

In sum, each of these theories is rooted in the Resource-Based View and offers different insights into how a firm can achieve and sustain a competitive advantage. By leveraging its unique resources and capabilities, managing its external environment, and continuously adapting and innovating, a firm can achieve long-term success.

Dynamic Capability Theory stands out as the most suitable firm-level theory to investigate the impact of capabilities on bank performance in the context of digital transformation. It specifically focuses on a firm's capacity to adapt, innovate, and reconfigure its resources and capabilities in response to the dynamic and ever-changing market conditions and technological advancements (Teece et al., 1997). Given the fast-paced nature of digital transformation, we argue that this theory aligns well with the need to understand how capabilities influence bank performance in such a dynamic environment.

More specifically, this theory aligned with our study since Teece (2007)'s exploration of dynamic capabilities focuses on a firm's capacity to integrate, build, and reconfigure both internal and external competencies, crucial for navigating changing environments. Emphasizing the micro foundations of dynamic capabilities, Teece underscores the role of managerial and organizational processes in fostering adaptability and innovation. He contends that, in dynamic and uncertain business landscapes, dynamic capabilities are essential for firms to maintain a competitive advantage. Building on this foundation, Eisenhardt and Martin (2000) further delve into dynamic capabilities, highlighting their significance in addressing rapidly changing environments. Their dynamic capabilities framework underscores the importance of strategic flexibility, advocating for adaptive strategies, quick decision-making, and the ability to adjust resources and routines. Consequently, this theoretical alignment enables us to scrutinize our research questions through the lens of dynamic capability theory.

In contrast to more static theories like Resource-Based View (RBV), Knowledge-Based View (KBV), and Market-Based View (MBV), the Dynamic Capability Theory goes beyond examining current resources and capabilities. It emphasizes the importance of capabilities evolving over time to remain relevant in the face of continuous market disruptions and technological shifts (Madhani, 2010b).

Capability map

Capability-Based Planning (CBP) is a strategic planning approach that focuses on defining and developing an organization's capabilities to achieve its objectives (Wu, 2020). It involves analyzing an organization's current capabilities, identifying gaps between the current state and the desired future state, and developing a plan to bridge those gaps.

The Business Capability Maps (BCM) by LeanIX is a tool that helps organizations map out their business capabilities and their relationships. A capability map is a visual representation of the various capabilities that an organization possesses, such as sales, marketing, customer service, and logistics.

The BCM tool by LeanIX provides a centralized platform for documenting, organizing, and managing an organization's capabilities, enabling stakeholders to better understand the connections between capabilities and their impact on business outcomes. The map is available on the company's website.[3]

At the industry level, this company has a specific map for finance[4]. Claims management, commercial banking, customer relationships, digital banking, enterprise support, finance, government risk, and compliance stand as the foundational pillars of the finance industry.

For this research, we use this as a guideline, because it is designed to facilitate collaboration between different stakeholders within an organization, as well as transparency in decision-making. This can help to ensure that everyone has a clear understanding of the organization's capabilities and how they contribute to business outcomes. LeanIX Capability Map uses visual representations of capabilities and their relationships to help stakeholders understand the organization's capabilities in a more intuitive way. This can make it easier for stakeholders to identify potential gaps or redundancies, and to visualize how different capabilities work together to enable specific business outcomes.

Categorizing capabilities in this study, we consciously embrace Hooley et al.'s (1998) well-acknowledged capability categorization, which classifies capabilities into strategic, functional, and operational categories. By utilizing this established framework, we ensure

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[3] https://www.leanix.net/en/resources/business-capability-map-library/#/Default

[4] https://www.leanix.net/en/resources/business-capability-map-library/#/Finance

that our study comprehensively covers the diverse spectrum of capabilities crucial for our analytical purposes. The strategic, functional, and operational categorization allows us to examine capabilities at different organizational levels, thus enriching the depth and breadth of our analysis. This robust categorization ultimately enhances the rigor and validity of our research outcomes. According to Hooley et al. (1998):

- Strategic capabilities are the highest-level capabilities that determine a firm's overall strategy and direction. These capabilities involve making strategic choices about where to compete and how to compete in a given market. Strategic capabilities include the ability to identify and prioritize market opportunities, allocate resources effectively, and develop and execute effective strategies. For example, a company with strong strategic capabilities might identify an untapped market opportunity and quickly develop a new product to capture that market.
- Functional capabilities are the middle-level capabilities that enable a firm to effectively execute its strategies. These capabilities involve functional areas such as marketing, finance, operations, and human resources. Functional capabilities include the ability to conduct market research, develop compelling value propositions, create effective marketing campaigns, manage financial resources, optimize operations, and attract and retain talented employees. For example, a company with strong marketing capabilities might conduct extensive market research to understand customer needs and preferences and develop marketing campaigns that effectively communicate the value of its products.
- Operational capabilities are the lowest-level capabilities that enable a firm to effectively execute its functional strategies. These capabilities involve day-to-day

operational activities such as production, logistics, and supply chain management. Operational capabilities include the ability to efficiently manage production processes, optimize logistics and supply chain operations, and ensure quality control. For example, a company with strong operational capabilities might have a highly efficient production process that minimizes costs and maximizes output.

3.2.2. Systems of innovation

Digital innovations have revolutionized innovation strategies by enabling the exploration of new possibilities in products, services, business models, and internal processes. While this presents significant risks, it also accelerates the pace of innovation, requiring business leaders to approach innovation differently. In today's digital age, companies must adapt to technological advancements and evolving business environments to remain competitive, especially as digital-native companies bring their advantages to traditional markets. As a result, more traditional companies are attempting to innovate digitally and more broadly (Hinings et al., 2018).

However, digital innovation brings forth several questions. Companies must determine what strategic capabilities they should create or acquire, how to leverage data to create a competitive advantage quickly, and whether to seek partnerships or continue alone. While technical skills are necessary, technology expertise is in short supply, which highlights the need to train technical talent. Another challenge is digitizing the supply chain to support digital processes at digital speed. Even large organizations recognize that they need partnerships and alliances to overcome the obstacles of technology adoption, including their place in the innovation system, intellectual property ownership, and more (Holmström, 2018).

Innovation is a collaborative process that requires the participation of many parties, making it a phenomenon that does not occur in isolation. To create innovation, organizations must work with other organizations to create a knowledge flow. Parties involved in innovation include business organizations, universities, customers, research institutes, and the financial system. Moreover, the actions of companies are influenced by institutions, such as laws, regulations, and socio-cultural norms that form the context in which organizations involved in innovation operate. Therefore, to describe innovation, one must consider these actors and background factors. The system of innovation approach aims to achieve this goal (Edquist, 2010).

Lundvall (1992) and Freeman (1995) are credited with coining the term "national innovation system". In the 1990s, other concepts such as "technological systems" (Bergek et al., 2008), "sectoral systems" (Malerba, 2002), and "regional systems of innovation" (Asheim, 1996) also emerged to provide further insight into the innovation system. This concept is now widely used by academics and policymakers to explain how to support technological change and innovation. It emphasizes that learning, discovery, and interaction lead to the creation of products, methods, and new forms of organizations and markets. In addition, the system of innovation emphasizes the interactions between different actors as a key factor in creating innovation (Nelson, 1993).

The success of digital transformation requires the existence of regulatory institutions, including regulations such as the protection of intellectual property, which can play a role in directing digital activities correctly. However, the speed of technological development often outpaces regulatory laws, which can inhibit digital transformation. Moreover, some laws in certain countries lack the necessary sufficiency to guide and encourage digital transformation, creating an additional obstacle. For instance, regulatory laws in many Asian countries do not respond to digital developments in the banking system (Barquin, 2015). Despite this, digital transformation is impossible without the involvement of regulatory bodies and legal organizations. Therefore, it is essential to pay attention to the role of regulatory institutions and make necessary reforms to support digital transformation.

In the system of innovation approach, institutions play a vital role in creating, disseminating, and using technology. They are a fundamental factor in the creation of innovation, and their norms and guidelines provide the basis for innovation creation and its diffusion. According to Carlsson and Stankiewicz (1991), institutions are normative structures that enhance social interactions in line with vital social actions. Institutional infrastructures in technological systems include all regimes and organizations directly or indirectly involved in the creation and dissemination of technological innovations, such as educational centres, political systems, and regulatory frameworks (Nelson, 1993); Nelson and Rosenberg (1993) regarded research laboratories and firms as key institutions involved in technological innovation, treating institutions and organizations as equivalent. Edquist (2010) by reviewing different definitions of institutions in innovation literature, presented two areas for defining institutions:

- Institutions as norms, rules, and regulations that determine the pattern of innovation behavior; and

- Institutions as structures with a specific purpose (i.e., what are called organizations).

Also, Edquist (2012) explores how institutions and regulations play a crucial role in shaping the rules of the game for technology creation, innovation processes, and the delivery of innovations to customers. According to Edquist, institutions and regulations provide the necessary structure and guidance that enable the effective functioning of innovation systems. They define the property rights, standards, and legal frameworks that facilitate technology development, protection, and diffusion. Additionally, they influence the allocation of resources, funding mechanisms, and incentives for research and development activities. Edquist (2012) also highlights how user involvement and feedback are integral to the innovation process. Users play an active role in bringing forward new ideas, preferences, and demands, shaping the direction of innovation. This user-centric perspective emphasizes the importance of understanding the needs and experiences of end-users, ultimately leading to more relevant and successful innovations.

Overall, "Systems of Innovation" sheds light on the complex interplay between institutions, regulations, and the diverse set of actors involved in the innovation process. It emphasizes the significance of aligning policies and governance mechanisms with technological advancements and societal demands to foster successful innovation and economic development.

There are several other theories and frameworks that explore the role of regulators in various contexts. Some of these include:

- Institutional Theory: This theory focuses on the role of formal and informal rules, norms, and values in shaping organizational behaviour. In the context of regulators, the institutional theory would examine how regulatory institutions and rules influence the behaviour and actions of businesses and industries (Scott, 1987).
- Principal-Agent Theory: This theory explores the relationship between principals (such as shareholders or owners) and agents (such as managers or regulators), and how information asymmetry and conflicting interests can affect decision-making. In the context of regulators, principal-agent theory would analyze how regulators act on behalf of the public interest while considering the interests of the regulated entities (Jensen & Meckling, 1976).
- Stakeholder Theory: This theory emphasizes the importance of considering the interests of various stakeholders (e.g., customers, employees, communities) in organizational decision-making. In the context of regulators, stakeholder theory would examine how regulators balance the interests of different stakeholders in their decision-making processes (Donaldson & Preston, 1995).

This study employs the SI approach to understand the role of regulatory institutions in the context of digital transformation. We argue that using the Systems of Innovation theory to explore the best capabilities for enhancing bank performance under different regulatory regimes is appropriate for several reasons and it will understand the role of different regulatory environments on the development of these capabilities. Firstly, this theory emphasizes the significance of interactions and collaborations among various actors, institutions, and organizations within an innovation system (Edquist, 2012). This perspective is particularly relevant for studying capabilities in the context of digital transformation in the banking sector, where effective coordination and collaboration are essential. Secondly, the Systems of Innovation theory takes into account the specific contextual factors in which innovations occur, including the influence of regulatory frameworks, institutional arrangements, and stakeholder interests (Edquist, 2010). Understanding the regulatory environment is crucial when investigating the impact of capabilities on bank performance in different settings. Thirdly, this theory offers a holistic view of innovation processes, considering not only technological aspects but also the social, economic, and institutional dimensions. This comprehensive perspective enables a deeper analysis of the complexities involved in the digital transformation of banks.

The choice of Systems of Innovation theory for this study appears well-suited to address the complex dynamics of capabilities and bank performance in the context of digital transformation, with a particular emphasis on the regulatory environment and collaboration among diverse stakeholders. While the Systems of Innovation theory is a suitable choice for the research focus, it does not imply that other theories, such as Institutional Theory, Stakeholder Theory, or Principal-Agent Theory, are inappropriate. Each theory offers unique insights and perspectives, and researchers may select different theories based on their specific research objectives and the aspects they wish to explore. For instance, Institutional Theory could be valuable when examining how regulatory institutions and rules shape the behavior of banks and stakeholders during the digital transformation process. Stakeholder Theory could be relevant for studying how the interests of various stakeholders, including customers, employees, and regulators, influence the adoption of specific capabilities and innovations in the banking sector. Similarly, the Principal-Agent Theory could be useful when investigating how regulators act in the public interest and how their decisions impact banks' performance and behaviour during digital transformation.

In conclusion, this section delved into the theoretical framework essential for understanding the dynamics of digital transformation in the banking sector. The study ambitiously incorporates the dynamic capability theory by Teece et al. (1997) and the Systems of Innovation (SI) approach proposed by Edquist (2010) to comprehensively investigate the interplay of internal and external factors shaping successful digital transformation strategies within banks.

3.2.3. Integrating DCT and SI

Integration capability is recognized as one of three key managerial functions—alongside guided learning and reconfiguration/transformation—essential to dynamic capabilities, as noted by Teece et al. (1997). Examples of external integration activities include the assimilation of market and customer insights, as well as the incorporation of knowledge about emerging technologies, as discussed by Iansiti and Clark (1994). Integration capability also helps organizations transform resources into innovative products, according to Dutta et al. (2005). Moreover, successful new products are often the result of effectively merging internal and external technological knowledge, a process that enhances a firm's likelihood of success, as Marsh and Stock (2006) pointed out.

The concept of integrating internal activities with external environment can be well defined by using both SI and DCT. System of Innovation typically focuses on the macro-level innovation environment, including institutional frameworks and inter-organizational networks that facilitate innovation. Conversely, DCT concentrates on micro-level organizational processes that enable firms to adapt and capitalize on changing market conditions. These two theories were chosen for this study because we propose that SI can greatly enhance DCT. Here are several ways in which SI theory enriches DCT:

1. Enhanced Sensing Capabilities: The SI theory underscores the importance of external elements such as technology clusters, research institutions, and policy frameworks in the identification of new opportunities. This theory, as highlighted by Edquist (2012), suggests that these components form an integral part of the innovation system that helps firms detect and interpret emerging trends and changes. By integrating SI insights, firms can significantly improve their ability to recognize and analyze new technological developments, shifts in consumer demand, and alterations in regulatory environments. This enhanced sensing capability is crucial as it enables firms to quickly adapt and respond to changes in their external environment, a core function of dynamic capabilities. This proactive adaptation is essential for firms aiming to maintain competitiveness and innovate continuously in rapidly changing markets.

2. Broader Resource Access and Integration: The networks and relationships highlighted in SI theory provide access to a wider array of resources, knowledge, and technologies. This access is critical for firms looking to build and reconfigure their resource base in response to shifting market conditions. By leveraging these external assets, firms can

enhance their ability to integrate diverse technologies and competencies, thereby strengthening their dynamic capabilities in innovation and strategic adaptation.

3. Improved Collaborative Innovation: SI theory often involves collaborative innovation efforts, such as partnerships with universities, other firms, or government agencies (Edquist, 2012). By applying SI principles, companies can better manage these collaborations to fuel their own innovation processes. Effective collaboration as advised by SI can help firms develop new products and services more efficiently, which is a direct enhancement to the 'seizing' aspect of dynamic capabilities.

4. Policy and Regulatory Adaptation: Understanding the regulatory and institutional aspects of innovation systems is a critical component of SI theory (Edquist, 2012). This knowledge can help firms navigate complex legal and regulatory environments, ensuring that their dynamic capabilities are not only responsive but also compliant and proactive in terms of regulatory changes. This is particularly important in industries where regulation heavily influences technological adoption and business models. It should be noted this item is the most important approach as the foundation of this research.

6. Strategic Alignment with Macro-level Trends: SI theory encourages firms to align their strategies with larger macro-economic and technological trends (Edquist, 2010). This alignment ensures that the development of dynamic capabilities is not done in isolation but is instead synchronized with broader economic, technological, and societal shifts. Such alignment can enhance the strategic relevance and efficacy of a firm's dynamic capabilities, ensuring they are well-suited to the external environment.

However, integrating DC and SI presents several challenges due to their differing focus areas, levels of analysis, and theoretical implications. Here’s a breakdown of these challenges:

1. Different Analytical Levels: DCT operates at the micro-level, focusing on the capabilities within an organization that allow it to adapt to changing environments (Teece, 2012). In contrast, SI works at a macro-level, considering the broader system, including institutions, policies, and inter-organizational networks that facilitate innovation (Edquist, 2012). Integrating these theories requires bridging the gap between organizational capabilities and systemic innovations, a complex endeavor given their different scopes.

2. Theoretical Coherence: Each theory has its own set of assumptions and key constructs, which may not always align neatly. For example, DCT assumes that the firm's internal processes are central to competitive advantage (Teece et al., 1997), whereas SI emphasizes external factors and collaborative networks as drivers of innovation (Edquist, 2010). Integrating these perspectives requires a nuanced understanding of how internal capabilities and external systems interact.

3. Measurement and Evaluation Differences: The metrics and indicators used in SI and DCT theories differ significantly. SI often uses broad economic indicators or innovation output metrics at a national or regional level, whereas DCT focuses on specific organizational performance metrics. Developing a unified framework for measurement that respects both theoretical perspectives is not only methodologically challenging but also critical for the successful integration of these theories. Recent studies are addressing this by developing unified frameworks that incorporate both broad innovation metrics and

specific performance metrics, aiming to provide a comprehensive assessment of how well firms integrate external innovations with internal capabilities (Pundziene et al., 2021).

4. Practical Implementation: The practical implementation of these integrated theories presents operational challenges. Researchers are exploring frameworks that detail how organizations can effectively recognize new opportunities (sensing capability), seize these opportunities (seizing capability), and reconfigure resources to integrate new knowledge and technologies (transformation capability). For example, seizing capabilities focus on internal R&D and integrating external innovations through open innovation strategies (Pundziene et al., 2021). Applying these theories in a cohesive manner to practical scenarios such as digital transformation in banking involves translating complex theoretical concepts into actionable strategies. This translation is not straightforward and requires innovative thinking to create models that can be practically implemented within organizations while considering the broader innovation system.

5. Empirical testing: The integration of these theories lacks extensive empirical testing. Recent research focuses on empirical validations using case studies and large datasets to examine how firms practically apply these theories. For instance, studies leveraging big data analytics explore how firms can utilize their capabilities for innovation ambidexterity, illustrating practical applications of these theories (Liao et al., 2023).

6. Managing Conflicting Incentives and Goals: Teece (2020a) underscores the critical importance of aligning managerial incentives with the broad strategic objectives of organizations within evolving market systems. Agency theory points to the risks of incentive misalignment, which can lead to strategic drift or maladaptation (Jensen &

Meckling, 1976). This misalignment can become particularly problematic in the context of innovative systems where managers are required to allocate resources effectively to drive innovation while also maintaining operational efficiencies. Within such systems, managers tasked with implementing strategies face dual pressures. On one hand, they need to integrate and harness external innovations that can offer competitive advantage or meet regulatory requirements. On the other hand, they must optimize internal processes and capabilities to maintain operational efficiency and effectiveness. If managers' incentives are structured only around short-term financial goals, they might underinvest in the capabilities needed for long-term innovation, leading to suboptimal outcomes and potential strategic failures. Teece (2020b) emphasizes the need for governance mechanisms that effectively align these incentives to foster both innovation and sustainable competitive advantage.

Overall, the integration of SI and DCT theories into a unified strategic framework poses significant theoretical and practical challenges due to their differing scopes, focuses, and operational levels. Overcoming these challenges requires innovative thinking, a deep understanding of both theories, and a commitment to bridging gaps not just conceptually but also in practical, operational terms. This integration, although complex, holds the potential to provide a more robust and comprehensive understanding of how firms can innovate and adapt in dynamically changing environments.

3.3. Terms definition

In this section, the primary concepts and terms used in the research will be clearly and comprehensively defined. This will ensure that the readers have a solid understanding of the key ideas and terminology used throughout the thesis. Defining the terms will help prevent any misunderstandings or confusion that may arise from the use of unfamiliar terminology. It is essential to define technical terms that are specific to the research area and that might be unfamiliar to general readers. By defining the main concepts and terms, the research will be more accessible and readable to a wider audience, which will ultimately increase the impact of the study.

3.3.1. Capability and resource

Barney's defines capability as a firm's ability to perform a set of coordinated activities to achieve a competitive advantage. Meanwhile, his definition of a resource is any tangible or intangible asset that a firm owns, controls, or has access to, which can be used to improve its efficiency and effectiveness.

According to Amit and Schoemaker (1993), capability refers to the ability to use resources together to achieve the desired outcome of organizational processes. Helfat (2007) define it as the ability to perform a specific activity, while Teece (2012) defines it as the firm's ability to efficiently perform its current activities. Capabilities are sometimes viewed as "higher-order" resources that enable other resources to be allocated in a profitable way for the company. However, they are not as easily valued as other assets because they are rooted in organizations, formed by distinct individuals and teams, processes, organizational structures, decision rules, and discipline, and cannot be traded on the market; they must be built (Wójcik, 2015).

3.3.2. Digital transformation from a capability view

The concept of digital transformation refers to the structuring of new business operations so that core competencies can be fully exploited through technology for competitive advantage (Brynjolfsson & Hitt, 2000). In order to remain competitive, firms must develop foundational capabilities related to digital business transformation (Wielgos et al., 2021). The resource-based view (RBV) has been used by many researchers to study a firm's digital transformation as it relates to its competitive strategy (Bharadwaj, 2000). However, there are some limitations with RBV as it lacks a clear model that explains how firm heterogeneity arises and how the processes it implements turn resources into competitive advantages (Teece et al., 1997). To achieve a balance between external and internal changes, managers need to adapt the fit concept (Brown & Eisenhardt, 1995). Strategic fit is the term Miles and Snow (1994) use to emphasize that for organizations to gain a competitive advantage, they need to match internal resources and capabilities with external demands. The idea behind digital transformation is to evaluate resources to generate competitive advantage and identify synergies or fit for a particular organization. As a result, resource fit extends our understanding of digital transformation by considering both resource-based theory and strategic fit (Liu, 2011). From an external perspective, when a firm's approach aligns with its environment, it usually increases its competitive advantage and leads to improved business performance (Zajac et al., 2000).

3.3.3. Capability and resource categorization

In the literature, scholars have categorized resources into various groups. Grant (1991) identified three types of resources: technological, financial, and reputational, while Barney

(1991) categorized resources into physical capital, human capital, and organizational capital.

Brumagim (1994) offers a model of hierarchical resources with four distinct levels including producing/maintaining resources (basic level), administrative resources, organizational learning resources, and strategic vision resources (the highest level).

Resources can also be divided into tangible and intangible categories. A number of intangibles can be identified, such as property rights, organizational capital, knowledge of management and employees, brand recognition, market position, and organizational culture. It appears that intangible resources serve as more effective isolation mechanisms called imitation barriers than tangible ones since they are unique and causally ambiguous (Wójcik, 2015).

Hooley et al. (1998) distinguished between competencies that can be held by individuals, groups, or organizations. Additionally, they categorize capabilities into strategic, functional, and operational categories. A strategic competency is the ability to recognize and interpret environmental trends and industry events that affect the organization. By contrast, functional competencies relate specifically to the functions or processes of the organization. Lastly, competencies are the abilities and skills that enable managers and employees to carry out tasks at the operational level.

In this research, the classification of capabilities by Hooley et al. (1998) is used because it provides a comprehensive and practical framework for understanding the different levels of capabilities that a firm may possess. The framework distinguishes between strategic, functional, and operational competencies, which can be held by individuals, groups, or organizations. This allows for a more focused analysis of the specific competencies required to create and sustain a competitive advantage in the industry.

3.3.4. Digital Capabilities, Technical Capabilities and Digital Innovation

Digital innovation involves producing novel products through new combinations of digital and physical components, distinguishing them from traditional IT-led innovation processes. It encompasses activities related to digital technology, innovation processes, and innovation results. Digital innovation entails the use of information, computing, communication, and connection technologies in the innovation process to bring about new products, improve production processes, change organizational models, and drive changes in business models (Wang & Li, 2023). Digital capabilities refer to an organization's ability to effectively manage and leverage digital technology, resources, and skills to create new products, processes, and business models, and to respond to changes in the digital environment. They encompass the capacity to use digital technologies, such as big data, artificial intelligence, and communication technologies, to acquire external knowledge, engage customers in innovation, and adapt products according to changing needs to reduce the risk of digital innovation (Wang & Li, 2023). Technical capabilities encompass an organization's ability to absorb and utilize technological knowledge, skills, and resources to drive innovation and competitiveness. These capabilities involve the capacity to explore and develop new ideas, transform innovative ideas into market-oriented products or services, and coordinate internal codes of conduct and processes to facilitate new product development (Wang & Li, 2023).

3.3.5. Performance

Performance is a complex term that includes all concepts related to the success of an organization and its activities. Different attitudes and definitions have been presented in the literature. For example, Roberson et al. (2017) define performance as "doing, carrying out, completing, and doing ordered or committed work," while other researchers see it as a multidimensional structure whose evaluation varies depending on a variety of factors (Parnell, 2011). Performance is behaviour and must be distinguished from outcomes, as systemic factors can distort outcomes (Bennouri et al., 2018).

The success and survival of any organization depends on its performance. Accounting and economics play a significant role in evaluating the performance of companies, but choosing a suitable criterion among them is an issue that has caused much research in the literature on financial management (Aggarwal & Thakur, 2013). Organizations that constantly improve their performance create a strong synergistic force that supports growth and development programs. Continuous improvement of performance will not be possible without checking and gaining knowledge of the progress and achievement of goals and without identifying the challenges facing the organization and obtaining feedback and information on the implementation of the developed policies (Dvoulety et al., 2021).

Performance evaluation is the process of quantifying effectiveness and efficiency. A performance evaluation system is a set of criteria used to quantify the effectiveness and efficiency of an activity (Pulka et al., 2018). Evaluating the organization's performance means evaluating and measuring the efficiency, economy, and effectiveness of all management methods and decisions related to performing and implementing tasks for the organization (Qureshi et al., 2017). The official use of evaluation systems goes back to the 19th century, and performance evaluation efforts have a long history (Noorzai et al., 2022).

One of the most famous approaches to evaluating an organization's performance is the use of the balanced scorecard, which was invented by Kaplan (1992). The balanced scorecard provides a diverse set of performance indicators in four groups, including financial performance indicators, customer relationship indicators, internal business process indicators, and growth and learning indicators. Many companies have adopted it as a foundation for their strategic management system, and it helps managers align their business with new strategies in line with growth opportunities based on greater flexibility (Coe & Letza, 2014). The balanced scorecard is a management tool for strategy implementation that examines and formulates the organization's strategy from four key aspects: financial, customers, internal processes, and growth and learning (Cooper et al., 2017).

In addition to financial criteria, non-financial performance evaluation criteria such as customer and employee satisfaction, innovation, and quality are necessary for evaluating the organization's performance (Fullerton & Wempe, 2009). Non-financial criteria are more closely related to the organization's long-term strategies and reflect issues related to customers and competitors or non-financial goals that may be important in achieving profitability, competitive power, and long-term strategic goals (Popescu, 2020). Non-financial data related to intangible assets such as intellectual capital and customer loyalty can also be provided (Van Dooren et al., 2015).

In this research, performance is categorized into financial and nonfinancial performance. Financial performance is defined as the evaluation of an organization's financial resources, profits, and earnings (Aggarwal & Thakur, 2013). Financial performance indicators include company earnings, profit per share, and cash flow (Aggarwal & Thakur, 2013). On the other hand, nonfinancial performance is defined as the evaluation of an organization's performance based on criteria other than financial data. Nonfinancial criteria include customer and employee satisfaction, innovation, and quality (Fullerton & Wempe, 2009).

3.4. Summary

In summary, this chapter delved into the essential theoretical framework necessary for comprehending the dynamics of digital transformation within the banking sector. It amalgamated the dynamic capability theory, emphasizing a firm's adaptive capacity and the evolution of resources for a competitive edge, with a keen focus on the continuous adaptation of resources to evolving market conditions. Furthermore, the Resource-Based View (RBV) underscored the significance of internal resources and capabilities in achieving lasting competitive advantages, emphasizing the value, rarity, inimitability, and organization (VRIO) of resources.

On the other hand, the Systems of Innovation approach illuminated the impact of external factors, stressing the collaborative and systemic nature of innovation involving a multitude of stakeholders and institutions. It highlighted the critical role played by institutions in providing the necessary structure and norms for fostering technological innovation. This theoretical foundation, centered around dynamic capabilities and external factors, will serve as a compass for analyzing how capabilities and regulatory environments shape bank performance during digital transformation.

Moreover, this chapter meticulously provided comprehensive definitions of the primary concepts and terms employed in this research. This meticulous approach is pivotal in ensuring that readers grasp the fundamental concepts and specialized vocabulary used throughout the document.

Chapter 4: Literature review and conceptual framework

4.1. Overview

Chapter 4 of this dissertation will focus on the literature on capabilities' impact on performance in the banking industry, as well as the regulatory studies in the scope of digital transformation.

The chapter will commence with a comprehensive review of the pivotal role played by regulators in the context of digital transformation. This review will entail a segmentation of regulators, focusing specifically on their involvement and impact in the domain of digital transformation, all within the scope of this study.

Following this, an overview of the impact of capabilities on performance in various industries will be provided before narrowing the focus to the banking sector as the scope of our research.

Furthermore, the chapter will include an extensive systematic literature review, which will encompass a detailed explanation of the searching protocol, data collection procedures, data analysis methods, and the resultant findings. The systematic review will draw upon available data, reports, documents, and scholarly articles that specifically report the capabilities needed for digital transformation and their impact on bank's performance. In the process, any existing gaps in the literature will be identified.

Finally, the chapter will present a well-defined research model that captures the interrelationships between capabilities and performance, financial and non-financial and regulartoy scope of focus in digital transformation. This model will serve as a crucial framework for understanding the complex dynamics at play in the realm of digital transformation within the banking sector. Additionally, the chapter will delve into key research concepts, including strategic, functional, and operational capabilities, resources, non-financial and financial performance, and the role of digital banking technologies. A rigorous academic treatment of these concepts will provide a solid foundation for the subsequent analyses and insights to be derived from the research.

Overall, chapter 4 will provide a comprehensive overview of the literature on the impact of capabilities on performance in the banking industry, as well as the regulatory environment in the literature. It will also present the conceptual framework that will be used in the rest of the dissertation.

4.2. Review of Regulator's role in the literature

The banking industry has witnessed a significant transformation in recent years with the advent of digital technologies. Regulators play a critical role in overseeing the industry and ensuring that it operates in a secure and efficient manner. In this section, we aim to explore the roles of regulators in the banking industry, specifically in the context of digital transformation.

It has been argued that regulation has an important impact on competence development and innovation (Anning-Dorson et al., 2017; Frohwein, 2015). Frohwein (2015) examines the impact of regulations on competence development and sustainable competitive advantage in regulated firms. The study finds that regulations can have both positive and negative effects on competence development and competitive advantage, depending on how they are implemented. Anning-Dorson et al. (2017) examine the impact of regulations and competition on the relationship between innovativeness and performance in the banking industry. They find that regulations and competition have a significant impact on the innovativeness-performance relationship, with regulations having a more significant impact than competition. Ramanathan et al. (2017) revisit the Porter hypothesis and examine the relationship between environmental regulations, innovation, and firm performance. Their study finds that environmental regulations can drive innovation and improve firm performance, suggesting that regulators can play a positive role in promoting digital transformation in the banking industry by creating a regulatory environment that encourages innovation. These studies suggest that regulators play a critical role in shaping the innovation and performance of banks, and most importantly, that regulators need to adopt a nuanced approach to regulation to ensure that it supports digital transformation in the banking industry.

Regulations are essential to secure customers' use of digital banking. For instance, Melnychenko et al. (2020) explore the dominant ideas of financial technologies in digital banking. Their study finds that digital banking is characterized by a shift towards customer-centricity and the use of innovative technologies such as blockchain and artificial intelligence. Regulators need to keep pace with these changes and ensure that they create a regulatory environment that fosters innovation and protects customers.

Naimi-Sadigh et al. (2022) examine the value chain disruption of banking services as a result of digital transformation. The study finds that digital transformation has disrupted traditional banking value chains, leading to the emergence of new business models and value propositions. Regulators need to adapt to these changes and create a regulatory framework that supports innovation and protects customers. In light of the importance of regulation on innovation performance, competences, and customer safety, several scholars have focused on the ability of agencies to regulate effectively. For instance, in a study of state public utility commissions, Berry (1984) suggests an alternative to the capture theory of regulation. The study finds that regulatory agencies have different levels of independence, which affects their ability to regulate effectively. This finding may be applicable to the banking industry, where regulators need to strike a balance between promoting innovation and ensuring compliance. Therefore, flexibility as suggested by Ramanathan et al. (2018) and Reitz et al. (2018) is essential to support digital transformation. For example, Reitz et al. (2018) examine the moderating effect of IT flexibility on the negative impact of governmental pressure on business agility. The study finds that IT flexibility can mitigate the negative impact of governmental pressure on business agility. Shleifer (2005) emphasizes that regulation can have both positive and negative effects on firms, depending on how it is implemented. This suggests that regulators need to adopt a nuanced approach to regulation to ensure that it supports digital transformation.

According to this literature, we formulate the following hypothesis:

H1: The regulatory environment have a positive impact on the capability of banks in digital transformation.

Table 3 shows the summary of the literature review of the regulator's role and its effect on capabilities.

Table 3- Summary of studies that focus on the regulator's role and its effect on capabilities across different industries

Article	Study purpose	Methodology	Country	Industry	Main findings
Anning-Dorson et al. (2017)	Investigate the effects of regulations and competition on the relationship between innovativeness and performance.	Regression analysis	Ghana	Banking	The study finds that both regulations and competition have significant effects on the innovativeness-performance relationship. It highlights the importance of considering regulatory and competitive factors when examining the relationship between innovation and performance in the banking sector.
Frohwein (2015)	Examine the effects of regulation on competence development and sustainable competitive advantage of regulated firms.	Literature review	NA	General	The study argues that regulation can influence the development of competencies within firms, which in turn can contribute to their sustainable competitive advantage. It emphasizes the importance of understanding the relationship between regulation, competence development, and competitive advantage.
Melnychenko et al. (2020)	Explore the dominant ideas of financial technologies in the context of digital banking.	Literature review	NA	Banking	The study identifies and categorizes dominant ideas related to financial technologies in digital banking. It provides insights into the key concepts and trends shaping the digital transformation of the banking sector.
Naimi-Sadigh et al. (2022)	Investigate the impact of digital transformation on the value chain disruption of banking services.	Literature review	Not specified	Banking	The study highlights the transformative effects of digital technologies on the value chain of banking services. It emphasizes the need for banks to adapt to digital transformation to remain competitive and meet evolving customer expectations.
Ramanathan et al. (2017)	Examine the relationship between environmental regulations, innovation, and firm performance by revisiting the Porter hypothesis.	Regression analysis	United Kingdom and China	General	The study provides evidence supporting the Porter hypothesis, suggesting that environmental regulations can stimulate innovation and have positive effects on firm performance. It emphasizes the potential benefits of environmental regulations for firms' long-term competitiveness.

Ramanathan et al. (2018)	Explore the flexibility of environmental regulations by examining their impact on innovation capabilities and financial performance.	Data Envelopment Analysis (DEA)	United Kingdom	General	The study finds that the flexibility of environmental regulations positively affects a firm's innovation capabilities, thereby enhancing its financial performance. It suggests that flexible environmental regulations can create a positive environment for firms to innovate and improve their financial outcomes.
Reitz et al. (2018)	Explore the moderating effect of IT flexibility on the negative impact of governmental pressure on business agility.	Regression analysis.	Germany	Banking	The study reveals that IT flexibility can moderate the negative impact of governmental pressure on business agility. It suggests that organizations with higher IT flexibility are better equipped to respond and adapt to changing governmental pressures, maintaining and enhancing their business agility.
Shleifer (2005)	Gain an understanding of regulation.	Literature review	NA	NA	The main findings of the study suggest that regulation plays a crucial role in promoting fair competition, protecting consumer interests, and ensuring market stability.
Suzuki (2017)	Examine the effectiveness of attention regulators in social sciences.	Literature review	NA	NA	The main findings of this study revealed that attention regulators have a significant impact on enhancing focus, improving productivity, and reducing distractions.
Hinings et al. (2018)	Explore the use of an institutional perspective as a valuable framework for studying digital innovation and transformation.	Literature review	NA	General	The study highlights that existing institutions greatly affect the acceptance speed of digital changes, as seen in examples like Manulife Financial and regulatory struggles with Uber and Airbnb. Despite rapid tech advances, institutional changes are slow, urging policymakers to use this delay to experiment with new business models.

4.3. Review of the impact of capabilities on performance in different industries

Table 4 presents a summary of the capabilities reviewed that have an impact on performance in digital transformation across various industries.

As can be seen in this table, in terms of theory, the literature on digital transformation has utilized various capabilities to examine their impact on firm performance. In some studies, researchers have used the perspective of dynamic capabilities to assess the effect of digital technologies on performance (e.g., Caputo et al., 2019; de Vasconcellos et al., 2020; Tsou & Chen, 2021; Wang, 2020; Wang et al., 2022). These studies demonstrate that digital technologies have a positive impact on both financial and non-financial performance, such as improving internal processes and enhancing customer relationships.

Another approach used in previous research is the market-based view, which emphasizes the importance of digital transformation in improving firm performance (e.g., Caputo et al., 2019; Khin & Ho, 2018; Wang, 2020; Wang et al., 2022). These studies show that digital transformation has a positive impact on both financial and non-financial performance.

The resource-based view has also been used in previous studies, which indicate that digital transformation has a positive effect on firm performance by increasing the internal capabilities of the organization (e.g., de Vasconcellos et al., 2020; Jorge Heredia et al., 2022; Hinings et al., 2018; Keskin et al., 2021).

With regard to capabilities discussed in the literature, table 3 illustrates that technological and digital capabilities are often used in previous research to examine the effects of digital transformation on firm performance (e.g.,Caputo et al., 2019; Jorge Heredia et al., 2022; Hinings et al., 2018; Khin & Ho, 2018; Tsou & Chen, 2021; Wang, 2020). These studies show that digital transformation improves firm performance by enhancing digital capabilities.

Moreover, marketing capabilities are also used in many previous studies to examine the impact of digital transformation on firm performance (e.g., Francesco, 2019; Keskin et al., 2021; Khin & Ho, 2018; Tsou & Chen, 2021; Wang, 2020; Wang & Yin, 2022). These studies reveal that digital transformation has a positive impact on firm performance by improving marketing capabilities.

Other capabilities, such as human resources capabilities, relational capabilities, and learning capabilities, have also been observed in relevant research (e.g., Caputo et al., 2019; Jorge Heredia et al., 2022; Keskin et al., 2021; Tsou & Chen, 2021). These research findings indicate that the adoption of digital transformation enhances a firm performance through the improvement of its human resource capabilities.

Overall, these studies emphasize the importance of digital capabilities in improving firm performance, and how different aspects of digital capabilities can have various effects on firm performance. These findings provide valuable insights for companies to develop digital capabilities that can help them achieve better performance and stay competitive in today's business environment.

Table 4- Review of digital transformation capabilities and their impact on performance across different industries

Authors	Country of study	Theory employed in the study	Capabilities	Performance	Industry	Methodology	Main findings
Wang et al. (2022)	China	Dynamic capabilities, Market-based view	Technological capabilities, marketing capabilities	Internal process, financial, and marketing performance	Manufacturing sector	Quantitative analysis using panel data	Digital transformation initiatives positively impact the performance of manufacturing firms in China.
Heredia et al. (2022)	27 different countries	Resource-based view	Technological capabilities, digital capabilities, human resource capabilities	Financial performance	Manufacturing sector	Quantitative analysis with mediation model	Digital capabilities influence firm performance, and this relationship is partially mediated by the development of technological capabilities, particularly in the context of the "new normal" brought about by the COVID-19 pandemic.
Keskin et al. (2021)	Turkey	Resource-based view (RBV), Structure–conduct–performance (SCP) paradigm	Technological capabilities, marketing capabilities, relational capabilities	Financial performance, export performance	Manufacturing sector	Quantitative analysis using survey data	Firm capabilities, including digital capabilities, influence export performance, and this relationship is moderated by competitive advantages and competitive intensity.

de Vasconcellos et al. (2020)	Not specified	Human resource management, Dynamic capabilities, Resource-based view	Technological capabilities	Financial performance	Manufacturing sector	Literature review	Digital capabilities positively impact firm performance by bridging the gap between creativity and overall organizational performance.
Wang (2020)	167 international firms	Market-based view, Dynamic capabilities	digital capabilities, marketing capabilities	Sales growth, cash flow, gross profit margin, net profit from operations, profit-to-sales ratio, return on investment	Various manufacturing industries	Quantitative analysis using survey data	Digital marketing capabilities and collaborative relationships with partners positively impact the international performance of firms.
Tsou and Chen (2021)	Taiwan	Dynamic capabilities	Digital capabilities, marketing capabilities, learning capabilities, innovation capabilities	Financial performance	Financial industries	Quantitative analysis using survey data and mediation model.	Digital technology usage benefits firm performance through digital transformation strategy and organizational innovation as mediating factors.
Caputo et al. (2019)	European countries	Dynamic capabilities, Human resource management Market-based view	Digital capabilities, marketing capabilities, human resource capabilities	Economic performance	High-tech firms	Quantitative analysis using survey data	Soft skills and big data analytics play a critical role in enhancing firm performance through digital innovation.

Khin and Ho (2018)	Malaysia	Market-based view	Digital capabilities, marketing capabilities,	Financial and non-financial performance	IT firms	Quantitative analysis using survey data	Digital capability acts as a mediator between digital technology adoption and organizational performance, demonstrating the importance of developing digital capabilities to fully leverage digital technologies.

4.4. Systematic literature review

We employed systematic review, a research methodology that aims to provide a comprehensive and unbiased summary of the available evidence on specific research questions or hypotheses. It involves a rigorous and transparent process of identifying, selecting, appraising, and synthesizing evidence from multiple studies (Fanousse et al., 2021). The results of a systematic review can provide guidance for clinical practice, policy-making, and future research. In this study, a Cochrane-style systematic review methodology was utilized, which is widely recognized and accepted for conducting systematic reviews(e.g., Fernández-Batanero et al., 2022; Greenhalgh et al., 2008; Mays et al., 2005). The process involved developing a focused research question and a transparent protocol outlining the search strategy, inclusion and exclusion criteria, data extraction process, and analysis plan (Higgins et al., 2022). Below the details of each step are described.

4.4.1. Searching protocol

We conducted a comprehensive systematic review of the literature to identify papers that analyze the essential capabilities required for digital transformation at the firm level, specifically in the banking industry. The search was conducted using various academic databases and search engines, to ensure that all relevant and up-to-date literature was included. The selected articles were then carefully analyzed, and relevant data, such as the author's name, publication year, research methodology, key findings, and conclusions, were extracted and coded in an Excel spreadsheet for efficient management and analysis. This search was conducted according to the protocol presented hereunder on 12/19/2022.

Searching, inclusion and exclusion criteria

According to the Cochrane approach, we conducted research across multiple databases and identified relevant studies based on predefined inclusion criteria. Subsequently, we appraised the quality of the included studies using predefined criteria to assess the risk of bias. Nine reputable international databases, namely ProQuest, EBSCO, Emerald Insight, Taylor Francis, Wiley Online Library, Sage Journals, IEEE Xplore, ScienceDirect, and Web of Science, were searched to ensure that a wide range of sources were included. As the study did not yield a significant number of findings, no time limitations were imposed.

Developing appropriate search terms is an essential requirement of systematic review research (Cooper, 2017), which can be derived from the research objectives. Accordingly, the selection of search terms was conducted through a brainstorming meeting composed of authors with extensive experience in the field of corporate strategy in September 2022. Search terms were also extracted from new papers. The search terms and expressions (which were searched in the abstract of the documents) used in this systematic review were as follows:

- "digital"
- "bank"
- "capability"
- "performance"

To ensure the scope of the study was maximized, inclusion criteria were set to include English/Farsi language publications, which were the first or second languages of the author. The scope of the study also included all journal articles, conference proceedings, book chapters, working papers, grey literature (including thesis and dissertations), reports, magazines, and trade publications.

To ensure the relevance of the selected documents to the study, we established exclusion criteria. These criteria excluded documents related to industries other than banking, those not related to digital transformation, and those not related to capability and resources.

In summary, the search process for this systematic review was designed to be rigorous and comprehensive, and the inclusion and exclusion criteria were established to ensure that only relevant and high-quality sources were included in the final analysis. The resulting search terms and database selection were tailored to the research objectives and designed to provide a comprehensive review of the literature in the field of digital banking capabilities and performance.

4.4.2. Data collection

On December 19th, 2022, a systematic search was conducted to identify relevant documents for this study. The selected documents were collected in Hubmeta[1] and then analyzed using thematic analysis, which is a widely accepted method for summarizing and synthesizing data in systematic reviews (Thomas & Harden, 2008). The thematic analysis was applied to identify common themes and patterns across the data and to gain a comprehensive understanding of the research question.

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[1] https://hubmeta.com/

The search initially yielded 156 articles, which were reduced to 113 after removing duplicates. The titles and abstracts of the remaining articles were reviewed, and 40 articles were retained for full-text assessment. To ensure the quality of the selected articles, the TAPUPAS checklist was used, which is a tool for evaluating the transparency, accuracy, purposively, utility, propriety, accessibility, and specificity of scientific articles (Long et al., 2005). The TAPUPAS criteria are listed in Table 5. All seven items in the TAPUPAS criteria needed to be met to achieve a full score, and 13 articles (marked with * in the References list) met these criteria and were included in the review.

Table 5 - TAPUPAS checklist

Generic standard	**Principle**
Transparency	Is the evidence open to outside inspection?
Accuracy	Are claims supported by relevant facts?
Purposivity	Does the evidence answer the research problem?
Utility	Does the evidence suggest intuition and input to corporate strategy decision-making?
Propriety	Is knowledge organized ethically?
Accessibility	Is the evidence accessible to the users?
Specificity	Does the evidence contribute innovation to corporate HQ activities?

Source: Long et al. (2005)

Figure 4 summarizes the study selection process, including the number of articles retrieved, screened, and included in the final review. The study selection process followed a systematic and transparent approach to ensure the inclusion of high-quality articles in the review.

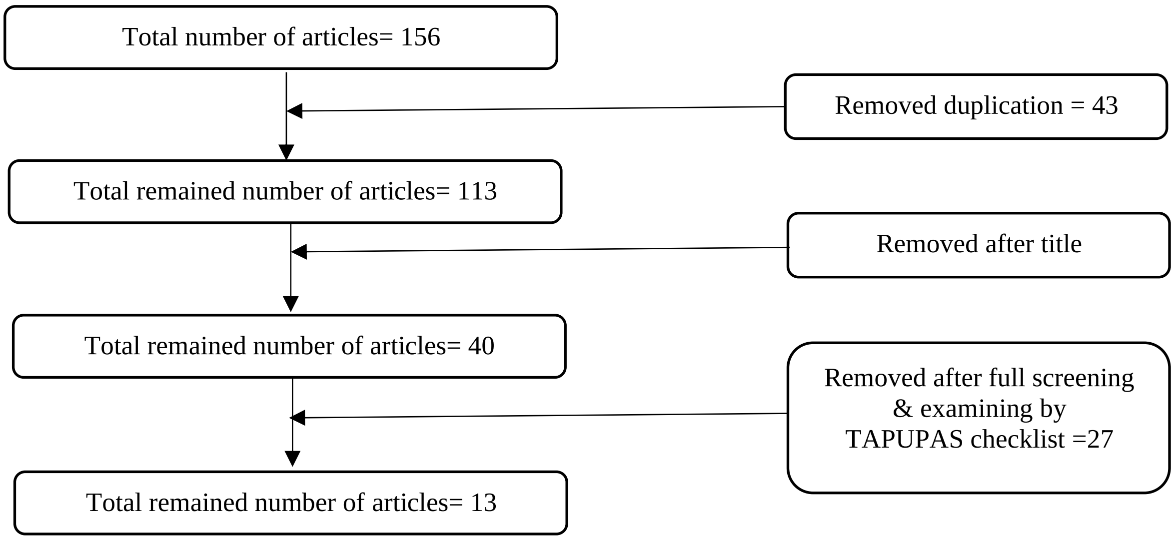


Figure 4- Screening process of the articles. Source: Author

In summary, this study employed a rigorous and systematic approach to identify and evaluate relevant articles using thematic analysis and the TAPUPAS checklist. By applying these methods, the study aimed to provide a comprehensive understanding of the research question.

Figure 5 shows the distribution of the selected papers according to their years of publication.

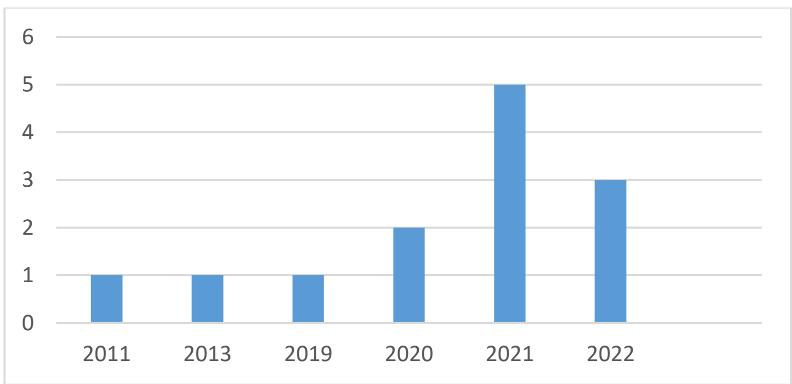


Figure 5- Selected papers distribution according to years of publication.

Figure 6 shows the distribution of the selected papers according to their research approach. It also shows the place of study for 10 quantitative papers in this study.

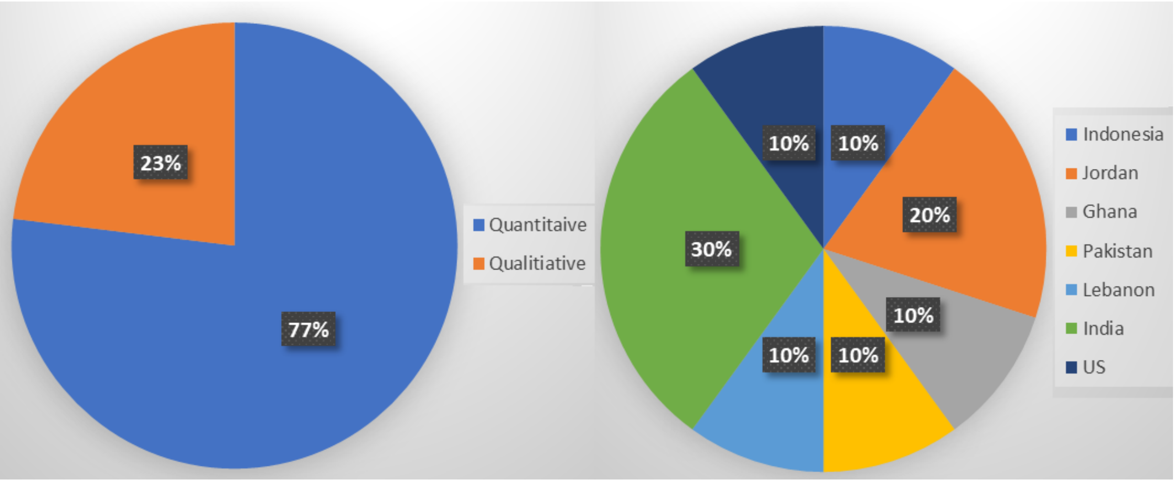


Figure 6- Selected paper's research approach and Place of study for the 10 quantitative studies

4.4.3. Data analysis and results

We used the selected studies and extracted the list of capabilities, resources, digital operations, and performance. Then we employed thematic analysis. Thematic analysis is a commonly used qualitative research method that involves identifying patterns and themes in data (Braun & Clarke, 2006). This approach allows researchers to identify recurring patterns in the data and draw meaningful conclusions based on these patterns.

Thematic analysis

After we collected the data and imported it into Excel, we conducted a thematic analysis according to the research purpose. We identified the list of capabilities and the performances that these capabilities have an impact on. We thematically categorized the capabilities based on Hooley et al. (1998) classification into three groups: strategic, functional, and operational. Moreover, we categorized the list of digital technologies into a separate group. In addition, we thematically categorized the performances into two themes: financial and non-financial.

Results

I. Performance

For the list of performance, we categorized them into two groups including financial and non-financial according to these definitions:

- Financial performance generally refers to a company's ability to generate profits for shareholders over time. According to Brigham and Houston (2021), financial performance can be measured using a variety of metrics, including return on investment, return on equity, return on assets, and earnings per share.
- Non-financial performance is a measure of a company's performance that is not related to its financial statements but rather focuses on factors such as customer satisfaction, employee engagement, sustainability, and social responsibility (Johansson, 2010).

According to this definition and according to the conceptualization and definition in the selected articles we categorized performance into these two groups. It should be mentioned that some measurements in the conceptualization of performance are considered in both, financial and non-financial performance groups. Table 6 shows the grouping:

Table 6- Categorization of the founded performance

Category	Performance	Reference
Non-financial performance	Bank performance	Suandi et al. (2022)
	Firm performance outcomes	Manser Payne et al. (2021)
	Consumer service performance	Setia (2013)
	Financial service agility	Edu (2022b)
	Successful e-banking project implementation	Liu et al. (2011)
	Digital financial innovation	Al-dmour et al. (2021); Al-dmour et al. (2022)
	Bank performance (non-financial)	Al-dmour et al. (2020)
Financial performance	Operating profitability	Vijayalakshmi (2019)
	Firm Performance Outcomes	Manser Payne et al. (2021)
	Aggregate efficiency scores	Cao et al. (2022)
	Productivity of banks	Gul et al. (2021)
	Performance (financial)	Gul and Ellahi (2021)
	Bank performance (financial)	Al-dmour et al. (2020)

As discussed in Chapter 3, Hooley et al. (1998) emphasized the importance of building and leveraging a firm's capabilities to achieve competitive positioning. They argued that a firm's capabilities can be classified into three main types: strategic, functional, and operational. These capabilities play a critical role in a firm's ability to compete effectively and achieve a sustainable competitive advantage.

Below, we initially categorized articles based on the nature of their performance, distinguishing between financial and non-financial aspects. Subsequently, for each performance category, we classified the capabilities mentioned in the chosen articles into three distinct groups. Additionally, we identified and grouped resources and digital operations.

GROUP 1: Capabilities, resources, and digital operations impacting Non-Financial Performance:

Various strategic capabilities impact non-financial performance. Customer response capability, customer orientation capability, competitive advantage, and digital servitization orientation have been found to be positively related to non-financial performance (Manser Payne et al., 2021; Setia, 2013; Suandi et al., 2022). However, convergence marketing and marketing ethics do not influence bank performance directly (Suandi et al., 2022). Suandi et al. (2022) reveal that both Islamic marketing ethics and convergence marketing do not directly impact bank performance. Islamic marketing ethics, aimed at fairness and consumer welfare, does not necessarily lead to improved bank performance, possibly because customers have various compliance-based options. However, competitive advantage does mediate the relationship between Islamic marketing ethics and bank performance. Similarly, while convergence marketing enhances competitive advantage through technology adoption, it does not directly affect bank performance.

Operational capabilities such as fintech innovation, internal and external resource fit, organizational culture, and organizational digital literacy also have a positive impact on non-financial performance (Al-dmour et al., 2021; Al-dmour et al., 2020, 2022; Liu, 2011; Manser Payne et al., 2021; Suandi et al., 2022)

Functional capabilities such as employee education and position, knowledge management functions, IT capability, built-in and invested-in marketing assets, and internal and external marketing capabilities have also been found to positively impact non-financial performance (Al-dmour et al., 2021; Al-dmour et al., 2020, 2022; Edu, 2022a; Manser Payne et al., 2021).

Finally, technological operations such as big data analytics, customer-centric, platform-based orientation, AI strategy embeddedness in firm goals, system quality, network quality, information quality, and omni-channel have been found to positively impact the financial performance of banks (Cheng & Feng, 2021; Edu, 2022; Gul & Ellahi, 2021; Manser Payne et al., 2021).

Table 7 summarizes the literature's findings on the capabilities, resources, and technological operations impacting the non-financial performance of banks.

Table 7- Capabilities and technological operations with impact on bank's non-financial performance

Group	Capability/resource	Reference
Strategic capabilities	Customer response capability	Setia (2013)
	Marketing ethics	Suandi et al. (2022)
	Convergence marketing	Suandi et al. (2022)
	Customer orientation capability	Setia (2013)
	Digital servitization orientation	Manser Payne et al. (2021)
	Competitive advantage	Suandi et al. (2022)
Operational capabilities	External resource fit	Liu et al. (2011)
	Internal resource fit	Liu et al. (2011)
	External capability fit	Liu et al. (2011)
	Internal capability fit	Liu et al. (2011)
	Fintech innovation	Al-dmour et al. (2020)
	Organization culture	Manser Payne et al. (2021)
	Organizational digital literacy	Suandi et al. (2022)
Functional capabilities	Built-in marketing assets	Al-dmour et al. (2020, 2022)
	Invested-in marketing assets	Al-dmour et al. (2020, 2022)
	Internal marketing capabilities	Al-dmour et al. (2020, 2022)
	External marketing capabilities	Al-dmour et al. (2020, 2022)
	Managers demographic characteristics (age, sex, education, experience, and position)	Al-dmour et al. (2021)
	Employee education and position	Al-dmour et al. (2022)
	Knowledge management functions (acquisition, integration, utilization)	Al-dmour et al. (2021)
	IT capability	Edu (2022a)
Technological operations	Application of big data	Cheng and Feng (2021)

	Big data analytics capabilities	Edu (2022a)
	Customer-centric, platform-based orientation	Manser Payne et al. (2021)
	AI strategy embeddedness in firm goals	Manser Payne et al. (2021)
	System quality/Network quality/Information quality	Manser Payne et al. (2021)
	Omni-channel	Manser Payne et al. (2021)
	Level of AI technology infrastructure	Manser Payne et al. (2021)

GROUP 2: Capabilities, resources, and digital operations impacting Financial Performance

Strategic capabilities such as digital servitization orientation, innovation capability, diversification, and fintech innovation have been found to positively impact the financial performance of banks during digital transformation (Al-dmour et al., 2021; Al-dmour et al., 2020, 2022; Cao et al., 2022; Gul & Ellahi, 2021; Manser Payne et al., 2021).

Operational capabilities such as ATM digital transactions, organization culture, partnership, and peer group are positively related to financial performance (Cao et al., 2022; Manser Payne et al., 2021; Vijayalakshmi, 2019). While, NEFT (National Electronic Funds Transfer), RTGS (Real Time Gross Settlement), and Mobile digital transactions negatively affect performance (Vijayalakshmi, 2019).

Resources such as capital, capital adequacy, IT expenses, age of investment in data analytics, and deposits, have also been found to positively impact the financial performance of banks during digital transformation (Cao et al., 2022; Gul & Ellahi, 2021). While non-performing loans have a negative impact on financial performance (Cao et al., 2022)

While both financial and non-financial performance groups identified different capabilities, it is clear that banks require a wide range of capabilities to succeed during digital transformation. The capabilities identified in Group 1 are mainly related to the non-financial performance of banks, such as customer response and organizational culture, while the capabilities identified in Group 2 are related to the financial performance of banks, such as capital adequacy and innovation capability. It is worth noting that some capabilities, such as digital servitization orientation, fintech innovation, and internal marketing capabilities, were identified in both groups as the definition of performance in the related articles included both financial and non-financial aspects.

Finally, the adoption of various technological operations such as data analytics, customer-centric approach, platform-based orientation, embedding AI strategy into business objectives, ensuring system/network/information quality, and implementing an omnichannel approach have been identified as having a positive effect on the financial performance of banks. Studies conducted by Cheng and Feng (2021), Edu (2022b), Gul et al. (2021), Manser Payne et al. (2021) have provided evidence to support this claim

Table 8 outlines the conclusions drawn from existing literature regarding the effects of capabilities, resources, and technological operations on the financial performance of banks.

Table 8- Capabilities and technological operations with impact on bank's financial performance

Group	Capability/resource	Reference

Strategic capabilities	Income diversification	Cao et al. (2022)
	Digital servitization orientation	Manser Payne et al. (2021)
	Dynamic capabilities	Gul et al. (2021)
	Innovation capability	Cao et al. (2022)
	Fintech innovation	Al-dmour et al. (2020)
Operational capabilities	Digital transactions-ATM transaction	Vijayalakshmi (2019)
	Partnerships with technology companies	Cao et al. (2022)
	Digital transactions-NEFT	Vijayalakshmi (2019)
	Digital transactions-RTGS (Real Time Gross Settlement)	Vijayalakshmi (2019)
	Digital Transactions-Mobile transaction	Vijayalakshmi (2019)
Functional capabilities	Built-in marketing assets	Al-dmour et al. (2020, 2022)
	Invested-in marketing assets	Al-dmour et al. (2020, 2022)
	External marketing capabilities	Al-dmour et al. (2020, 2022)
	Internal marketing capabilities	Al-dmour et al. (2020, 2022)
	Organization culture	Manser Payne et al. (2021)
Resources	Capital (K)	Cao et al. (2022); Gul and Ellahi (2021)
	Information Technology expense (ITE)	Gul et al. (2021)
	Age of investment in data analytics (DA-Age)	Gul et al. (2021)
	Deposits (Deposits)	Gul et al. (2021)
	Non-performing loans (NPL)	Cao et al. (2022),Gul et al. (2021)
	Investment in data analytics	Gul and Ellahi (2021)
Technological operations	Data Analytics	Gul et al. (2021)
	Customer-centric, platform-based orientation	Manser Payne et al. (2021)
	AI strategy embeddedness in firm goals	Manser Payne et al. (2021)
	System quality/Network quality/Information quality	Manser Payne et al. (2021)
	Omni-channel	Manser Payne et al. (2021)
	Level of AI technology infrastructure	Manser Payne et al. (2021)

In summary, the outcomes of this analysis revealed distinct categories of capabilities, resources, and digital operations that significantly impact different facets of bank performance. Specifically, strategic capabilities such as customer orientation and digital servitization orientation, operational capabilities including organizational culture and employee education, as well as functional capabilities like knowledge management and IT capability have been shown to positively influence non-financial performance. On the other hand, strategic capabilities such as innovation and digital servitization orientation, along with operational capabilities like ATM digital transactions and organization culture, were identified as contributors to enhancing financial performance (Al-Dmour et al., 2021; Cao et al., 2022a; Cheng & Feng, 2021; Edu, 2022; Gul et al., 2021; Manser Payne et al., 2021; Vijayalakshmi, 2019).

These findings demonstrate the multifaceted nature of capabilities and their role in bolstering diverse dimensions of bank performance during the digital transformation era. It's noteworthy that some capabilities, like digital servitization orientation (Manser Payne et al., 2021), and internal marketing capabilities(Al-dmour et al., 2020, 2022) were found to impact both financial and non-financial performance. These insights are of paramount importance for banks aiming to navigate the complexities of digital transformation effectively and capitalize on their capabilities to achieve sustainable competitive advantages.

Overall, the findings from both groups suggest that banks need to have a holistic approach to digital transformation, encompassing both non-financial and financial aspects. The capabilities required for a successful digital transformation are broad, and they range from strategic planning to operational and functional capabilities, as well as technological operations and resources.

Literature gap

Following a systematic and comprehensive literature review, we conducted a rigorous examination of the identified capabilities within the context of selected articles, juxtaposing these findings against established models such as LEANIX.

This meticulous analysis revealed a noteworthy and intriguing observation: among studies scrutinizing the influence of capabilities on bank performance during the era of digital transformation, certain imperative capabilities were conspicuously absent from the discourse. Specifically, notable capabilities encompassing risk management and compliance management received little to no attention within the academic discourse exploring the intricate interplay between capabilities and performance in the domain of digital banking.

This conspicuous research gap serves as a critical point of reflection, underscoring the potential existence of latent capabilities that remain undiscovered but may wield substantial impact on the success trajectory of digital transformation within the banking industry. Such an absence signifies the prospect of uncharted dimensions of capabilities that hold the key to steering the digital evolution of the banking sector toward an elevated echelon of success and resilience. This realization, undoubtedly, opens avenues for further investigation, urging scholars and practitioners alike to delve into unexplored facets of capabilities that could wield momentous influence on the sector's transformative journey.

This research gap is significant as it unveils a critical oversight in the academic exploration of capabilities within the digital banking realm. The apparent lack of emphasis on crucial capabilities such as risk management and compliance management raises essential concerns, considering regulators' pivotal role in enforcing compliance and mitigating risks within the banking sector. Neglecting or underestimating these fundamental capabilities can potentially result in systemic risks and regulatory challenges. For regulators, recognizing and addressing this research gap is vital. Firstly, it underscores the necessity for a comprehensive and interdisciplinary approach to assess the digital transformation landscape, ensuring the stability and security of the financial sector. Secondly, it highlights the need to adapt different capabilities like risk management and compliance capabilities to the evolving digital landscape. Lastly, it urges regulators to advocate for targeted research and collaboration, fostering a dialogue between academia, industry, and regulatory bodies. By encouraging research in these critical areas, regulators can shape a more balanced and comprehensive understanding of the capabilities essential for the successful digital transformation of the banking sector, informing regulatory policies and guidelines effectively.

Moreover, it is pertinent to note that an additional gap exists in the geographical focus of these studies. The examination of capabilities' impact on bank performance within the context of digital transformation appears to be predominantly skewed towards emerging economies. There is a marked dearth of research addressing this issue within the context of developed countries. This observation emphasizes the need to broaden the scope of the investigation to encompass developed economies, thereby creating a more comprehensive and holistic understanding of the nuanced interplay between capabilities and bank performance in the era of digital transformation.

Furthermore, a conspicuous gap is evident within the existing literature concerning the thorough examination of external factors, specifically the impact of regulatory regimes, on the dynamics of these identified capabilities. The intricate interplay between these capabilities and the regulatory environment remains relatively under-explored, even though regulatory frameworks can significantly shape a bank's ability to cultivate and leverage these capabilities effectively. Delving deeper into this aspect could offer invaluable insights into the symbiotic relationship between capabilities and regulatory parameters, shedding light on how these factors mutually influence and shape each other. This uncharted territory of investigation holds the potential to provide a holistic understanding of the multifaceted landscape in which banks navigate their digital transformation endeavours.

In light of these identified gaps in the existing literature, this study endeavours to address them through a systematic investigation. To this end, the Delphi method will be employed as a robust approach to unearth potential capabilities imperative for the successful digital transformation of banks. Furthermore, this exploration will be conducted within the context of a two-tiered country comparison – focusing on a developed nation such as Canada and a developing nation like Iran. This deliberate selection of countries offers a compelling foundation for a comparative and contrasting analysis.

By conducting this research across these diverse settings, we aim to enrich the understanding of the capabilities essential for effectual digital transformation within the banking sector. This approach is anticipated to yield insights that bridge the gap in our comprehension, and consequently, enhance the depth and breadth of knowledge in this domain.

Furthermore, in an effort to bridge the identified gap, our research endeavours to utilize the fsQCA (fuzzy-set qualitative comparative analysis) method. The primary aim is to uncover optimal combinations of these identified capabilities that exert a significant impact on banks undergoing digital transformation within diverse contextual settings. Moreover, by conducting SEM(Structural Equation Modeling) we will explore the regulator's environment and its relation with capabilities in digital transformation in banking. Concurrently, we seek to elucidate the pivotal role played by regulatory bodies in shaping and influencing these capabilities. By embarking on this comprehensive exploration, we aspire to contribute valuable insights that illuminate the intricate interplay between capabilities, context, and regulatory frameworks in the realm of digital transformation within the banking sector.

4.5. Research model

This research endeavours to provide an extensive examination of the distinct assortment of capabilities intertwined within the landscape of digital transformation in the banking sector, encompassing two diverse contextual dimensions. The core inquiry revolves around the identification and characterization of the unique set of capabilities pivotal for driving successful digital transformation in the banking industry across these varied contexts. Moreover, the research delves into the intricate interplay between these identified capabilities and the regulatory frameworks that govern the banking sector. By doing so, the study aims to shed light on how regulatory regimes shape and influence the optimal combinations of capabilities that contribute to elevated performance levels in the realm of digital banking, catering to the distinct demands and nuances within each contextual domain.

4.5.1. Capability, resources and performance

The convergence of findings from multiple studies in the literature unequivocally underscores the paramount importance of capabilities in shaping both the financial and non-financial performance outcomes of banks throughout their digital transformation endeavours. These studies provide a comprehensive view of the nuanced relationships between specific capabilities and various performance dimensions, shedding light on the intricate interplay that defines success in the digital age.

Al-dmour et al. (2021)'s investigation into the impact of knowledge management practices on digital financial innovation accentuates the pivotal role played by bank managers in fostering innovation. This focal point not only emphasizes the strategic capability of knowledge management but also hints at the operational aspect of bank management in aligning capabilities with transformation goals. Al-dmour et al. (2022)'s research delve into marketing knowledge management's influence on digital financial innovation, emphasizing its functional significance in driving innovation within commercial banks.

The study by Cao et al. (2022) takes a broader stance, assessing the aggregate efficiency of non-homogeneous bank holding companies in the digital age. The implications of this research extend beyond specific capabilities to encompass the overarching strategic choices of these entities. However, within this broader context, the role of technology-related capabilities in supporting these choices becomes apparent. This brings forth the strategic aspect of capabilities, not only within individual banks but across the sector as a whole.

Moreover, Setia (2013) delves into the interplay of information quality, localized capabilities, and customer service performance. This research offers a multi-faceted perspective that intertwines operational elements, such as information quality, with the nuanced implications of localized capabilities. These interconnections are shown to have a direct impact on bolstering customer-centric functions, highlighting the intricate ways in which capabilities manifest in enhancing service delivery.

The study by Manser Payne et al. (2021) introduces an innovative digital servitization value co-creation framework for AI services in financial ecosystems. This framework accentuates the intersection of functional capabilities (AI services) and strategic endeavours (value co-creation), underlining the dynamic and multifaceted nature of capabilities in the digital transformation context.

Additionally, Suandi et al. (2022)'s study on Islamic marketing ethics and convergence marketing underscores the importance of these capabilities in shaping Islamic bank performance. This lens allows us to see how ethical and strategic choices can synergistically impact performance outcomes, revealing a deeper level of the strategic interplay of capabilities.

Lastly, the research conducted by Vijayalakshmi (2019) elucidates the consequences of digital transactions on the financial performance of the banking sector. While not explicitly discussing capabilities, this study indirectly highlights the operational facets of capabilities related to digital transaction systems and processes.

Collectively, these studies contribute to an enriched analytical discourse on resource and capabilities' multifaceted roles in digital transformation within the banking sector. They showcase the intricate balance between strategic, functional, and operational dimensions, offering a holistic understanding of how capabilities orchestrate performance outcomes. The literature review suggests that resource capabilities have a crucial impact on the financial and non-financial performance of banks in digital transformation. Banks need to develop and enhance their resources and capabilities, to achieve better performance and stay competitive in the digital age.

Considering categories of these capabilities which were mentioned in the thematic analysis (section 3.2.) and using this literature we formulate these hypotheses:

H2: Strategic capability have a positive impact on bank performance in digital transformation.

H3: Operational capability have a positive impact on bank performance in digital transformation.

H4: Functional capability have a positive impact on bank performance in digital transformation.

4.5.2. Technology and performance

The array of literature examined comprehensively establishes the pivotal role of digital technologies in shaping and enhancing the performance of banks Cheng and Feng (2021)'s study delves into the intricate landscape of big data application within the banking sector, illuminating how this technology can revolutionize traditional practices. Their analysis reveals the potential of big data to drive strategic insights, risk management improvements, and heightened customer experiences.

Edu (2022b)'s work contributes a strategic dimension by focusing on the positioning of big data analytics to foster financial service agility. By integrating these technologies, banks can rapidly respond to changing market dynamics, leading to improved efficiency and adaptability. Gul and Ellahi (2021) offer a more direct link between data analytics and firm performance, establishing a concrete nexus between the two. Their research demonstrates that data analytics contributes to informed decision-making, which translates into optimized resource allocation, innovative service offerings, and ultimately, enhanced financial and operational results.

Expanding on the theme of digitalization, Gul et al. (2021) explore the complementarities between digitalization and productivity, redefining the boundaries for the financial sector. Their study showcases how digital technologies can reconfigure internal processes, streamline operations, and enhance resource utilization, thereby positively impacting financial performance. The concept of digital transformation is presented as a holistic strategy that intersects with productivity to yield comprehensive performance enhancements.

In synthesis, the analyzed research literature cogently demonstrates that digital technologies have emerged as powerful catalysts for driving both the financial and non-financial performance of banks. From harnessing big data for strategic decision-making to utilizing data analytics for agility and enhancing productivity through digitalization, the empirical findings consistently underline the transformative potential of digital technologies. As the banking landscape continues to evolve, these insights highlight the imperative for financial institutions to strategically embrace and leverage digital technologies to bolster their performance across multifaceted dimensions.

4.5.3. Capability, resource and technology

The implementation of digital technologies in banks is dependent on various factors, including the resources available to the bank. Subbiah et al. (2020) conducted a study on technology adoption in public sector banks in India and found that employee-centric capabilities, such as employees' perception of the usefulness of the technology and their training in using it, are important determinants of technology adoption. This suggests that the availability of human resources and training programs can affect the implementation of digital technologies in banks.

Similarly, Hannan (1984) identified several factors that influence technology adoption in banks, including the firm's structure, as well as the availability of resources. In their study, they found that larger and more financially sound banks were more likely to adopt new technologies, suggesting that resources play a crucial role in technology adoption.

Moreover, McKinsey's report on AI in banking highlights the importance of having the right resources, such as data and talent, to fully realize the potential of AI in banking. The report states that banks need to invest in building data capabilities, hiring data scientists, and creating a culture that fosters innovation to successfully implement AI (Biswas, 2020).

Similarly, the Canadian Bankers Association (CBA) emphasizes the importance of having the right resources and a culture that supports innovation for technology-led innovation in banking. The CBA report highlights the need for banks to invest in talent development and to create an environment that encourages experimentation and innovation (CBA, 2022).

The implementation of digital technologies in banks is influenced by various factors, including the availability of resources and capabilities, such as human, innovation, marketing capabilities and capital and IT investments. Banks need to invest in developing the right resources and capabilities and creating a culture that supports innovation to successfully implement digital technologies and adapt to changing environments.

4.5.4. Model development

In this section, we used the concepts we found in the literature and according to them, we present this study model.

4.6. Research Conceptual framework

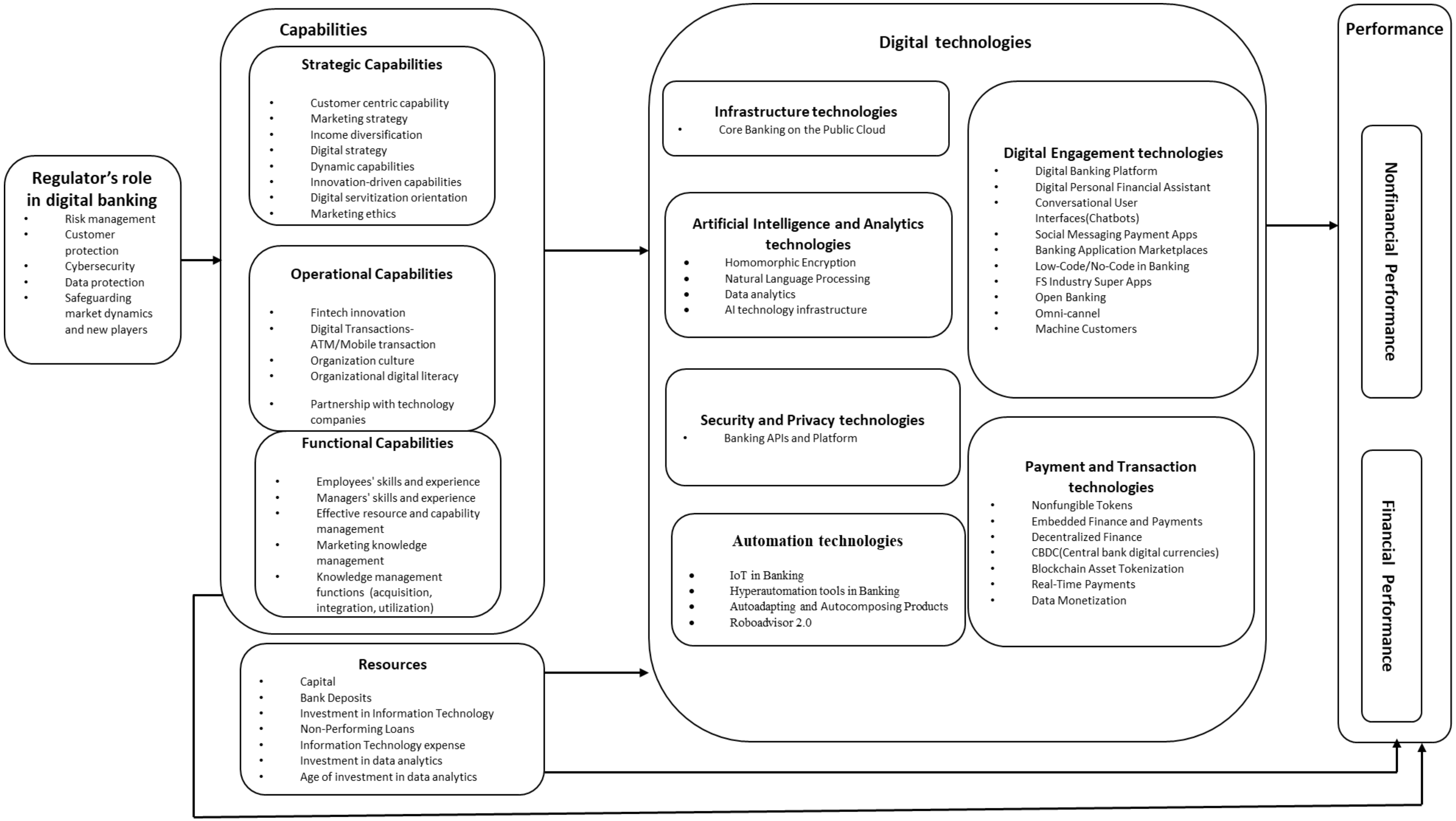
This section aims to define the key concepts used in this research to provide readers with a clear understanding of the study's scope and context. Firstly, we will define capabilities and resources, which are categorized based on Hooley et al. (1998)'s model (see Chapter 3). Then, we will explore the definitions of technologies provided in the literature and the Gartner Banking Digital Transformation cycle and we will categorize the technologies according to Skinner (2018)'s model (see Chapter 2).

This research endeavours to provide an extensive examination of the distinct assortment of capabilities intertwined within the landscape of digital transformation in the banking sector, encompassing two diverse contextual dimensions. The core inquiry revolves around the identification and characterization of the unique set of capabilities pivotal for driving successful digital transformation in the banking industry across these varied contexts. Moreover, the research delves into the intricate interplay between these identified capabilities and the regulatory frameworks that govern the banking sector. By doing so, the study aims to shed light on how regulatory regimes shape and influence the optimal combinations of capabilities that contribute to elevated performance levels in the realm of digital banking, catering to the distinct demands and nuances within each contextual domain.

To achieve these objectives we developed a research model. In the model, we organized the diverse capabilities extracted from the literature based on Hooley et al. (1998)'s model, classifying them into strategic, functional, and operational categories. We also incorporated digital banking technologies from both Newton (2022)'s insights as described in Chapter 2 and the findings of our systematic review, further classifying them according to Skinner (2018)'s model into seven distinct groups. As for performance assessment, we divided it into two primary categories: financial and non-financial. The regulatory scope in digital banking is determined based on the amalgamation of various models in different countries, as outlined in Chapter 2. The intricate interrelationships among these components are visually represented in Figure 7, forming the basis of the model we intend to validate through testing in this study.

In this study, we aim to test these hypotheses in order to draw definitive conclusions.

Figure7 - Research model



Model items (Capabilities, Resources, Digital technologies)

Each element within this model is accompanied by a specific definition. The definitions for each item can be found in the glossary located at the end of this thesis. Notably, items related to the regulatory environment in digital banking were described in Chapter 2, section 2.3.

4.7. Summary

In this chapter, we undertook a rigorous systematic literature review, meticulously examining various sources to uncover insights into our research inquiries. Our exploration uncovered a spectrum of capabilities, resources, and digital technologies within the literature, which we systematically categorized through thematic analysis. Combining these findings with our elucidation of regulators' roles in digital banking from Chapter 2, we constructed an all-encompassing research model to cover the impact of regulators on digital banking capabilities, the correlation between capabilities/resources and banks' digital transformation performance, the interrelation between capabilities/resources and digital banking technologies, and the influence of digital banking technologies on overall transformation performance.

To validate this model, our approach involved conducting empirical tests within two distinct contexts—Iran and Canada—followed by comprehensive cross-country analyses. In the upcoming chapter, we embark on a detailed exploration of this meticulously designed model, focusing on its practical application and insights gained within these primary research contexts.

Chapter 5: Methodology and research design

5.1. Overview

In this chapter, we embarked on an exploration of the research model established in Chapter 4, which involved the utilization of three primary research methods. First, we employed the Delphi method to identify the most significant capabilities and pivotal technologies influencing financial and non-financial performance in the realm of digital transformation. This investigation spanned two key research contexts: Iran and Canada. Additionally, we assessed the readiness of each set of capabilities in their alignment with digital technologies.

Following the Delphi results, we collected data via survey to select the most important capabilities and proceeded to evaluate their impact on financial and non-financial aspects using Structural Equation Modeling (SEM). Furthermore, we examined the influence of the regulatory environment on these capabilities, comparing the results between the two research contexts, Iran and Canada.

To enhance the results of our SEM analysis, we employed the Fuzzy-Set Qualitative Comparative Analysis (fsQCA) technique. This step aimed to identify optimal combinations of capabilities that had a significant impact on performance in the digital banking landscape. This chapter provides a comprehensive explanation of the intricacies of each methodology.

5.2. Ethical considerations

Ethical considerations are an important aspect of any research study, and there are several ethical principles that researchers must adhere to in order to protect the rights and welfare of their participants. In this study, several ethical considerations have been applied to ensure the integrity and validity of the research.

Firstly, informed consent was obtained from all participants before they participated in the study. Participants were fully informed about the study's purpose, procedures, and potential risks and benefits, and were given the opportunity to ask questions and decide whether or not to participate. This ethical principle was emphasized by (Babbie, 2015; Creswell, 2018), who stressed the importance of respecting participants' autonomy and obtaining their voluntary and informed consent.

Secondly, confidentiality and anonymity were maintained throughout the study to protect participants' privacy and personal information. This meant that participants' identities were not revealed, and their responses were kept confidential and only used for the study. This ethical principle was emphasized by Gravetter(2018) , who elaborated on the importance of protecting participants' personal information and ensuring that it was not disclosed without their consent.

Finally, the study adhered to the principle of beneficence, which meant that the research was conducted in a way that minimized harm to the participants by providing an informed consent form. This ethical principle was emphasized by Creswell(2015), who stressed the importance of conducting research that was socially responsible and promoted the well-being of individuals and communities.

This study has received approval from the Research Ethics Board of Saint Mary's University, with the approval number: REB 23-017. This certificate is available in the Appendix 1.

Overall, the ethical considerations applied in this study were consistent with the principles of informed consent, confidentiality and anonymity, and beneficence. These principles helped to ensure that the research was conducted ethically and responsibly and that the rights and welfare of the participants were protected throughout the study.

5.3. Methodological approach

The research paradigm that underpins this study is a hybrid of both positivism and constructivism (Burrell, 1979). This approach represents a mixed-methods or multi-paradigm strategy, incorporating facets of both qualitative and quantitative research paradigms.

The utilization of a Delphi questionnaire and thematic analysis for categorizing digital capabilities aligns with an interpretative research paradigm, as it emphasizes the subjective interpretations and experiences of the participants. The Delphi method, a structured communication technique enabling anonymous opinions and iterative refinement based on group feedback, respects the significance of considering participants' perceptions of optimal digital capabilities in the digital transformation era. Thematic analysis, conversely, enables researchers to uncover patterns and themes in qualitative data, providing deeper insights into participants' subjective interpretations (Creswell, 2015).

Furthermore, the inclusion of fsQCA to identify combinations of digital capabilities linked to high performance also aligns with the interpretative paradigm. fsQCA helps identify the necessary and sufficient conditions for particular outcomes and delves into how these conditions interact with each other. This approach relies on the perceptions of managers with specific roles and expertise, including IT managers, innovation managers, marketing managers, strategy and development managers, HR managers, and risk managers. to define high performance in digital transformation (Babbie, 2015; Gravetter, 2018).

Additionally, a positivist paradigm is evident in the use of research methods such as Structural Equation Modeling (SEM), a statistical technique employed for testing and validating hypotheses with empirical data. These methods resonate with a positivist approach, emphasizing objective, quantifiable data and the pursuit of knowledge that can be generalized.

In summary, this research embraces a mixed paradigm approach, integrating positivist elements that stress quantitative data and objectivity with constructivist elements that account for subjective perspectives and contextual considerations (Burrell, 1979). This holistic approach facilitates a more comprehensive understanding of the intricacies within the digital banking landscape in diverse research contexts, namely, Iran and Canada.

Figure 8 offers a snapshot of this research methodology.

Study1

- **Method:** Delphi
- **Purposes**: A) Identifying undiscovered capabilities in previous stage B) Prioritizing capabilities, technlogoies and resources to find the most important ones C). Finding level of digital banking technologies readiness of two contexts
- **Population**: Canadian/Iranian Banks' IT managers
- **Sampling**: Purposeful
- **Instrument**: Delphi questionnaire

Study 2-1

- **Method:** PLS-SEM
- **Purposes**: A) Finding the impact of the most important capabilities (identified in previous study) on performance in different contexts B) Exploring the impact of regulatory environment on these capabilities
- **Population**: Canadian/Iranian Banks' IT managers, innovation managers, marketing managers, strategy and development managers, HR managers, and risk managers
- **Sampling**: Purposeful, Snowball sampling
- **Instrument**: Questionnaire

Study 2-2

- **Method:** FsQCA
- **Purposes**: By eliminating the linearity assumption of SEM and moving beyond the isolated examination of individual capabilities, this study aims to identify the configurations of the most significant capabilities that drive high performance in banks in digital transformation.
- **Data**: The data utilized for SEM were also employed for this analysis.

Figure 8-Snapshot of research methodology

5.3.1. Delphi method

The Delphi method is a structured communication framework that involves multiple rounds of questionnaires sent to a panel of experts (Dalkey, 1969). The Delphi method is characterized by a series of steps, including the selection of a panel of experts, the development of the questionnaire, the administration of the questionnaire, and the analysis and reporting of the results (Linstone & Turoff, 1975). The panel of experts is selected based on their knowledge and experience in the field, and the questionnaire is designed to gather their opinions on the topic at hand. The questionnaire is typically administered in multiple rounds, with feedback provided to the panel after each round. This feedback is used to refine the questionnaire and to encourage consensus among the experts.

One of the key requirements for a successful Delphi study is a representative and diverse panel of experts (Turoff & Linstone, 2002). In this study, we employed Delphi method because it allows for anonymous responses, reducing the influence of dominant personalities and minimizing groupthink. Participants can rethink and refine their opinions based on input from others, fostering a more thoughtful decision-making process (Dalkey, 1969). In our research the target population for the Delphi questionnaire were IT managers from Iranian and Canadian banks, and we used a purposive sampling method to select experienced managers in digital banking. Another important requirement was the anonymity of the panelists, which encouraged honest and unbiased feedback (Rasouli et al., 2021).

The Delphi method is a widely used research tool in a variety of fields, including information management, education, and healthcare (Skulmoski et al., 2007). It is a useful tool for exploring complex issues and gaining consensus among experts. The Delphi method is particularly useful in this study, as it allows for the identification of any capabilities that were not covered in the literature and prioritization of the identified capabilities within the categories or subcategories established in the first stage. By asking a series of open-ended questions and allowing for anonymity, this method can encourage participants to freely express their opinions and ideas, providing valuable insight into capabilities (Grime & Wright, 2016; Turoff & Linstone, 2002).

Another goal of the Delphi questionnaire is to prioritize all of the identified digital capabilities within the categories or subcategories established in the first stage. This process involves multiple rounds of data collection and feedback, allowing for the convergence of ideas and the formation of a consensus among the experts. By using a structured approach to gathering and analyzing data, the Delphi method can help to ensure that the results are reliable and valid (Okoli & Pawlowski, 2004).

The Delphi method requires several key elements to be successful, including a diverse group of experts, a structured process for data collection and feedback, and anonymity to encourage candid responses. These elements can help to ensure that the Delphi method is an effective tool for achieving the goals of this study, which include identifying digital capabilities not previously covered in the literature and prioritizing them based on expert consensus. Ultimately, the Delphi method can provide valuable insights into the best combinations of digital capabilities that can enhance banks' performance in digital transformation under different regulatory situations.

It should be mentioned that there is no consensus regarding the optimal number of Delphi rounds. Common practice involves conducting two or three rounds (Habibi et al., 2014). In alignment with this, we opted to conduct our Delphi process over two rounds. This choice was motivated by the fact that we had nearly achieved a consensus among the expert participants regarding the topic under investigation. By doing so, we struck a pragmatic balance between gathering valuable expert insights and efficiently managing the research process. This allowed us to focus on areas of significance and relevance while respecting the time and resources of all involved parties.

In order to gauge the extent of consensus among the participants, we employed a comprehensive approach. To accomplish this, we computed the standard deviation for each capability, resource, and digital technology, evaluating their impact on both financial and non-financial performance. Additionally, we conducted an assessment of the readiness scores for each type of capability with respect to different digital technologies, calculating their respective standard deviations. The standard deviation calculations helped us understand the dispersion of opinions and the range of perspectives held by the participants.

5.3.2. Structural Equation Modeling (SEM)

After completing the Delphi test, we entered the final phase of our study. In this stage, we surveyed to gather pertinent data and harnessed the power of Structural Equation Modeling (SEM) and Fuzzy-set Qualitative Comparative Analysis (fsQCA) for our data analysis.

Before delving into the fsQCA analysis, we commenced SEM with two primary objectives. Firstly, through SEM, we aimed to investigate the impact of regulatory factors on the most crucial capabilities within the regulatory environment. We sought to comprehend how these regulatory bodies influence each capability within the context of our study. Secondly, we employed SEM to assess whether the identified capabilities in this study had a tangible effect on bank performance concerning digital transformation. We endeavoured to scrutinize the relationship between these capabilities and the financial and non-financial performance of banks in their digital transformation efforts. SEM provided valuable insights into these aspects, laying the groundwork for a comprehensive fsQCA analysis that would further elucidate the intricate interactions and combinations of conditions influencing bank performance in the digital transformation realm.

Overall, through SEM analysis, we assessed the impact of each capability on both financial and non-financial performance measures. Additionally, we explored the influence of regulatory status on individual capabilities.

Structural Equation Modeling (SEM) constitutes a suite of confirmatory multivariate techniques designed to evaluate the goodness of fit of models to data, as elucidated by Byrne (2011). SEM boasts several distinct advantages compared to traditional multivariate methods. Firstly, it allows for a direct assessment of measurement error. Secondly, it facilitates the estimation of latent (unobserved) variables based on observed variables. Finally, SEM supports model testing, permitting the imposition and evaluation of a structural framework in terms of data fit. In contrast to many multivariate approaches that inadvertently overlook measurement error by not explicitly modelling it, SEM meticulously estimates these error variance parameters for both independent and dependent variables (Byrne, 2011).

For our SEM analysis, we utilized Smart PLS4 as the chosen software tool. To assess discriminant validity, we examined whether the AVE statistics of the constructs surpassed the squared inter-construct correlations, in accordance with Hair (2014). The Fornell-Larcker criterion affirms that discriminant validity is indeed present. Additionally, we employed the heterotrait-monotrait (HTMT) ratio as an alternative measure of discriminant validity, as proposed by Henseler et al. (2015). Moreover, we evaluated the reliability of the latent constructs by analyzing their Cronbach's alphas and Composite Reliability (CR) scores.

Structural equation models are evaluated for their compatibility with the available data. Once the model meets the established fit criteria, a comprehensive examination of individual paths within the model takes place. Model fit is assessed by scrutinizing the Standardized Root Mean Residual (SRMR) value, which serves as an indicator of model compatibility. A value of 0.08 or lower is considered indicative of acceptable model fit, aligning with the guidelines established by Hu and Bentler (1999) and Schermelleh-Engel et al. (2003).

Given the relatively modest sample size in this study, we employed bootstrapping as a method to enhance the robustness of our results and stabilize parameter estimates.

Within the Smart PLS software, we conducted a bootstrapping procedure using 5,000 resampled datasets. To ensure the accuracy of our statistical tests, we opted for two-tailed testing with studentized bootstrapping, maintaining a fixed seed for consistency. We set the significance level at 0.1 to ensure a thorough examination of our hypotheses. Additionally,

To address any missing data, we adopted listwise deletion following Amusa and Hossana (2024). This approach helped us to ensure that each analysis included complete cases only, thereby maximizing the reliability of our results and minimizing potential biases introduced by incomplete data.

In this study, we employed Partial Least Squares based Structural Equation Modeling (PLS-SEM), a methodology rooted in variance (partial least squares). PLS-SEM differs from Classical (CB-SEM) in different aspects. Conceptually, PLS-SEM aligns with multiple regression analysis, aiming to maximize explained variance in dependent constructs(Dash & Paul, 2021). Moreover, it assesses data quality based on measurement model characteristics, as suggested by Hair Jr et al. (2017). When the research objective involves prediction and theory development, PLS-SEM becomes the preferred method; however, for theory testing and confirmation, CB-SEM is deemed more suitable (Dash & Paul, 2021).

In cases where formal theory and adequate sample size are lacking, the use of SPLS is an option, although it's noteworthy that CB-SEM may not yield a satisfactory model fit (Dash, 2021). According to Hair (2017a), these methods are not competitive but rather complementary. Considering our research objectives, particularly the novel aspect of developing regulatory environments in digital banking, PLS-SEM emerges as the most appropriate choice. This is especially true given the complexity of our model and the constraints of relatively small sample sizes. PLS-SEM offers the flexibility and robustness necessary to effectively analyze our data and explore the intricate relationships between variables in our study.

In the following section, we provide an in-depth explanation of the Fuzzy-set Qualitative Comparative Analysis (fsQCA) method that we employed. It's important to note that the instruments, sampling, and data used for both analyses were identical. Following the description of fsQCA, we will delve into the specific details of these topics.

Data cleaning

In addressing missing data within our research, we employed a method involving data imputation through averaging (Barata et al., 2019). This approach entailed the utilization of averaged values to fill in gaps created by missing data points, ensuring a more comprehensive and complete dataset for analysis and interpretation.

5.3.3. Fuzzy-set Qualitative Comparative Analysis

In our study, we embarked on an exploration of the research model established in Chapter 4. After conducting Structural Equation Modeling (SEM), we turned our attention to the Fuzzy-Set Qualitative Comparative Analysis (fsQCA) technique. FsQCA unravels complexity. It identifies equifinal paths—distinct combinations of capabilities and regulatory factors leading to the same outcome. While SEM provides valuable explanatory power, it often assumes linear relationships. In contrast, fsQCA embraces non-linearity and accounts for the complexity inherent in real-world scenarios (Pappas & Bley, 2023). Our objective was to identify optimal capability combinations to enahance the performance in the digital landscape. We used fsQCA software version 4.1 developed by the University of California.

Complexity and configuration theories and fsQCA

Complexity theory delves into the intricacies of relationships among variables, acknowledging their intricate, sometimes nonlinear nature, and the potential for sudden changes to yield different outcomes (Pappas, 2018; Urry, 2005). Contrasting with variance-based approaches that assume linear relations among variables, complexity theory suggests that understanding complex phenomena requires exploring them as clusters of interrelated conditions (Woodside, 2017). In this context, configuration theory offers a holistic perspective, aiming to comprehend the combined effects of conditions (Sawy et al., 2010).

Central to both theories is the concept of equifinality, positing that multiple combinations of antecedent conditions can lead to the same outcome (Bertalanffy, 1968; Fiss, 2007; Woodside, 2016). This principle aligns with the understanding that outcomes can be reached through various pathways, similar to how different routes can lead to a destination. Equifinality captures the inherent complexity of phenomena by recognizing that diverse conditions can yield similar results.

Configuration theory expands on these principles, highlighting the causal asymmetry between conditions that explain the presence and absence of an outcome (Fiss, 2011). It acknowledges that the factors driving an outcome's existence might differ from those responsible for its absence. This principle is exemplified when, for instance, the presence of a factor may lead to an outcome, but the absence of the same factor might not necessarily lead to the absence of the outcome.

Fuzzy-set Qualitative Comparative Analysis (fsQCA) leverages these theories to analyze complex relationships among variables (Rihoux, 2008). FsQCA developed through the integration of fuzzy sets and logic with Qualitative Comparative Analysis (QCA), enables researchers to capture both necessary and sufficient conditions for outcomes (Ragin, 2000; Rihoux, 2008). FsQCA focuses on identifying configurations—specific sets of causal variables that jointly contribute to outcomes. The presence of these configurations can be sufficient on their own or as parts of solutions that explain results (Mackie, 1965).

In fsQCA, researchers can discern core elements, signifying strong causal relationships with the outcome, and peripheral elements, indicating weaker relationships (Fiss, 2011). This allows for the identification of indispensable conditions, those necessary for an outcome to occur, and configurations that yield various pathways to achieve the same result. By providing a more nuanced view of causality, fsQCA and its application within complexity and configuration theories offer a comprehensive and detailed understanding of complex phenomena, such as personalized online shopping experiences (Pappas, Kourouthanassis, et al., 2016).

According to Pappas and Woodside (2021), fsQCA presents a unique approach that bridges qualitative and quantitative methods for understanding complex relationships among variables. By computing the degree to which a case belongs to a set, fsQCA captures combinations of conditions sufficient for outcomes to occur, operating within a [0, 1] range through calibrated measures. In comparison to variance-based methods, fsQCA is particularly advantageous when exploring complex, asymmetric relations between outcomes and antecedents. Unlike variance-based analyses that focus on net effects and the best solution, fsQCA identifies multiple solutions and configurations that explain different parts of a sample. FsQCA's adaptability allows it to be applied across diverse sample sizes, data types, and even categorical variables, making it suitable for various research contexts. This method is robust against outliers, as it explores multiple configurations and is not sensitive to their presence. It is especially valuable when researchers aim to uncover nuanced patterns and configurations that traditional methods might overlook.

FsQCA is an ideal method for our endeavour to identify the most critical variables impacting performance in digital banking for several reasons. First, digital banking systems involve complex relationships among various factors, whereas traditional linear methods might overlook nuanced interactions. FsQCA is designed to capture such intricate relationships and configurations, providing a holistic view of how different variables combine to influence outcomes. Second, the nature of digital banking performance is likely multifaceted, with multiple pathways leading to success. FsQCA's ability to analyze multiple pathways and identify various combinations of critical variables that contribute to performance aligns well with this complexity. Unlike traditional methods that focus on net effects, fsQCA allows us to explore not just the main effects but also interactions among variables, revealing patterns that might otherwise be missed. Third, fsQCA bridges the gap between qualitative and quantitative analysis, which is particularly useful when dealing with complex systems like digital banking. By accommodating both types of data, fsQCA ensures that we can leverage qualitative insights while also quantifying the strength and importance of each variable's contribution. Fourth, digital banking systems might involve variables that are not linearly related or where the absence of a certain condition might also play a significant role. FsQCA's consideration of both necessary and sufficient conditions enables us to identify factors that are indispensable for performance and those that, while not necessary, can still contribute significantly when present. Lastly, the method's flexibility in handling different sample sizes, diverse data types, and even categorical variables makes it a versatile choice for digital banking research. It accommodates the complex, nonlinear, and multifaceted nature of the digital banking environment, making it well-suited for uncovering the critical capabilities that impact performance.

Generally, the count of causal conditions should remain moderate, typically ranging from three to eight (Ragin, 2006; Ragin, 2017). Consequently, we meticulously identified the three most pivotal capabilities within both the financial and non-financial categories, applying this selection criteria to the context of Canada and Iran. The combination of these selections yielded a total of six distinct conditions that constitute our research instrument.

The utilization of fsQCA offers numerous advantages in comparison to conventional analytical approaches. To capture sets of conditions that are sufficient for an outcome to occur, fsQCA employs a combination of qualitative and quantitative assessments, and it calculates the degree to which a case belongs to a specific set

(Rihoux & Ragin, 2008), effectively establishing a connection between qualitative and quantitative methodologies.

Data treatment and calibration

An essential step in employing fsQCA is data calibration, which can accommodate various data types, such as survey responses, clickstreams, user performance data, and physiological data. When a variable or construct involves multiple items, it is necessary to compute a single value per construct for input into fsQCA. In other words, each case in our dataset requires one value for every construct. To achieve this, we calculated the mean of all the items to generate a singular value per case (Pappas & Woodside, 2021).

FsQCA also relies on calibrated measures, which transform data into the [0, 1] range. Calibration, more commonly practiced in natural sciences than in social sciences, caters to the needs of both qualitative and quantitative researchers by facilitating the interpretation of pertinent and irrelevant variations and by assisting quantitative researchers in precisely positioning cases relative to one another (Ragin, 2009; Vis, 2012).

If we consider a fuzzy set as a group, the values ranging from 0 to 1 determine the degree to which a case belongs to this group. A fuzzy membership score of 1 indicates full membership in the set, while a score of 0 signifies complete non-membership.

Data calibration can be performed through either direct or indirect methods. In the direct approach, researchers select three qualitative breakpoints that define the membership levels in the fuzzy set for each case (full, intermediate, non-membership). In the indirect method, measurements are rescaled based on qualitative assessments. The choice between these methods depends on the researcher's substantive knowledge of the data and underlying theory (Rihoux & Ragin, 2008). The direct method is typically recommended and more prevalent, where three values are set for full-set membership, full-set non-membership, and intermediate-set membership. This approach enhances the rigor, replicability, and validity of studies since it provides transparency in how thresholds are determined (Ragin, 2009).

Given that we utilized a 7-point Likert scale, we followed Ragin's (2008) guidance by using the values 7 for n1 (Threshold for Full Membership), 4 for n2 (Threshold for Crossover), and 1 for n3 (Threshold for Non-Membership) to calibrate the data. These common thresholds were chosen to ensure consistent interpretation of full membership, crossover, and non-membership across all variables in our study, facilitating the comparison and interpretation of results, especially in the context of comparing Iran and Canada.

Analysis of necessity

A condition is considered necessary when the outcome is a subset of the cases governed by that causal condition (Ragin, 2017; Schneider et al., 2010). In this study, consistency measures in fsQCA are employed to assess the extent to which observations adhere to strict rules. A consistency score of 1 signifies that the combination of causal conditions complies with the rule in all cases. Traditionally, a condition or combination of conditions is deemed necessary or nearly necessary if the consistency score exceeds the 0.8 threshold (Ragin, 2009).

Complex configurations

The truth table comprehensively generates all potential configurations, encompassing 2k rows, with 'k' signifying the number of outcome predictors, and each row corresponding to a conceivable combination. In the context of our study, with 6 outcome predictors, the truth table comprises 64 rows (Pappas & Woodside, 2021).

As per the guidelines proposed by Pappas and Woodside (2021), the subsequent step involves organizing the truth table based on frequency and consistency. Frequency delineates the number of cases in the sample accounted for by a given configuration. To guarantee a minimum number of cases for assessing relationships, a frequency threshold is set (i.e., the column number). A higher frequency threshold implies that each configuration pertains to a greater number of cases in the sample but diminishes the percentage (i.e., coverage) of the sample explained by the retained configurations. Conversely, a lower frequency threshold enhances sample coverage, although each combination is associated with fewer cases in the sample.

According to Pappas and Woodside (2021), to enhance the presentation of the findings, the solutions generated by fsQCA can be transformed into a more reader-friendly table (Tables 26 and 28in Chapter 6). In this table, the presence of a condition is denoted by a black circle (●), its absence or negation by a crossed-out circle (⊗), and the "do not care" condition by a blank space.

In presenting the findings, the overall coverage serves to describe the extent to which the outcome of interest can be elucidated by the configurations, and it can be likened to the R-squared statistic commonly reported in regression-based methods.

FsQCA research model, instrument and sampling

We adapted our research model, as elucidated in Chapter 4, to accommodate the implications of these six conditions on the output. Subsequently, we constructed the Venn diagram in accordance with the specifications of the fsQCA method as shown in Figure 9.

To perform fsQCA, we utilized the dataset originally gathered for the SEM test, ensuring consistency in both sampling and instruments between these two analyses. Notably, in the SEM test, we evaluated the influence of regulators on individual capabilities, followed by the impact of each capability on performance metrics. In contrast, within fsQCA, our focus shifted to identifying the optimal combinations of capabilities that significantly enhance both financial and non-financial performance. This comprehensive analysis was conducted for both Iran and Canada.

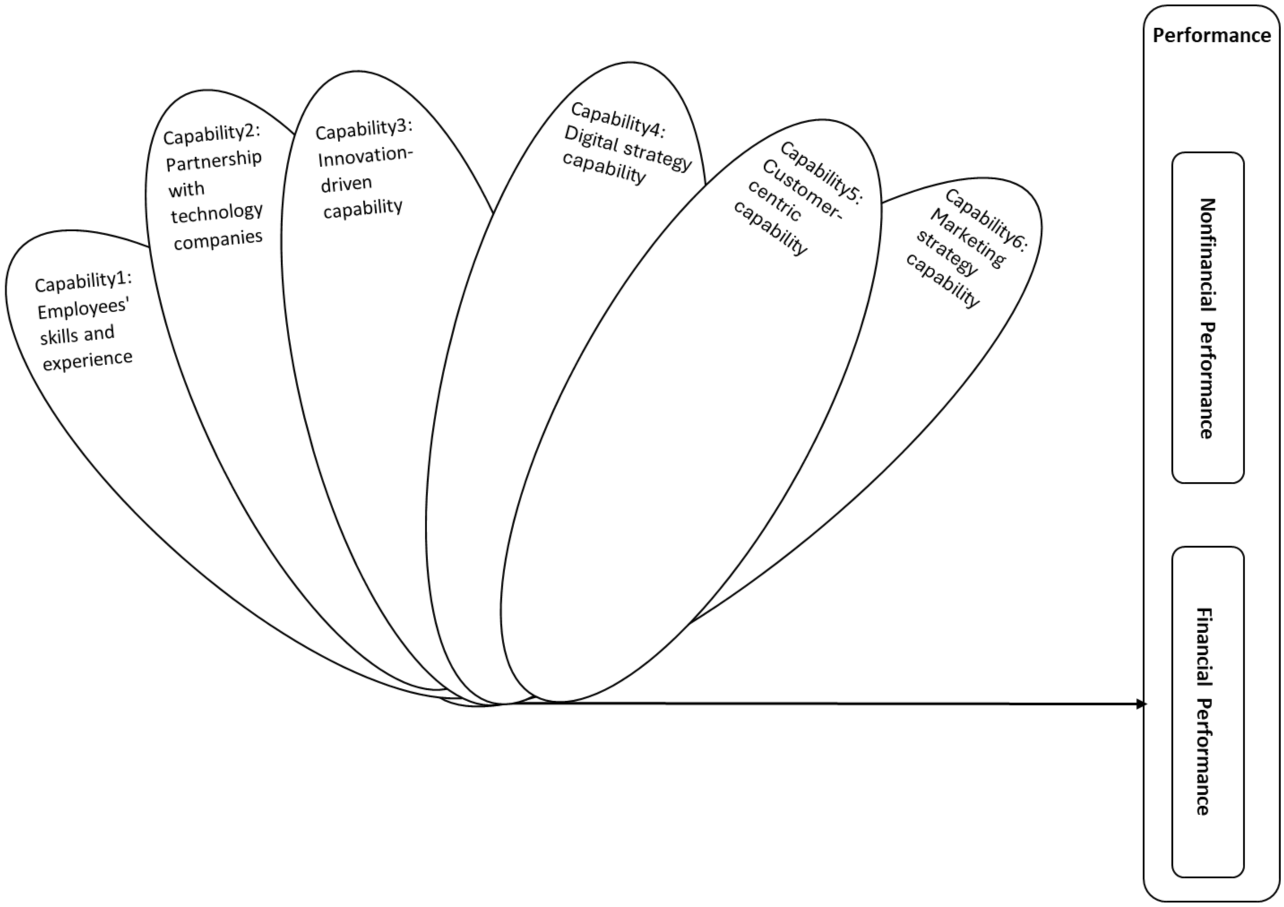


Figure 9- Second research model

5.4. Research Instrument

5.4.1. Delphi

In this study, we developed the Delphi questionnaire based on a systematic review of the literature to identify the digital capabilities required for successful digital banking. The development of our questionnaire aligns with the core tenets of DCT. Just as organizations adapt and reconfigure their internal resources to respond to changing environments, our study focuses on identifying organizational capabilities that enable banks to thrive in the dynamic digital landscape.

These capabilities were categorized based on Hooley et al. (1998)'s model, which identifies three different capability categories. Moreover, the digital technologies used in the study were identified based on Gartner's (2022) technologies report and other relevant sources from the literature. These technologies were then categorized based on Skinner's model, which identifies three different types of digital technologies.

We tested the research model through different sections of the Delphi questionnaire, including the ranking of the importance of capabilities to enhance financial and non-financial performance. Additionally, the questionnaire was used to assess the level of maturity of different capabilities to implement different technologies and to rank the importance of technologies to enhance financial and non-financial performance.

In order to encourage participants to freely express their opinions and ideas, open-ended questions were included in each part of the questionnaire. This allowed the participants to provide more detailed and nuanced responses that may not have been captured by closed-ended questions. The use of open-ended questions is a common practice in Delphi studies, as it allows for the exploration of new and potentially valuable insights (Okoli & Pawlowski, 2004; Turoff & Linstone, 2002).

The Delphi questionnaire underwent multiple iterations, incorporating insightful feedback from academics. Subsequently, it was subjected to review by two industry experts, further enhancing its accuracy and effectiveness. This meticulous process of refinement, guided by both academic and industry perspectives, culminated in a comprehensive and robust questionnaire designed to yield valuable insights. Then we designed a questionnaire using Qualtrics, an online survey platform, to make it easy for participants to complete and submit their responses.

By using a structured approach to developing the Delphi questionnaire, the study can ensure that the research model is reliable and valid. The categorization of capabilities and technologies allowed for a clear and concise presentation of the findings, making it easier for the participants to provide their input.

In conclusion, the development of the Delphi questionnaire in this study involved the use of various sources and models to identify the necessary digital capabilities and technologies for successful digital banking. The questionnaire was carefully designed, reviewed, and revised to ensure its accuracy and effectiveness. The study's methodology, including the use of systematic review, categorization models, and expert review, ensured that the results were reliable and valid. A copy of the questionnaire is in Appendix 2.

The structure of this questionnaire is distinctly designed to incorporate both ranking and rating questions, a deliberate choice made to ensure a thorough examination of the subject matter. It is evident that this questionnaire seamlessly integrates both ranking and rating questions, offering a well-rounded approach to gathering data and insights.

In the realm of rating questions, a 5-point Likert scale was employed to gauge participants' opinions and attitudes effectively. This 5-point Likert scale, a widely accepted measurement tool, is instrumental for rating because it provides respondents with five distinct response options, allowing them to express their level of agreement or disagreement with varying degrees of intensity. This scale's versatility is particularly beneficial for assessing the maturity level of digital technologies, as it enables participants to convey their evaluations on a 1 to 5 scale.

In addition to rating questions, the questionnaire includes ranking questions that enable participants to establish priorities among items or aspects. Ranking questions allow participants to determine the relative importance or significance of various elements presented to them, which is invaluable for identifying the key factors within the questionnaire's context.

5.4.2. SEM and fsQCA

The questionnaire was purposefully aligned with two influential theories: Dynamic Capabilities Theory and Systems of Innovation Theory. DCT posits that organizations must adapt, integrate, and reconfigure their internal resources to thrive in dynamic environments (Teece et al., 1997). Our questionnaire directly reflects this principle by assessing various organizational capabilities—essential components of dynamic adaptation in the digital landscape. By measuring these capabilities, we explore how organizations respond to technological shifts, innovate, and enhance performance. Moreover, Systems of Innovation Theory emphasizes the interconnectedness of actors, institutions, and technologies within innovation systems (Edquist, 2012). Our measurement of the regulatory environment aligns with this perspective. Regulatory frameworks shape innovation ecosystems, affecting how organizations navigate digital transformations. By considering regulatory factors, we acknowledge the broader context in which digital capabilities operate. In summary, our comprehensive questionnaire bridges theory and empirical investigation, providing valuable insights into the intricate interplay between capabilities, performance, and regulatory environment.

Our constructs were established by drawing upon items identified in the existing literature. These items were then customized to suit the specific context of digital banking, and we further updated them accordingly. Table 9, summarizes the measurement of the constructs we used. We describe each construct in the following section. The entire questionnaire is available in Appendix 3.

We translated the questionnaire into Persian to facilitate its use in Iran. It is worth noting that the questionnaire employed in this study utilized a 7-point Likert scale for responses. The Likert scale, a widely used measurement tool, allows participants to express their opinions and attitudes with varying degrees of agreement or disagreement on a continuum, ranging from strongly disagree to strongly agree. The use of a 7-point Likert scale in this questionnaire is advantageous in that it permits a more granular assessment of the participants' opinions, offering a higher level of detail and precision in the analysis of the survey data. This, in turn, enhances the overall quality and reliability of the study's findings.

Table 9- Measurement of the construct

Construct	Subconstruct	Reference
Customer-centric capability	Customer orientation capability	Im and Workman (2004); Setia et al. (2013)
	Customer response capability (response speed and response expertise)	Jayachandran et al. (2004); Setia et al. (2013)
Digital strategy	NA	Chen et al. (2014); Hakala and Kohtamäki (2011); Proksch et al. (2021)
Innovation capability	Product innovation	ZAHRA and DAS (1993)
	Process innovation	Delgado-Verde et al. (2011); ZAHRA and DAS (1993)
Marketing strategy	NA	Azizi et al. (2009)
Partnership	Cooperation	Yue et al. (2022)
	Trust	Poppo et al. (2016)
Employees' knowledge and skills	Technology management skills	Byrd et al. (2004); Lee and Lim (2003)
	Business functional skills	Byrd et al. (2004); Lee and Lim (2003)

	Interpersonal skills	Byrd et al. (2004); Lee and Lim (2003)
	Technical skills and knowledge	Byrd et al. (2004); Lee and Lim (2003)
Financial performance	NA	Hernaus et al. (2012); Prieto and Revilla (2006)
Non-financial performance	NA	Hernaus et al. (2012); Prieto and Revilla (2006)

Customer-centric capability

In this research, we explored customer-centric capability, which comprises two main constructs: customer orientation capability and customer response capability. Following Setia et al. (2013)'s definitions, customer orientation capability refers to a firm's ability to understand and align business strategies with customer needs. On the other hand, customer response capability pertains to the CSU's effectiveness in promptly addressing customer needs and desires. In Setia et al. (2013)'s study, Customer orientation capability was assessed using the six-item scale employed by (Im & Workman, 2004). To measure customer response capability, the researchers utilized a scale developed by (Jayachandran et al., 2004), which encompasses two dimensions: response speed, evaluated with a five-item scale, and response expertise, measured with a three-item scale.

Digital strategy

The measurement of digital strategy in our study followed Proksch et al. (2021)'s research, wherein five items were adopted from various sources, including Chen et al. (2014), Hakala and Kohtamäki (2011), Kim et al. (2013). The selected literature predominantly emphasized the alignment of technology orientation with a company's overall strategy. To adapt the measurement to the specific context of digital banking, we tailored the items accordingly and we identified the perceived strategic importance of digitalization, monitoring of emerging digital trends, perceived emphasis on digital projects, ongoing enhancement of digital strategy, and reputation in digital innovation as our measurements.

Innovation capabilities

We adopted a multidimensional approach to identify innovation capability, drawing inspiration from the work of Zahra and Bogner (2000). By considering various dimensions of a firm's innovative efforts to develop new products and processes, we aimed to capture a comprehensive view of its innovation capabilities. Following Zahra and Bogner's recommendation, we included both absolute and relative items in these measures. These relative items allowed for comparisons to previous periods, main competitors, or the industry average, thereby offering a more complete representation of a company's innovation capabilities development. For measuring product and process innovation capabilities, we utilized the four-item scale developed by ZAHRA and DAS (1993) and Delgado-Verde et al. (2011). which has been proven effective in previous research. This adaptation ensured that we captured essential aspects of a firm's ability to innovate in their processes effectively.

Marketing strategy

According to Azizi et al. (2009), six statements were designed for the investigation and analysis of marketing strategy. This questionnaire encompassed one statement for defensive strategy, four statements for four types of aggressive strategy, and one statement for focus strategy. This design aimed to capture key aspects of various marketing strategies and facilitate a comprehensive examination of the organization's approach to marketing.

Partnership

We adopted the framework proposed by Yue et al. (2022) to assess partnership in terms of trust and cooperation. To measure cooperation, they utilized the four-item scale developed by Arroyave et al. (2020), van Beers and Zand (2014). These items were carefully selected to capture essential aspects of cooperation within partnerships. For evaluating trust, we relied on the three-item scale used by Yue et al. (2022), which was based on the work of Nyaga and Whipple (2011), Poppo et al. (2016). These trust-related items were chosen to comprehensively measure the level of trust within the partnerships under study.

Employees' knowledge and skills

To assess knowledge and skills, we relied on the work conducted by (Byrd et al., 2004), they condensed and adapted the items from Lee et al. (1995), resulting in four distinct dimensions for assessing knowledge and skills: technology management skills (2 items), business functional skills (4 items), interpersonal skills (10 items), and technical skills and knowledge (13 items). We followed them with minor modifications to exclude items related to other concepts like programming languages, and we tailored the entire set of items to align with concepts specific to digital banking. We employed these items to measure management knowledge and skills while making slight adjustments, we also utilized them to assess employees' knowledge and skills. By adapting and customizing the items, we sought to accurately evaluate the relevant knowledge and skills within the context of the digital banking industry.

Financial and non-financial performance

To assess financial and non-financial performance, we selected a variety of items from previous research. As part of our survey, we constructed two constructs using multiple-indicator measures based on the work of Hernaus et al. (2012), Prieto and Revilla (2006). We carefully examined the items related to financial and non-financial performance in these studies and selected those that best align with our research objectives. This multi-dimensional approach was designed to holistically measure various facets of organizational performance, encompassing both financial and non-financial aspects, allowing for a comprehensive evaluation of the organization's overall performance.

Regulatory environment

Questions regarding the regulatory environment and its impact on capabilities were extracted using the information from Chapter 2, table 2, the scope of focus of different regulators in digital banking.

To ensure content validity and minimize measurement errors and potential biases, we incorporated a pre-testing phase during the questionnaire development process. This pre-testing phase allowed us to assess the effectiveness and appropriateness of the questionnaire items before the main data collection phase. By piloting the questionnaire with a small sample of participants, we could identify any unclear or ambiguous questions, gather feedback on the survey's comprehensibility, and make necessary refinements. This iterative approach helped us fine-tune the questionnaire, enhancing its reliability and validity for the subsequent data collection and analysis stages.

5.5. Sampling and data collection

5.5.1. Delphi

Iran and Canada serve as illuminating case studies for a comparative exploration of capabilities' effects on performance within the banking sector, framed by their statuses as developing and developed countries, respectively. Iran and Canada offer compelling case studies for a comparative analysis of capabilities' impact on performance in digital transformation and regulatory roles within the banking sector. In Iran, a country experiencing notable growth in its banking sector, the swift adoption of digital banking and FinTech solutions is evidenced by ongoing studies and initiatives, highlighting the potential for capability-driven performance improvements. The role of the Central Bank of Iran (CBI) in digitalization, coupled with Iran's status on the FATF blacklist, presents a unique regulatory landscape. Conversely, Canada's banking sector is undergoing a significant shift towards digital banking and open banking, with regulatory efforts focused on innovation while safeguarding stability. Its engagement with global regulatory bodies such as the BCBS and FATF underscores the significance of international alignment. By juxtaposing Iran's rapid digital integration and regulatory challenges with Canada's measured approach and regulatory engagement, this comparative analysis illuminates the nuanced interplay between capabilities, performance, and regulatory frameworks in two distinct banking contexts.

The use of a purposive sampling method to select IT managers from Iranian and Canadian banks as the target population for this study is appropriate and supported by the literature. According to Creswell (2018), purposive sampling is often used in qualitative research to select participants based on specific characteristics, such as their knowledge or experience. In this case, the IT managers in Iranian and Canadian banks were selected based on their experience in digital banking, which is relevant to the research questions of the study.

Furthermore, Gravetter (2018) note that purposive sampling is appropriate when the researcher is interested in a particular group of people, and it is difficult or impossible to obtain a random sample. This is often the case in qualitative research, where the goal is to obtain an in-depth understanding of a particular phenomenon or group of people. In this study, the goal is to obtain insights from experienced IT managers in Iranian and Canadian banks about digital capabilities that can enhance banks' performance in digital transformation under different regulatory situations. Given the specific expertise required for this study, a purposive sampling method is appropriate.

Furthermore, as Skulmoski et al. (2007) have highlighted, the Delphi method is frequently employed to solicit expert opinions from specific groups, such as IT managers, who possess an in-depth understanding of the subject under investigation. In both Canadian and Iranian banks, the selected IT managers predominantly occupy mid-level to senior-level positions within their respective IT departments. These roles encompass titles such as IT directors, IT managers, senior IT analysts, IT team leaders, and department heads. This consistency in managerial levels ensures a well-rounded representation of leadership within IT departments in both regions.

It is worth noting that IT managers in both areas typically boast over a decade of experience in the IT and banking industries, thereby ensuring a comparable level of professional background.

Moreover, to ensure diversity and representative sampling, we selected the banks within which these IT managers operate thoughtfully. This includes a mix of private banks and government-owned banks in both Canada and Iran. This strategic selection of bank types contributes to the comprehensiveness and inclusivity of the research sample.

In this research, we invited a total of 11 participants to partake in the Delphi process in Canada, of which 8 accepted the invitation. Our participant group consisted exclusively of IT managers, representing a diverse cross-section, including managers from both governmental and private banks, along with select private financial service providers. Similarly, in Iran, we extended invitations to 14 participants, and 11 confirmed their participation. This subset included managers from both private and governmental banks. It's noteworthy that all 19 participants actively engaged in both phases of the study, and there were no instances of participants withdrawing after the initial phase. Table 10 illustrates the composition of the sample involved in the Delphi study. It is important to note that all participants contributed to both phases of the research.

Table 10- The composition of the sample in the Delphi study

	Number of invitations	Number of participants confirmed	Total number of participants
Canadian Governmental banks	4	3	8
Canadian private banks	7	5	
Iranian Governmental banks	8	6	11
Iranian private banks	6	5	
Total number of participants			19

In summary, the use of a purposive sampling method to select experienced IT managers from Iranian and Canadian banks as the target population for this study was appropriate and supported by the literature. It allowed for the collection of in-depth insights from experts who had relevant knowledge and experience in digital banking, which is essential to answering the research questions of the study.

We sent the Delphi questionnaires to the target population of Iranian and Canadian IT managers via email using a Qualtrics link. Each participant was given two weeks to complete and submit the questionnaire.

After collecting the data, the Delphi method procedure was followed for the second round, which involved providing feedback to the participants and refining the questionnaire based on their responses. In this phase and after gathering data in the initial round, we proceeded to the second round after a month. In this subsequent stage, we presented the averaged industry expert opinions and individual preferences for each participant. We allowed participants to adjust their ideas based on the presented average; if they wished, they could modify or change their stance. The industry average was calculated and distributed separately for Iranian and

Canadian participants. The use of email and Qualtrics to administer the questionnaire allowed for a convenient and efficient data collection process, while also ensuring the anonymity of the participants. The two-week response period provided ample time for the participants to review and provide thoughtful responses to the questions.

Overall, the application of the Delphi method in this study allowed for the identification of digital capabilities and technologies that can enhance the financial and non-financial performance of banks in different regulatory situations. The use of a diverse and representative panel of experts, the structured approach to data collection and feedback, and the ethical considerations applied throughout the study all contributed to the success of the research.

5.5.2. SEM and fsQCA

We designed our questionnaire to assess various critical aspects of the banking industry, such as customer satisfaction, innovation capabilities, marketing strategy, partnerships, employee skills, financial/non-financial performance, and regulatory status. To expand our sample size, we employed a combination of snowball sampling and purposive sampling techniques. In pursuit of comprehensive insights, we initially utilized purposive sampling to target diverse samples from various managerial levels within both the Canadian and Iranian banking sectors.

Our purposive sampling strategy involved the selection of managers with specific roles and expertise, including IT managers, innovation managers, marketing managers, strategy and development managers, HR managers, and risk managers. This approach ensured that we engaged a cross-functional group of managers, each overseeing distinct aspects covered in the questionnaire. Consequently, we gained a holistic perspective on the banking industry's performance, capabilities, and strategies. Given the specialized nature of this study, purposive sampling was the most appropriate method for selecting participants. This approach allowed us to deliberately choose individuals with the specific characteristics and qualifications essential to our research goals (Gravetter, 2018).

However, the usage of snowball sampling came into play when we sought to further augment our sample size. Snowball sampling involves participants referring to other potential participants (Gravetter, 2018). In this phase, our initial purposively selected participants were asked to recommend additional colleagues or contacts who possessed relevant expertise and qualifications in the banking industry. This snowball approach allowed us to access a wider network of participants who met the specific criteria needed for our research.

In our selection of participants, we focused on senior-level managers, middle-level managers, and department heads, with a criterion of more than 10 years of experience in the banking industry. This uniformity in managerial levels guaranteed a well-rounded representation of leadership within departments in both regions and facilitated cross-sectional analysis.

Furthermore, our thoughtful selection extended to the banks in which these managers operated. We carefully curated a mix of credit unions, private banks, and government-owned banks in both Canada and Iran. This deliberate choice of diverse bank types enhanced the comprehensiveness and inclusivity of our research sample.

To gather responses, we distributed the questionnaire, along with a consent form, via email to potential respondents. We achieved a robust response rate of 72% in Canada and 74% in Iran, resulting in a sample size of 173 and 182 respondents, respectively. These high response rates signify a significant level of engagement and ensure the reliability and representativeness of our research findings in both regions. Table 11 depicts the sample composition.

Table 11- The composition of the sample in the survey

Bank \ Department	IT	Innovation (R&D)	Marketing	Strategy	HR	Risk	***Total***
Canadian Governmental banks	11	7	11	9	16	7	**61**
Canadian private banks	24	22	21	12	21	12	**112**
Total number of Canadian participants	**35**	**29**	**32**	**21**	**37**	**19**	**173**
Iranian Governmental banks	18	10	14	13	9	15	**79**
Iranian private banks	27	14	22	21	12	7	**103**
Total number of Iranian participants	**45**	**24**	**36**	**34**	**21**	**22**	**182**

5.6. Summary

Chapter 5 provided a detailed account of the methodologies applied to address the research questions in the two different contexts of Iran and Canada. The chapter commenced with a comprehensive explanation of the Delphi method employed to identify the most significant capabilities and pivotal technologies influencing financial and non-financial performance in the realm of digital transformation. We also assessed the maturity of each set of capabilities in their alignment with digital technologies. The characteristics of the sample used in the purposive sampling method were elaborated upon.

Subsequently, the SEM (Structural Equation Modeling) approach was discussed, which was utilized to assess the impact of the regulatory environment on banking capabilities in digital banking and the subsequent effects of these capabilities on financial and non-financial performance. The chapter concluded by addressing the FsQCA (Fuzzy Set Qualitative Comparative Analysis) method employed to identify the best combination of capabilities for enhancing a bank's performance in digital banking under different regulatory regimes. Detailed information about the samples and instruments used in these methods was presented.

Chapter 6: Findings

6.1. Overview

Building upon the foundational work laid out in the preceding chapters and with our research model now in place, this chapter delves into the practical application of the methodologies discussed in Chapter 5. The process commences with the meticulous deployment of a survey instrument that has been carefully constructed based on the insights garnered from our systematic literature review. With this tool at our disposal, we embark on a comprehensive two-phase Delphi study, a critical phase in our research that yields a wealth of invaluable data.

This chapter is dedicated to the in-depth analysis of the data acquired through the Delphi study, serving a dual purpose. Firstly, we aim to determine the paramount importance of existing capabilities within the banking industry by conducting a detailed analysis of these capabilities. Additionally, we seek to unveil novel insights contributed by industry experts. This analytical exploration extends to conducting a comparative assessment of these capabilities within the specific countries chosen for our study.

Secondly, our analysis of technologies and the identification of the most important technologies, along with the comparison analysis between the two countries, provide valuable new insights. Moreover, through an assessment of the readiness of the capabilities to implement these technologies in each country, we can obtain valuable insights into their adoption, implementation, current status, and differences. Armed with the insights garnered from the Delphi study, our research progresses to subsequent stages outlined in this dissertation. These stages involve the collection of data that is to be analyzed through the SEM and fsQCA methodologies. The primary goal here is to discern the role of regulatory factors and to identify the optimal combinations of capabilities unique to each country. The revelations and discoveries resulting from these multifaceted processes are at the heart of this chapter.

The fusion of outcomes from the Delphi study, and the SEM and fsQCA methodologies encapsulates the core of this comprehensive exploration. This combined insight grants us a holistic understanding of capability configurations and regulatory influences within the selected contexts. In essence, this chapter serves as the conduit through which the findings of these methodologies are unveiled, enriching the ever-evolving landscape of knowledge in this domain.

6.2. Delphi method findings

As delineated in Chapter 5, the We employ Delphi method to gather the discernments of seasoned managers within the banking industry. This undertaking transpired across two distinct phases. After the initial phase, a subsequent round of communication ensued, wherein individual participants were engaged to share their discrete perspectives, the collective expert consensus was disseminated, and participants were allowed to recalibrate their viewpoints if deemed necessary. It is pivotal to underscore that this iterative procedure was conducted within the parameters of two divergent contextual frameworks: a developed nation, namely Canada, and a developing counterpart, Iran.

The questions in this study are divided into the following categories:

1. Ranking the importance of capabilities for enhancing the non-financial performance of the banking industry.
2. Ranking the importance of capabilities for enhancing the financial performance of the banking industry.
3. Ranking the importance of resources for enhancing the non-financial performance of the banking industry.
4. Ranking the importance of resources for enhancing the financial performance of the banking industry.
5. Assessing the readiness of the banking industry's capabilities to implement these categories of digital technologies.
6. Ranking digital technologies based on their importance in enhancing the financial performance of the banking industry.
7. Ranking digital technologies based on their importance in enhancing the non-financial performance of the banking industry.
8. Inquiring about potential additional factors for each of the aforementioned questions.

In the analysis section, we eliminated missing values during the first round. For the missing values in the second round, we utilized the average from the first round, as specified in the second-round questionnaire where not answering any question signifies confirming the reported average. In instances where "Not Applicable" answers were provided, we converted them to 0 to ensure quantifiability.

6.2.1. Additional Input Analysis

During the first round of our Delphi study, we sought to gather valuable insights from study participants by inviting them to suggest any additional resources or capabilities that were not initially included in our questionnaire. We based this request on the existing literature, recognizing the potential for novel perspectives and overlooked factors in the realm of digital transformation.[1]

- Some of the participants from Canada emphasized the significance of the Bank's process integration with customers' businesses, highlighting its potential impact on financial performance. Furthermore, a participant from Canada suggested considering Strategic flexibility as a factor contributing to non-financial performance, underscoring its relevance in the context of our study. Additionally, the notion of Consistency in innovation was recommended as another capability that could influence financial outcomes.
- The participants from Iran, on the other hand, contributed their unique insights to our Delphi method. They proposed two capabilities that could impact non-financial performance: Social capital and Brand Preference These concepts were identified as potentially influential in shaping the overall success of digital transformation initiatives.

Regarding the new factors introduced by participants in this study, we categorize the bank's process integration with customers' businesses as a functional capability, consistency in innovation as an operational capability, and strategic flexibility as a

[1] The definitions of these new factors and descriptions of their categorization are available in Chapter 7.

strategic capability. Additionally, we identify social capital as a strategic capability and brand preference as a functional capability. Moreover, we explore board member combination as a strategic capability and asset portfolio management as a strategic capability. In the subsequent chapter of this thesis, we delve into the definitions of these factors, the reasons behind their categorizations, and how they can significantly contribute to knowledge enhancement and enrich the framework.

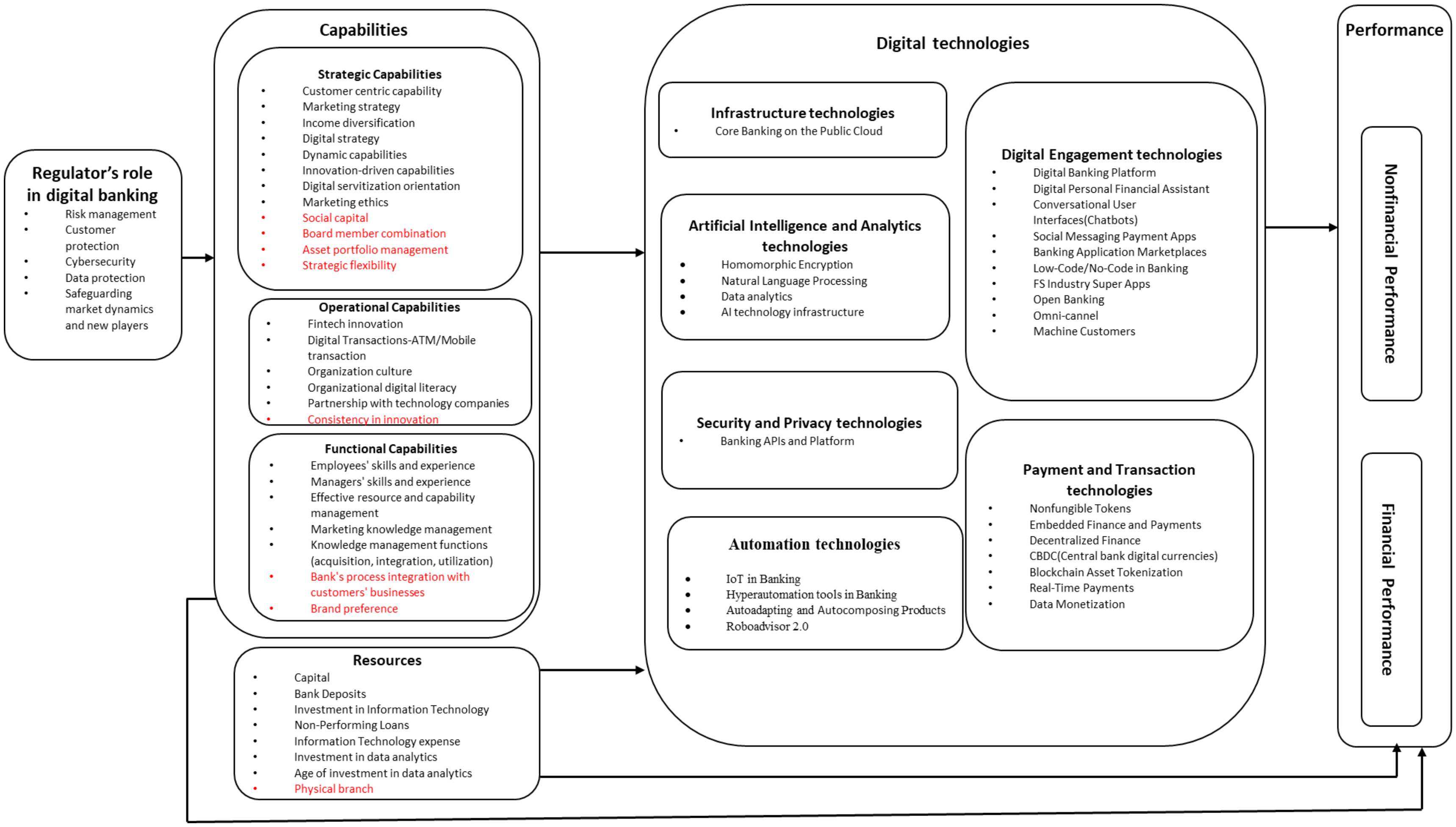
To ensure a comprehensive and inclusive approach, we incorporated all the suggested capabilities from both countries' participants into the subsequent round of our Delphi study. These capabilities, namely social capital, Brand Perception, Consistency in innovation, Strategic flexibility, Bank's process integration with customers' businesses, Board members combination, and Asset portfolio management, were considered essential factors that could impact both financial and non-financial performance in the realm of digital transformation.

- Additionally, we recognized the significance of the suggested resource, the physical branch, which was put forward by a participant from Iran. Understanding the potential influence of the physical branch on performance outcomes, we regarded it as a resource capable of impacting both the financial and non-financial aspects of digital transformation.

By integrating these diverse and valuable insights into our study, we aimed to foster a more comprehensive understanding of the factors and resources that drive successful digital transformation, encompassing both financial and non-financial dimensions.

By finding these factors we introduce a new framework with new items as presented in Figure 10.

Figure 10- New research model (Source: author)



6.2.2. Reliability: Cronbach's Alpha

Reliability pertains to the constancy or replicability of a measurement tool. In the context of multi-item instruments, the foremost facet of reliability is the internal consistency of the instrument, denoting the extent to which sets of items within the instrument exhibit congruent behaviours. This aspect holds significant importance as the items comprising the instrument's scale should effectively gauge the same underlying construct, thereby necessitating appropriate intercorrelations among these items (Creswell, 2018).

The evaluation of reliability involves the utilization of Cronbach's alpha (α) coefficient, a statistical metric that quantifies a scale's internal consistency. This coefficient assumes values between 0 and 1, with values between 0.7 and 0.9 deemed optimal according to (Creswell, 2018).

Appendix 4 presents the results of the alpha Cronbach tests conducted on different samples from Canada and Iran. The reliability and interitem covariance of various scales were assessed to gain insights into the consistency and quality of the collected data.

In terms of non-financial resource scales, both the Canadian and Iranian samples demonstrated reliable measures. The Canadian sample had a scale reliability coefficient of 0.833, with an average interitem covariance of 0.136. Meanwhile, the Iranian sample exhibited a scale reliability coefficient of 0.829, with an average interitem covariance of 0.620.

Moving on to capability scales, both the Canadian and Iranian samples showed high reliability in the non-financial scales, with scale reliability coefficients of 0.908 and 0.877, respectively. The average interitem covariance was 4.475 for Canada and 1.811 for Iran. In the financial capability scales, both samples also demonstrated high reliability, with scale reliability coefficients of 0.934 for Canada and 0.926 for Iran. The average interitem covariance was 5.557 for Canada and 1.670 for Iran.

In the digital technology domain, the financial scales exhibited moderate reliability in the Canadian sample, with a scale reliability coefficient of 0.817 and an average interitem covariance of 0.204. However, the Iranian sample showed relatively lower reliability in the same scales, with a scale reliability coefficient of 0.552 and an average interitem covariance of 0.173. On the other hand, the non-financial digital technology scales demonstrated high reliability in both samples, with scale reliability coefficients of 0.827 for Canada and 0.915 for Iran. The average interitem covariances were 0.579 for Canada and 0.781 for Iran.

Among the digital technology capability scales, the strategic capabilities scales exhibited high reliability with scale reliability coefficients of 0.882 for Canada and 0.782 for Iran. The functional capabilities scales also showed high reliability, with coefficients of 0.882 for Canada and 0.811 for Iran. In the operational capabilities scales, the Canadian sample demonstrated a reliable scale reliability coefficient of 0.863. However, there was a discrepancy in the scale name for the same measure in Canada, with a scale reliability coefficient of 0.758.

In summary, our investigation into the reliability of test results and internal consistency revealed that, in the majority of cases, we achieved a high degree of consistency among a set of items when administered to a specific group of individuals at a particular point in time. Internal consistency reflects the extent to which all items in a test measure the same underlying concept or construct, indicating the interconnectedness of items within the test. Our findings consistently exceeded the threshold of 0.7, underscoring the robustness of our results (Brown, 2002; Cervantes, 2005; Tavakol & Dennick, 2011).

Overall, the main findings are:

- Resource and Capability Factors: Both Canada and Iran exhibit relatively high-reliability coefficients for the capability-related scales, indicating the consistent measurement of capabilities. However, Canada shows better reliability in the resource-related scales.
- Digital Technologies: The reliability of digital technology-related scales varies. For Canada, some scales like "Digital Technologies-Functional capabilities" show relatively high reliability, while others like "Digital Technologies-Financial" exhibit lower reliability. Iran's digital technology-related scales, on the other hand, generally demonstrate lower reliability.
- Strategic and Operational Capabilities: Canada's scales related to "Digital Technologies-Strategic capabilities" and "Digital Technologies-Operational capabilities" show relatively high reliability, suggesting consistency in measuring these capabilities. Iran's "Digital Technologies-Strategic capabilities" scale, however, has a lower reliability coefficient.

In general, Canada tends to have higher average interitem covariance and higher scale reliability coefficients compared to Iran. This suggests that the measurement scales in Canada are more internally consistent and reliable across various factors and indicators.

6.2.3. Consensus Analysis

The summary of our findings reveals a notable trend toward increased consensus during the second phase of our study, both in Iran and Canada. However, it is important to highlight instances where the standard deviation (SD) has expanded during this second phase, indicating a greater divergence of opinions among participants. This divergence can be attributed to a range of influential factors, including the complexity of issues (Collingridge & Reeve, 1986; Stirling, 2008), differing organizational perspectives (Pätäri, 2010), differences in epistemic and normative views (Kattirtzi & Winskel, 2020), and uncertainty (Kattirtzi & Winskel, 2020).

In the following sections, we present a detailed breakdown of our findings within each respective category.

Non-Financial Performance Resource Standard Deviations (SD)

The first table in Appendix 6 displays the standard deviations (SD) of survey responses regarding the importance of different resources on non-financial performance.

Comparing the standard deviations in the second phase, we observe that for most resources, the standard deviations have decreased in both countries. This implies that there is a higher level of consensus or agreement regarding the importance of these resources for non-financial performance in both Canada and Iran. It indicates that respondents in both countries were more aligned in their opinions during the second phase of the survey. However, it is worth highlighting that a discernible increase in standard deviations pertaining to asset portfolio management in Iran has been observed during the second phase, as contrasted with the initial phase of the study. This observation alludes to a pronounced shift toward a less consensual viewpoint among respondents in Iran concerning the relative significance of these financial resources.

Moreover, it seems that in the first phase, the standard deviations vary for each resource between Canada and Iran. It indicates that there was less agreement or consensus on the importance of these resources in Iran compared to Canada.

Non-Financial Performance Capabilities Standard Deviations (SD)

The second table in Appendix 5 presents the standard deviations (SD) of survey responses that rank the importance of different capabilities on non-financial performance.

Upon comparing the standard deviations in the second phase of the survey, a noteworthy pattern emerges. For the majority of capabilities assessed, standard deviations have exhibited a consistent decrease in both Canada and Iran. This decrease signifies a heightened level of consensus and agreement among respondents regarding the significance of these capabilities in influencing non-financial performance within both countries. This trend suggests that respondents in both nations converged in their viewpoints during the second phase of the survey, aligning their opinions to a greater extent.

However, it is essential to acknowledge that this pattern does not apply universally. Some capabilities, including Knowledge Management Functions, Income Diversification, Digital Transactions (specifically ATM and Mobile Transactions), and Marketing Ethics in Canada, have shown an increase in standard deviations during the second phase when focusing on Iran. Similarly, when analyzing Effective Resource and Capability Management, Partnership with Technology Companies, Knowledge Management

Functions, and Digital Transactions (ATM/Mobile Transactions) in Iran, another increase in standard deviations is observed during the second phase compared to the first phase. These specific increases in standard deviations point towards a decreased consensus or a higher degree of divergence among respondents in Iran concerning the significance of these particular capabilities.

Also, it appears that in the first phase, there were variations in the standard deviations for each capability between Canada and Iran. This suggests that there was less consensus or agreement among respondents in Iran compared to Canada regarding the importance of these capabilities for non-financial performance.

Financial Performance Resource Standard Deviations (SD)

Appendix 5 also displays the standard deviations (SD) of survey responses regarding the importance of different resources on financial performance.

Comparing the standard deviations in the second phase, we observe that for most resources, the standard deviations have improved or decreased in both countries. This improvement indicates a higher level of consensus or agreement among respondents regarding the importance of these resources for financial performance in both Canada and Iran. It suggests that respondents in both countries were more aligned in their opinions during the second phase of the survey.

Nevertheless, it is worth highlighting that for Information Technology expenses, Investment in Data Analytics, and the Age of Investment in Data Analytics, a slight increase in standard deviation has been observed in Canada during the second phase in contrast to the first phase. This suggests the possibility of divergent opinions among respondents in Canada regarding the significance of these specific resources.

Also, it seems that in the first phase, there were variations in the standard deviations for each resource between Canada and Iran. This indicates that there was less consensus or agreement among respondents in Iran compared to Canada regarding the importance of these resources for financial performance.

Financial Performance Capabilities Standard Deviations (SD)

As it is clear in Appendix 5, for most capabilities having impacts on financial performance, the standard deviations have decreased in both Canada and Iran. However, for some capabilities such as Digital servitization orientation the standard deviations remain relatively high in both countries, indicating potential differences in opinions among respondents.

Non-Financial and Financial Performance Digital Technologies Standard Deviations (SD)

According to Appendix 5, we observe a significant improvement in consensus or agreement among respondents regarding the importance of digital technologies for both non-financial and financial performance. In the second phase, the standard deviations have generally decreased for most digital technologies in both Canada and Iran. This indicates a convergence of opinions among respondents in both countries. However, it's worth noting that some digital technologies still exhibit relatively high standard deviations in the second phase, suggesting the presence of divergent viewpoints among respondents.

Digital Technologies readiness Standard Deviations (SD)

Appendix 5 also displays the standard deviation for all technologies concerning the maturity of each capability type in Canada and Iran across two rounds of surveys. Below are the main findings of each category of digital technologies:

- In terms of Standard deviations for Security and Privacy technologies in Canada and Iran across two rounds of surveys, the consensus among participants in Canada seems relatively stable across both rounds, with consistent standard deviations for the strategic and functional capabilities of Security and Privacy technologies. However, in Iran, there was slightly higher variability in opinions, especially in the first round
- SD for infrastructure technologies shows that the consensus among analysts in Canada and Iran is relatively stable across both rounds, with consistent standard deviations for the functional and operational capabilities of Cloud Banking Technology. However, there is some variability in opinions regarding the strategic capability, particularly in the first round in Canada.
- In the second round, the standard deviations for Automation technologies in both countries generally decreased compared to the first round. This indicates a reduction in the dispersion of opinions among analysts, suggesting a potentially improved consensus in the second phase.
- The second phase of surveys generally yielded lower standard deviations for Artificial Intelligence and Analysis technologies compared to the first phase. The standard deviations for Artificial Intelligence and Analysis technologies varied

across different capabilities and between the two countries. While some capabilities showed consistent levels of consensus, others exhibited slight variations.

- Canada generally exhibits higher standard deviations across most digital engagement technologies and phases, indicating less consensus among participants. This suggests that opinions and ratings for Digital Engagement technologies vary more among analysts in Canada. On the other hand, Iran generally shows lower standard deviations, indicating a higher level of consensus among participants for most technologies and phases. Analysts in Iran seem to have more consistent opinions and ratings for Digital Engagement technologies.
- There are some variations in standard deviation values between the first and second rounds conducted in both Canada and Iran. These differences could indicate changes in participants' opinions or differing levels of understanding between the two rounds. Also, the standard deviation values for the Strategy dimension are relatively lower compared to the Functionality and Operational dimensions. This suggests a higher level of consensus among the participants regarding the strategic aspects of the technologies.

All in all, the findings suggest that Canada and Iran exhibit varying degrees of consensus and variability in their perceptions of digital technologies. The observed stability in certain areas and reductions in standard deviations imply potential trends toward increased agreement or understanding over survey rounds. These insights underscore the importance of considering regional nuances and evolving opinions when assessing the maturity of digital capabilities in diverse contexts.

6.2.4. Comparison Analysis

In this section, we analyze the findings pertaining to the importance of capabilities, resources, and digital technologies in enhancing performance. Initially, we examine non-financial performance, followed by an evaluation of financial performance. For each aspect, we conduct descriptive analysis and visually present the results. Subsequently, we employ t-test analysis to determine whether there are significant differences in the responses of participants from Iran and Canada.

6.2.4.1. Resource-non-financial performance

Descriptive analysis

In this section, we conducted a comparison of rankings for resources, capabilities, and digital technologies between two groups of participants: Iran and Canada. We aimed to identify any potential differences in perceptions regarding the importance of them. To accomplish this, we calculated the average scores for rankings in the second phase of the survey and analyzed the results. The findings of this comparison are presented below. In this report, the first-ranked factor is assigned a ranking of 1, while other factors follow sequentially. As the rank number increases, the importance decreases.

Figure 11 illustrates the ranking of resource importance in relation to their impact on non-financial performance during digital transformation, as perceived by participants from both Iran and Canada.

By grouping similarities and differences, we can gain insights into the shared and distinct perspectives of the two groups.

Both Canadian and Iranian participants ranked capital and investment in IT as the top two important resources. This demonstrates a consensus on the significance of financial resources and IT investments for achieving non-financial performance during digital transformation. Also, participants from both countries placed the age of data analytics in the sixth and seventh positions, respectively. This suggests a similar recognition of the importance of utilizing advanced data analytics and loans in driving non-financial performance.

However, Canadian participants ranked information technology expenses as the third most important resource, whereas Iran ranked it fourth. Moreover, Iranian participants ranked investment in data analytics higher at the fourth position, while Canadian participants ranked it fifth. In contrast, Canadian participants ranked Deposit higher at the fifth position, whereas Iranian participants ranked it and the third most important rank which is third. Finally, Iranian participants ranked the Physical branch higher at the seventh position, while Canadian participants ranked it last.

Overall, while there may be slight variations in ranking in certain instances, these differences are relatively minor. Notably, both sets of participants from the respective countries consistently ranked the importance of resources in digital transformation for enhancing non-financial performance in a remarkably similar manner. This alignment underscores the overarching significance of resources in the context of digital transformation.

Most importantly, it becomes evident that capital and investments in Information Technology (IT) emerge as pivotal resources in both contexts. This revelation underscores their pivotal roles as primary enablers for the successful adoption and implementation of cutting-edge technologies. In today's dynamic digital landscape, the imperative for organizations to maintain competitiveness and relevance hinges on their continuous commitment to updating and enhancing their technological infrastructure. The importance of capital and investments in Information Technology (IT) have been studied by Cao et al. (2022) and Gul and Ellahi (2021), who focused on specific regions and evaluated the impact of these on performance, but did not assess a comparison between resources.

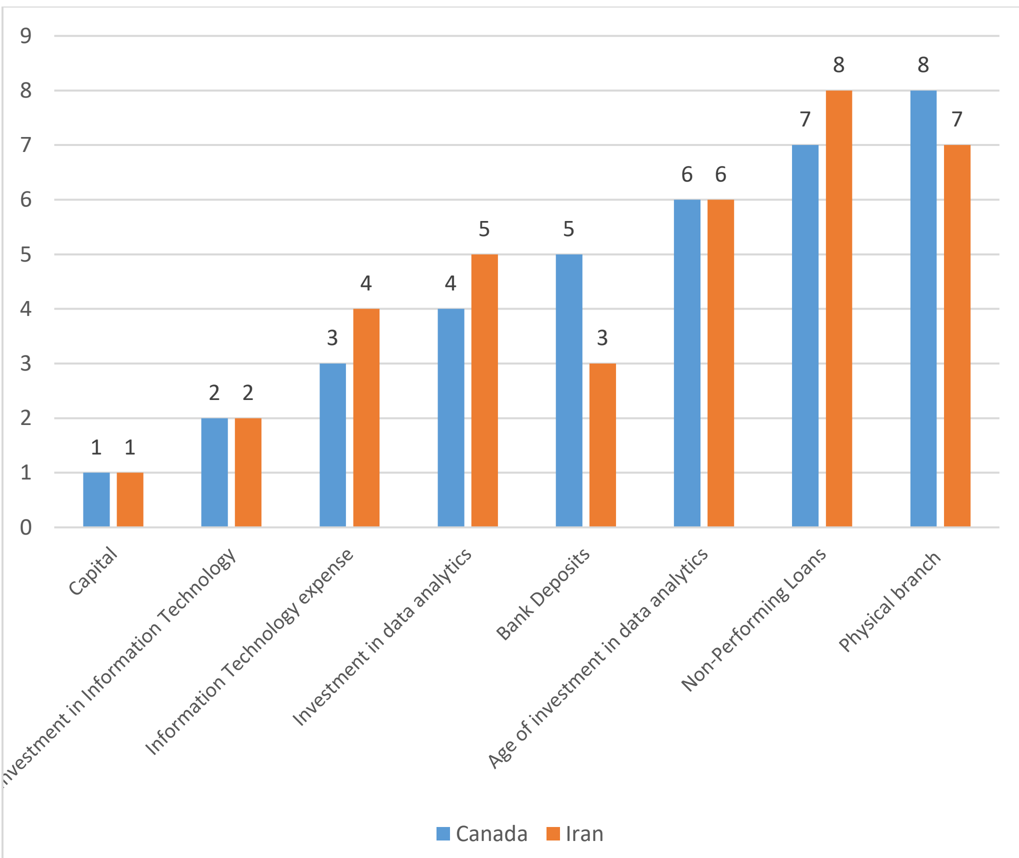


Figure 11- Ranking Importance of Resources in Terms of Impact on Non-financial Performance

Factor Importance Ranking (1 = Most Important, 2 = Second Most Important, 3 = Third Most Important, ..., 10 = Less Important; Higher numbers indicate lower importance)

Statistical tests for comparing the importance of resources for no financial performance

We conducted t-tests using SPSS to examine potential significant differences between the rankings of capabilities, resources, and digital technologies in Iran and Canada in the second round of the Delphi. The results of these tests are presented below.

Appendix 6 provides the group statistics, including the sample size (N), mean, standard deviation and standard error mean for each country within different performance categories. Table 13 presents the results of the t-tests, including Levene's test for equality of variances and the t-test for equality of means.

The t-tests reveal noteworthy disparities in the assessment of Investment in IT and Deposits. In the case of Investment in IT and Deposits, the p-value is less than 0.05, signifying a statistically significant distinction. Participants from Iran and Canada exhibit significantly divergent evaluations of the significance of these resources in enhancing non-financial performance, with Canada potentially affording them higher importance. This divergence could be attributed to a variety of external factors. For example, according to Ramanathan et al. (2017) the regulatory environment, which we will delve into in the subsequent phase of our study, may also contribute to these disparities.

However, for the remaining resources, there exists no statistically significant variance in the assessments made by participants from Iran and Canada regarding their role in enhancing non-financial performance. This coherence may be due to the possibility that both Iranian and Canadian participants share a collective comprehension of the importance of these resources within the framework of non-financial performance during digital transformation. This shared understanding could be attributed to the influence of international best practices, global industry standards, or the exchange of knowledge transcending national boundaries.

Table 12- T-test- resource non-financial performance

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Capital	Eva	6.828	0.018	-0.915	17	0.373	-0.386	0.422	-1.277	0.505
	EVna			-1.030	14.135	0.321	-0.386	0.375	-1.191	0.418
Investment in Information Technology	Eva	5.560	0.031	-3.653	17	0.002	-1.523	0.417	-2.402	-0.643
	EVna			-4.106	14.233	0.001	-1.523	0.371	-2.317	-0.729
Information Technology expense	Eva	64.673	0.000	-0.684	17	0.503	-0.455	0.664	-1.856	0.947
	EVna			-0.809	10.000	0.437	-0.455	0.562	-1.706	0.797
Investment in data analytics	Eva	2.104	0.165	1.282	17	0.217	0.307	0.239	-0.198	0.812
	EVna			1.391	16.440	0.183	0.307	0.221	-0.160	0.774
Deposits	Eva	14.797	0.001	1.908	17	0.073	1.511	0.792	-0.160	3.183
	EVna			2.236	10.701	0.048	1.511	0.676	0.018	3.004
Age of investment in data analytics	Eva	0.824	0.377	1.890	17	0.076	0.466	0.246	-0.054	0.986
	EVna			1.903	15.609	0.076	0.466	0.245	-0.054	0.986
Non-Performing Loans	Eva	0.010	0.921	-0.914	17	0.373	-0.295	0.323	-0.977	0.387
	EVna			-0.910	14.979	0.377	-0.295	0.325	-0.988	0.397
Physical branch	Eva	0.450	0.511	0.787	17	0.442	0.375	0.476	-0.630	1.380
	EVna			0.811	16.579	0.429	0.375	0.463	-0.603	1.353

NOTE:”EVa" (Equal Variances assumed), "EVna" (Equal Variances not assumed)

6.2.4.2. Capabilities-non-financial performance

Descriptive analysis

The rankings provided by participants from Canada and Iran regarding the importance of capabilities for non-financial performance during digital transformation reveal insights into their perceptions and priorities as is in Figure 12.

Both Canadian and Iranian participants displayed a notable consensus in their rankings of certain strategic capabilities. Specifically, digital strategy and innovation-driven capability, along with marketing strategy and customer centric capability, secured positions within the top four in both countries. This shared ranking underscores a common understanding of the pivotal role these strategic capabilities play in achieving non-financial performance goals. It implies that both groups held nearly identical attitudes toward the importance of these strategic capabilities in driving success.

However, striking disparities emerge in the ranking of certain capabilities between the two countries. Notably, one of the most significant differences lies in the assessment of Organizational Digital Literacy. In Canada, this operational capability secured a high rank at 7, while in Iran, it found itself at a considerably lower position, occupying the 17th spot. This notable divergence raises questions regarding the factors contributing to such disparities, a topic we will delve into further, drawing insights from external factors as elucidated by Ramanathan et al. (2017).

Understanding the ranking of these capabilities is crucial as it provides valuable insights into the strategic priorities of different banking sectors (Suandi et al., 2022; P. Setia et al., 2013; Cao et al., 2022). This comprehension enables organizations to allocate resources efficiently, focusing on the capabilities deemed most crucial for achieving non-financial performance goals. It aids in optimizing their strategies and investments to enhance competitiveness and innovation. Furthermore, comparing these rankings between countries is essential as it sheds light on the contextual nuances that influence strategic assessments (Suandi et al., 2022; Ramanathan et al., 2017). Cross-country comparisons help identify the impact of diverse economic, regulatory, cultural, and market conditions on the perceived importance of these capabilities. This knowledge is vital for multinational institutions and policymakers seeking to tailor strategies and policies to specific regions, ensuring they align with the unique dynamics and priorities of each banking sector.

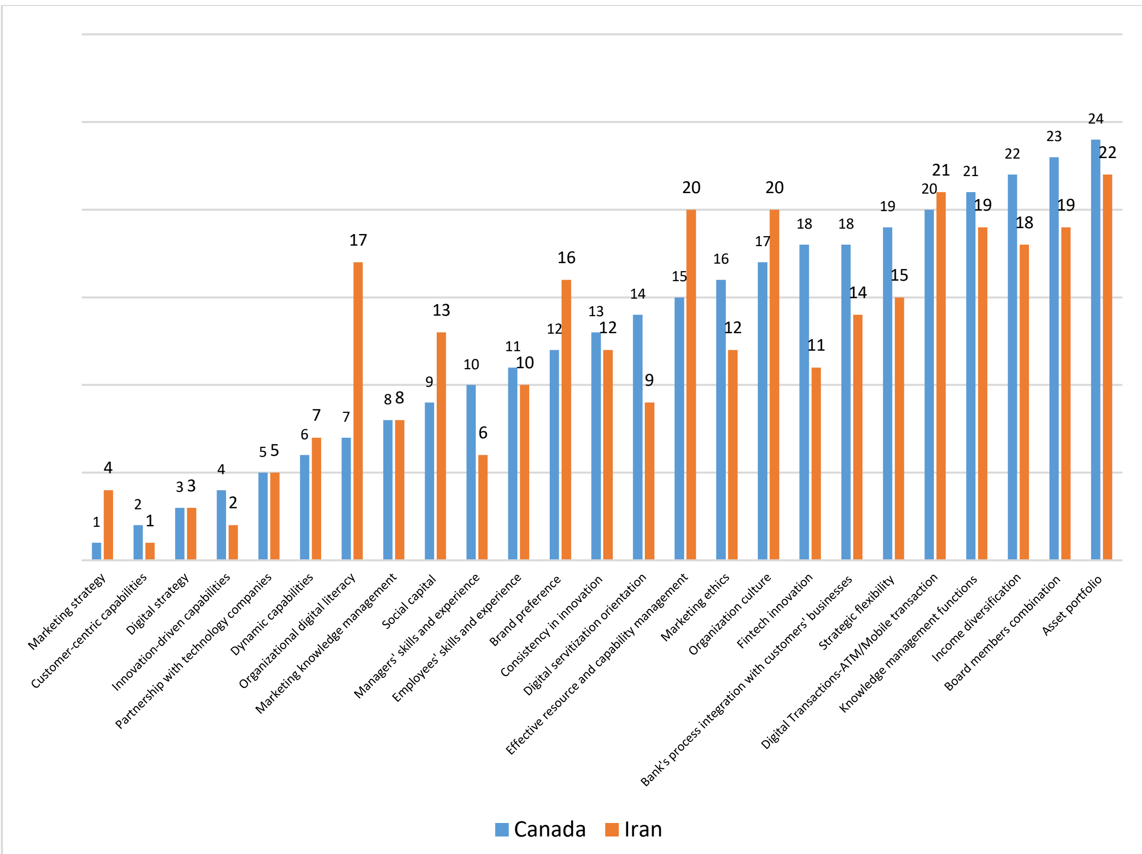


Figure 12- Ranking Importance of Capabilities in Terms of Impact on Non-financial Performance

Factor Importance Ranking (1 = Most Important, 2 = Second Most Important, 3 = Third Most Important, ..., 24 = Less Important; Higher numbers indicate lower importance)

Statistical tests for comparing the importance of capabilities in terms of non-financial performance

Appendix 6 presents group statistics for various non-financial performance capabilities in the two countries. Table 13 presents the results of t-tests comparing the means of the two groups' ranking capabilities in terms of no financial performance. The Bonferroni correction is a conservative statistical method employed to address the multiple comparisons problem. When conducting numerous hypothesis tests simultaneously, the risk of encountering false positives (Type I errors) increases (Haynes, 2013). In our study, we performed 25 t-tests with an original significance level (alpha) of 0.05. To mitigate the inflated risk of false positives due to multiple comparisons, we applied the Bonferroni correction. This method adjusts the significance threshold for each individual test by dividing the original alpha by the total number of tests (25). Consequently, we considered a corrected alpha of approximately 0.002 for each t-test. By doing so, we ensured a more stringent control over the overall family-wise error rate while comparing only two groups.

Several capabilities showed statistically significant relationships with non-financial performance. However, it's noteworthy that some other capabilities did not demonstrate statistical significance in this particular context. One possible explanation for this lack of significance is that non-financial performance is influenced by a complex interplay of various factors, including the interdependence of multiple capabilities. When multiple factors are at play, it becomes more challenging to isolate and attribute the specific effect of a single capability on non-financial performance.

Table 13- T-test- capabilities- non-financial performance

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Customer-centric capabilities	Eva	0.003	0.956	0.860	17	0.402	0.489	0.568	-0.710	1.687
	EVna			0.879	16.309	0.392	0.489	0.556	-0.688	1.665
Digital strategy	Eva	2.616	0.124	-2.267	17	0.037	-1.205	0.531	-2.326	-0.084
	EVna			-2.497	15.673	0.024	-1.205	0.482	-2.229	-0.180
Marketing strategy	EVa	0.028	0.869	-3.353	17	0.004	-1.545	0.461	-2.518	-0.573
	EVna			-3.416	16.167	0.003	-1.545	0.452	-2.504	-0.587
Innovation-driven capabilities	EVa	6.158	0.024	9.056	17	0.000	2.500	0.276	1.918	3.082
	EVna			8.351	10.539	0.000	2.500	0.299	1.838	3.162
Fintech innovation	EVa	0.005	0.944	2.629	17	0.018	1.284	0.488	0.254	2.315
	EVna			2.724	16.749	0.015	1.284	0.471	0.288	2.280
Dynamic capabilities	EVa	7.909	0.012	1.595	17	0.129	1.216	0.763	-0.393	2.825
	EVna			1.414	8.735	0.192	1.216	0.860	-0.738	3.170
Organizational digital literacy	EVa	0.095	0.762	-6.450	17	0.000	-8.295	1.286	-11.009	-5.582
	EVna			-6.784	16.989	0.000	-8.295	1.223	-10.875	-5.716
Marketing knowledge management	EVa	0.012	0.915	3.125	17	0.006	2.807	0.898	0.912	4.702
	EVna			3.276	16.963	0.004	2.807	0.857	0.999	4.615
Managers' skills and experience	EVa	0.463	0.505	6.054	17	0.000	4.955	0.818	3.228	6.681
	EVna			5.820	12.886	0.000	4.955	0.851	3.114	6.795
Employees' skills and experience	EVa	0.122	0.732	1.365	17	0.190	1.375	1.007	-0.750	3.500
	EVna			1.422	16.865	0.173	1.375	0.967	-0.667	3.417
Digital servitization orientation	EVa	0.163	0.692	5.199	17	0.000	4.386	0.844	2.606	6.166
	EVna			5.123	14.394	0.000	4.386	0.856	2.555	6.218
Effective resource and capability management	EVa	3.542	0.077	-3.910	17	0.001	-6.318	1.616	-9.728	-2.909
	EVna			-4.274	16.082	0.001	-6.318	1.478	-9.450	-3.186
Organization culture	EVa	0.071	0.793	-4.013	17	0.001	-4.705	1.172	-7.178	-2.231
	EVna			-3.951	14.346	0.001	-4.705	1.191	-7.253	-2.156
Partnership with technology companies	EVa	1.027	0.325	3.766	17	0.002	6.511	1.729	2.863	10.160
	EVna			3.744	14.919	0.002	6.511	1.739	2.803	10.220
Knowledge management functions	EVa	0.951	0.343	-0.510	17	0.616	-0.784	1.536	-4.025	2.457
	EVna			-0.497	13.710	0.627	-0.784	1.577	-4.172	2.604
Income diversification	EVa	1.128	0.303	1.898	17	0.075	3.273	1.725	-0.366	6.911
	EVna			1.866	14.270	0.083	3.273	1.754	-0.482	7.028
Digital Transactions-ATM/Mobile transaction	EVa	0.978	0.337	-1.009	17	0.327	-2.409	2.388	-7.447	2.629
	EVna			-0.944	11.293	0.365	-2.409	2.553	-8.011	3.192
Marketing ethics	EVa	27.021	0.000	1.004	17	0.329	2.761	2.750	-3.040	8.563
	EVna			0.858	7.387	0.418	2.761	3.219	-4.771	10.294
Social capital	EVa	6.703	0.019	-1.073	17	0.298	-2.909	2.712	-8.630	2.812
	EVna			-0.997	10.968	0.340	-2.909	2.917	-9.331	3.512
Brand preference	EVa	16.427	0.001	-2.003	17	0.061	-4.023	2.009	-8.261	0.215
	EVna			-1.801	9.339	0.104	-4.023	2.233	-9.047	1.001
Consistency in innovation	EVa	18.814	0.000	0.058	17	0.954	0.136	2.344	-4.809	5.081
	EVna			0.052	8.848	0.960	0.136	2.636	-5.842	6.115
Strategic flexibility	EVa	0.000	0.988	0.651	17	0.524	1.409	2.165	-3.158	5.976

	EVna			0.651	15.236	0.525	1.409	2.165	-3.199	6.017
Bank's process integration with customers' businesses	EVa	4.782	0.043	0.945	17	0.358	1.693	1.791	-2.085	5.471
	EVna			0.863	10.046	0.408	1.693	1.961	-2.674	6.060
Board members combination	EVa	0.090	0.768	1.051	17	0.308	1.091	1.038	-1.100	3.282
	EVna			1.072	16.248	0.299	1.091	1.017	-1.063	3.245
Asset portfolio management	EVa	1.667	0.214	-0.248	17	0.807	-0.420	1.693	-3.992	3.151
	EVna			-0.279	14.254	0.784	-0.420	1.506	-3.646	2.805

NOTE:"EVa" (Equal Variances assumed), "EVna" (Equal Variances not assumed)

6.2.4.3. Digital technologies -non-financial performance

Descriptive analysis

The rankings provided by participants from Canada and Iran regarding the importance of digital technologies for non-financial performance highlight both similarities and differences in their perceptions and priorities as shown in Figure 13.

When comparing the importance of digital technologies in enhancing non-financial performance in digital banking, we found that the digital banking platform, a key digital engagement technology, holds the highest significance for both countries. Open banking follows as the second most important technology for Iranians and holds the third position for Canadians. Conversational technologies rank second in importance for Canadians, while digital personal financial assistance takes the third spot for Iranians.

There are minimal differences in rankings across the other technologies, except for banking APIs and platforms, which are notably more important for Iranians than for Canadians.

In the existing literature, the importance of these technologies for improving bank performance has rarely been studied comprehensively. Typically, when examining capabilities to enhance performance, research has focused on the specific scope of one of these technologies. For instance, one study explores the capabilities that financial institutions gain from big data analytics (Edu, 2022).

In conclusion, our comparative analysis sheds light on the significance of digital technologies in digital banking and underscores the need for further research and strategic considerations to leverage these technologies effectively in different regional contexts.

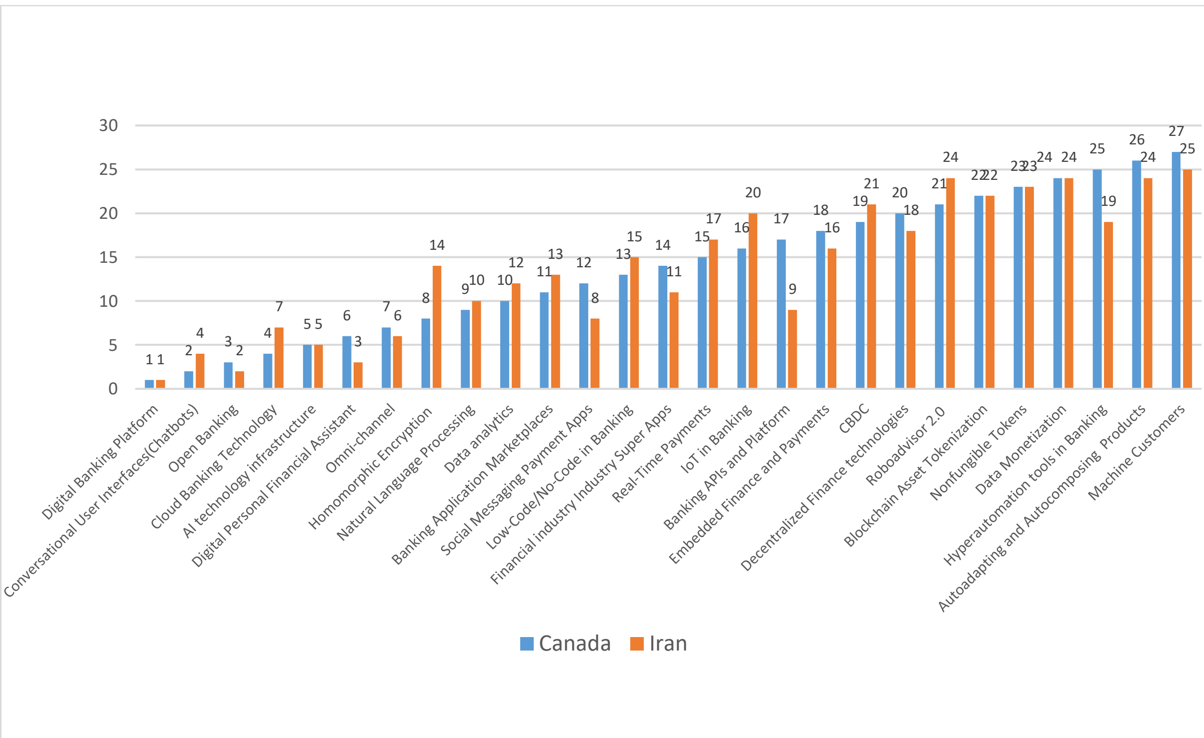


Figure 13- Ranking Importance of Digital Technologies in Terms of Impact on Non-financial Performance

Factor Importance Ranking (1 = Most Important, 2 = Second Most Important, 3 = Third Most Important, ..., 27 = Less Important; Higher numbers indicate lower importance)

Statistical tests for comparing the importance of digital technologies for non-financial performance

Based on the t-test analysis conducted on various dimensions of digital technologies and non-financial performance, the following conclusions can be drawn from Table 14. In this test, as the total number of the tests are 27, the alpha Bonferroni corrected is 0.0018.

We conducted an analysis to assess whether there were notable discrepancies in mean rankings between Iranian and Canadian respondents regarding digital technologies' impact on non-financial performance. Our findings indicate that significant differences in rankings emerged for some technologies. However, for the remaining technologies, no statistically significant distinctions were observed.

These results could be attributed to a shared perspective or consensus between the Iranian and Canadian respondents regarding the importance and effectiveness of these technologies for non-financial purposes. In essence, both groups appeared to align closely in their rankings, resulting in minimal variance. Consequently, statistical tests might not have detected substantial differences due to this high level of agreement.

This outcome suggests a potential convergence in perceptions between the two respondent groups concerning the significance of various digital technologies for non-financial performance, as evidenced by the limited variability in their rankings.

Table 14- T-test- digital technologies- Non-financial performance

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
AI technology infrastructure	Eva	2.536	0.130	-0.986	17	0.338	-0.784	0.795	-2.462	0.894
	EVna			-0.900	10.045	0.389	-0.784	0.871	-2.723	1.155
Banking APIs and Platform	Eva	3.713	0.071	7.768	17	0.000	7.193	0.926	5.240	9.147
	EVna			7.263	11.277	0.000	7.193	0.990	5.020	9.366
Banking Application Marketplaces	Eva	0.232	0.637	-5.675	17	0.000	-3.000	0.529	-4.115	-1.885
	EVna			-5.593	14.403	0.000	-3.000	0.536	-4.147	-1.853
Blockchain Asset Tokenization	Eva	0.005	0.944	0.623	17	0.542	0.591	0.949	-1.411	2.593
	EVna			0.626	15.555	0.540	0.591	0.943	-1.414	2.596
Digital Personal Financial Assistant	Eva	2.755	0.115	0.730	17	0.475	0.193	0.265	-0.365	0.751
	EVna			0.666	10.009	0.520	0.193	0.290	-0.453	0.839
Digital Personal Financial Assistant	Eva	0.032	0.861	4.111	17	0.001	1.989	0.484	0.968	3.009
	EVna			3.946	12.789	0.002	1.989	0.504	0.898	3.079
Embedded Finance and Payments	Eva	0.282	0.602	3.058	17	0.007	1.636	0.535	0.507	2.765
	EVna			3.224	16.999	0.005	1.636	0.507	0.566	2.707
Financial industry Super Apps	Eva	2.640	0.123	4.869	17	0.000	3.739	0.768	2.119	5.359
	EVna			5.335	15.964	0.000	3.739	0.701	2.253	5.224
Hyperautomation tools in Banking	Eva	10.218	0.005	4.570	17	0.000	5.818	1.273	3.132	8.504
	EVna			5.136	14.235	0.000	5.818	1.133	3.392	8.244
IoT in Banking	Eva	0.040	0.844	-4.219	17	0.001	-3.670	0.870	-5.506	-1.835
	EVna			-4.211	15.135	0.001	-3.670	0.872	-5.527	-1.814
Low-Code/No-Code in Banking	Eva	0.945	0.345	-4.892	17	0.000	-2.557	0.523	-3.660	-1.454
	EVna			-4.671	12.487	0.000	-2.557	0.547	-3.744	-1.369
Machine Customers	Eva	0.029	0.868	-1.844	17	0.083	-0.761	0.413	-1.632	0.110
	EVna			-1.783	13.251	0.097	-0.761	0.427	-1.682	0.159
Nonfungible Tokens	Eva	0.407	0.532	0.081	17	0.936	0.057	0.699	-1.419	1.532
	EVna			0.087	16.881	0.932	0.057	0.654	-1.324	1.438
Open Banking	Eva	2.741	0.116	1.471	17	0.160	2.318	1.576	-1.007	5.644
	EVna			1.289	8.282	0.232	2.318	1.798	-1.804	6.440
Roboadvisor 2.0	Eva	44.034	0.000	-2.855	17	0.011	-4.295	1.505	-7.470	-1.121
	EVna			-2.444	7.458	0.042	-4.295	1.757	-8.400	-0.191
Social Messaging Payment Apps	Eva	0.979	0.336	8.215	17	0.000	4.943	0.602	3.674	6.213
	EVna			8.746	16.947	0.000	4.943	0.565	3.750	6.136
Autoadapting and Autocomposing Products	Eva	0.948	0.344	-0.614	17	0.547	-0.295	0.481	-1.311	0.720
	EVna			-0.639	16.844	0.532	-0.295	0.463	-1.272	0.681
CBDC	Eva	1.023	0.326	-0.955	17	0.353	-0.477	0.500	-1.532	0.578
	EVna			-1.042	16.140	0.313	-0.477	0.458	-1.447	0.493
Cloud Banking Technology	Eva	0.338	0.569	-2.425	17	0.027	-2.159	0.890	-4.037	-0.281
	EVna			-2.281	11.606	0.042	-2.159	0.947	-4.229	-0.089
Conversational User Interfaces(Chatbots)	Eva	1.706	0.209	-1.515	17	0.148	-1.068	0.705	-2.556	0.419
	EVna			-1.718	13.512	0.109	-1.068	0.622	-2.406	0.270
Data analytics	Eva	0.002	0.964	-1.585	17	0.131	-1.102	0.695	-2.569	0.365
	EVna			-1.676	16.999	0.112	-1.102	0.658	-2.490	0.285
Data Monetization	Eva	1.428	0.249	-0.201	17	0.843	-0.170	0.848	-1.959	1.618
	EVna			-0.185	10.502	0.857	-0.170	0.920	-2.207	1.866
Decentralized Finance technologies	Eva	0.053	0.821	3.415	17	0.003	1.830	0.536	0.699	2.960
	EVna			3.492	16.319	0.003	1.830	0.524	0.721	2.938
Homomorphic Encryption	Eva	0.075	0.788	-5.825	17	0.000	-6.886	1.182	-9.381	-4.392
	EVna			-5.896	15.868	0.000	-6.886	1.168	-9.364	-4.409
Natural Language Processing	Eva	0.113	0.741	-4.415	17	0.000	-2.114	0.479	-3.124	-1.104
	EVna			-4.250	12.974	0.001	-2.114	0.497	-3.188	-1.039

Omni-channel	Eva	0.316	0.581	0.514	17	0.614	0.375	0.729	-1.164	1.914
	EVna			0.559	16.338	0.584	0.375	0.671	-1.044	1.794
Real-Time Payments	Eva	1.972	0.178	-2.028	17	0.059	-1.920	0.947	-3.918	0.077
	EVna			-2.250	15.194	0.040	-1.920	0.853	-3.738	-0.103

NOTE:"EVa" (Equal Variances assumed), "EVna" (Equal Variances not assumed)

6.2.4.4. Resources-Financial performance

Descriptive analysis

The rankings provided by participants from Canada and Iran regarding the importance of resources for financial performance are presented in Figure 14. By examining the rankings, we can identify commonalities and distinctions between the two groups.

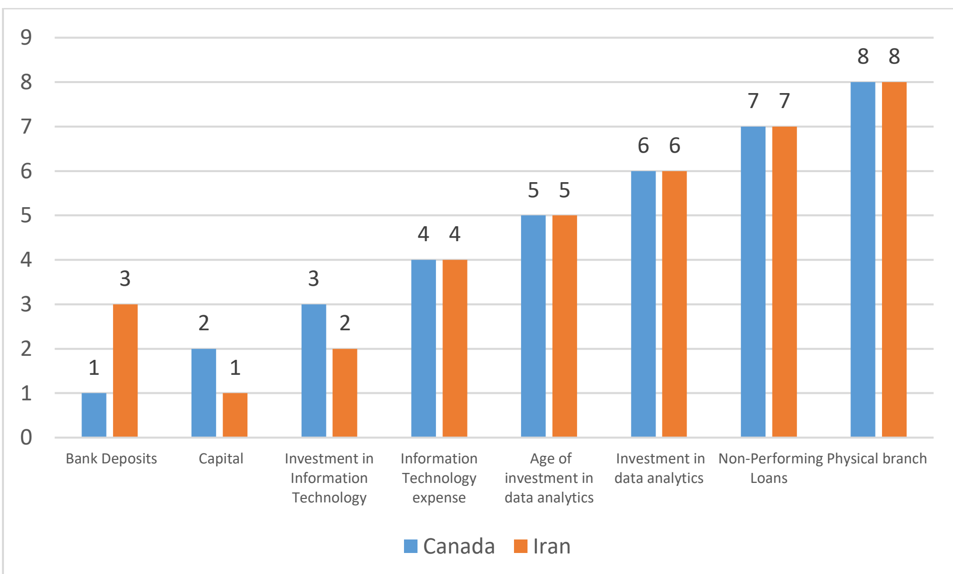


Figure 14- Ranking Importance of Resources in Terms of Impact on Financial Performance

Factor Importance Ranking (1 = Most Important, 2 = Second Most Important, 3 = Third Most Important, ..., 8 = Less Important; Higher numbers indicate lower importance)

It is evident that the ranking of resource importance for enhancing financial performance is largely consistent between Iran and Canada, with some minor differences. This consistency underscores the significance of resources, regardless of the specific context. In Iran, capital emerges as the most crucial resource for improving financial performance, aligning precisely with our findings regarding resources and non-financial performance. However, in Canada, concerning financial performance, capital has shifted to the second position in terms of importance, while deposits has assumed the most critical role. Notably, Cao et al. (2022) and Gul et al. (2021) have explored the impacts of capital and deposits on performance in the United States and Pakistan respectively.

Statistical tests. for comparing the importance of resources for -financial performance

Appendix 6 provides information on group statistics and the results of the t-tests conducted to compare the means of different capabilities between Canada and Iran.

The results in Table 15 reveal interesting findings regarding the significance of the differences in means between Canada and Iran. The t-test results reveal a noteworthy contrast between the responses from Iranian and Canadian participants concerning Capital and Deposits, indicating a statistically significant difference in their perceptions of these two resources. However, it's important to note that for the remaining resources, our analysis did not find any statistically significant differences between the two groups. The observed differences in how Iranian and Canadian participants perceive the importance of Capital and Deposits may reflect variations in the economic and financial landscapes of these two countries. Further investigation into these differences could shed light on the unique challenges and opportunities faced by banks in each region.

Table 15- T-test- resources- financial performance

Levene's Test for Equality of Variances	t-test for Equality of Means

		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Capital	EVa	12.248	0.003	2.167	17	0.045	0.534	0.246	0.014	1.054
	EVna			1.919	8.685	0.088	0.534	0.278	-0.099	1.167
Banks Deposits	EVa	0.869	0.364	-2.268	17	0.037	-1.045	0.461	-2.018	-0.073
	EVna			-2.539	14.566	0.023	-1.045	0.412	-1.926	-0.165
Investment in Information Technology	EVa	1.583	0.225	1.195	17	0.249	0.341	0.285	-0.261	0.943
	EVna			1.143	12.598	0.274	0.341	0.298	-0.305	0.987
Non-Performing Loans	EVa	0.213	0.650	-0.854	17	0.405	-0.534	0.625	-1.853	0.785
	EVna			-0.904	16.995	0.379	-0.534	0.591	-1.780	0.712
Information Technology expense	EVa	3.057	0.098	1.389	17	0.183	0.886	0.638	-0.460	2.232
	EVna			1.257	9.601	0.239	0.886	0.705	-0.694	2.467
Investment in data analytics	EVa	1.461	0.243	0.000	17	1.000	0.000	0.422	-0.890	0.890
	EVna			0.000	9.855	1.000	0.000	0.464	-1.035	1.035
Age of investment in data analytics	EVa	21.899	0.000	0.266	17	0.793	0.193	0.726	-1.339	1.725
	EVna			0.232	8.128	0.822	0.193	0.832	-1.720	2.106
Physical branch	EVa	0.269	0.611	-0.682	17	0.505	-0.466	0.684	-1.908	0.976
	EVna			-0.750	15.729	0.464	-0.466	0.621	-1.785	0.853

NOTE:"EVa" (Equal Variances assumed), "EVna" (Equal Variances not assumed)

6.2.4.5. Capabilities -Financial performance

Descriptive analysis

As shown in Figure 15, we can identify commonalities and distinctions between the two groups' rankings regarding the importance of capabilities for financial performance.

In the existing literature, several studies have delved into the influence of capabilities on financial performance. However, these studies often concentrate on individual technologies rather than the broader spectrum of digital banking. Furthermore, they typically do not conduct comparative assessments of these capabilities. For instance, Cao et al. (2022) highlighted the importance for bank holding companies to enhance innovation capabilities and bolster diversification levels for improved resource utilization and overall performance. Additionally, Manser Payne et al. (2021) explored the impact of the development of AI-enabled banking activities, specifically those involving direct consumer engagement, on organizational performance. Below we discuss our findings in this section.

For Canadian participants, the most crucial capabilities for financial success include customer-centric approaches and marketing strategies, mirroring their priorities for non-financial performance. Interestingly, the ranking of partnerships with technology companies shifted, now occupying the third position for financial performance, which differs from its placement in non-financial performance. Strategic capabilities maintain their position among the top three most important capabilities.

Conversely, Iranian participants present a distinct viewpoint. They emphasize partnership with technology companies as the paramount capability for financial performance, closely followed by customer-centric approaches. However, in the third position, Iranians introduce a novel perspective, highlighting functional capabilities, specifically employees' skills and knowledge. This divergence from the Iranian perspective on non-financial performance sets them apart from Canadian participants, where functional capabilities did not rank among the top three priorities.

All in all, the comparative analysis of Canadian and Iranian participants' rankings on key capabilities for financial performance unveils significant divergences, highlighting varying priorities and perspectives. While Canadians place greater emphasis on managerial digital skills, digital strategy, flexibility, portfolio management, and the composition of board members, Iranians assign higher importance to marketing ethics and innovation capabilities compared to Canadians, showcasing the nuanced dynamics shaping their respective financial success strategies.

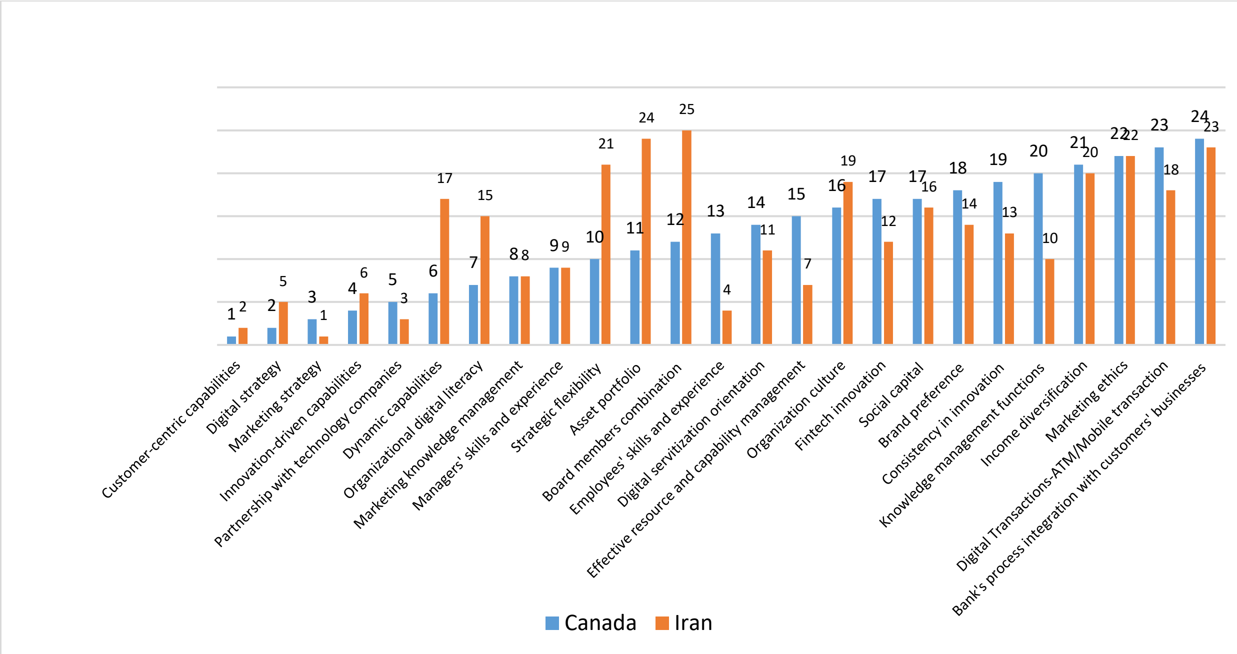


Figure 15- Ranking Importance of Capabilities in Terms of Impact on Financial Performance

Factor Importance Ranking (1 = Most Important, 2 = Second Most Important, 3 = Third Most Important, ..., 24 = Less Important; Higher numbers indicate lower importance)

Statistical tests for comparing the importance of capabilities for financial performance

Table 16 includes the results of several t-tests examining the relationship between capabilities and financial performance. In this test, as the total number of the tests are 25, the alpha Bonferroni corrected is 0. 002.The t-test results reveal significant differences in several capabilities that enhance financial performance between Iranian and Canadian perspectives. However, there were no significant differences found in others. These findings suggest that, in these specific areas, Iranian and Canadian participants share similar viewpoints and priorities, which may have important implications for understanding their perspectives on digital banking and financial performance.

Table 16- T test capabilities- financial performance

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	Upper
Customer-centric capabilities	Eva	0.027	0.871	-2.321	17	0.033	-0.807	0.348	-1.540	-0.074
	EVna			-2.325	15.324	0.034	-0.807	0.347	-1.545	-0.068
Marketing strategy	Eva	2.513	0.131	-7.686	17	0.000	-3.216	0.418	-4.099	-2.333
	EVna			-8.289	16.657	0.000	-3.216	0.388	-4.036	-2.396
Partnerships with technology companies	Eva	0.326	0.575	3.968	17	0.001	1.511	0.381	0.708	2.315
	EVna			4.208	16.987	0.001	1.511	0.359	0.753	2.269
Income diversification	Eva	2.055	0.170	-1.283	17	0.217	-1.239	0.966	-3.276	0.799
	EVna			-1.470	12.637	0.166	-1.239	0.843	-3.065	0.587
Employees' skills and experience	Eva	1.844	0.192	1.555	17	0.138	2.261	1.454	-0.806	5.329
	EVna			1.798	11.885	0.098	2.261	1.258	-0.482	5.005
Digital strategy	Eva	0.899	0.356	-11.528	17	0.000	-8.864	0.769	-10.486	-7.241
	EVna			-12.620	16.014	0.000	-8.864	0.702	-10.352	-7.375
Managers' skills and experience	Eva	0.032	0.861	-7.300	17	0.000	-5.841	0.800	-7.529	-4.153
	EVna			-7.692	16.997	0.000	-5.841	0.759	-7.443	-4.239
Dynamic capabilities	Eva	9.749	0.006	3.926	17	0.001	2.364	0.602	1.093	3.634
	EVna			3.584	10.044	0.005	2.364	0.659	0.895	3.832
Effective resource and capability management	Eva	0.035	0.854	1.644	17	0.118	1.250	0.760	-0.354	2.854
	EVna			1.686	16.427	0.111	1.250	0.741	-0.318	2.818
Innovation-driven capabilities	Eva	0.120	0.733	9.655	17	0.000	7.932	0.821	6.199	9.665
	EVna			9.321	13.148	0.000	7.932	0.851	6.096	9.768
Digital servitization orientation	Eva	0.755	0.397	2.534	17	0.021	2.920	1.153	0.489	5.352
	EVna			2.511	14.721	0.024	2.920	1.163	0.437	5.404
Marketing knowledge management	Eva	2.234	0.153	9.433	17	0.000	8.898	0.943	6.908	10.888
	EVna			8.959	12.169	0.000	8.898	0.993	6.737	11.058
Knowledge management functions	Eva	4.346	0.052	-2.533	17	0.021	-2.534	1.000	-4.645	-0.424
	EVna			-2.396	11.932	0.034	-2.534	1.058	-4.840	-0.228
Fintech innovation	Eva	5.266	0.035	2.693	17	0.015	4.557	1.692	0.986	8.127
	EVna			2.321	7.684	0.050	4.557	1.963	-0.003	9.117
Marketing ethics	EVa	5.694	0.029	6.911	17	0.000	8.511	1.232	5.913	11.110
	EVna			6.385	10.633	0.000	8.511	1.333	5.565	11.458
Digital Transactions- ATM/Mobile transaction	EVa	6.508	0.021	-0.101	17	0.921	-0.114	1.127	-2.492	2.265
	EVna			-0.093	10.419	0.928	-0.114	1.225	-2.829	2.602
Organization culture	EVa	18.259	0.001	2.864	17	0.011	3.295	1.151	0.868	5.723
	EVna			2.543	8.783	0.032	3.295	1.296	0.353	6.238
Organizational digital literacy	Eva	13.880	0.002	0.298	17	0.769	0.432	1.448	-2.624	3.487
	EVna			0.265	8.837	0.797	0.432	1.629	-3.264	4.128
Social capital	Eva	15.763	0.001	1.051	17	0.308	1.193	1.135	-1.202	3.589
	EVna			0.942	9.177	0.370	1.193	1.267	-1.665	4.051
Brand preference	Eva	0.132	0.721	1.971	17	0.065	2.705	1.372	-0.190	5.599
	EVna			1.988	15.680	0.065	2.705	1.361	-0.185	5.594
Consistency in innovation	EVa	0.217	0.647	2.641	17	0.017	5.261	1.992	1.059	9.464
	EVna			2.692	16.176	0.016	5.261	1.955	1.121	9.402

Strategic flexibility	EVa	3.895	0.065	-3.871	17	0.001	-8.727	2.254	-13.484	-3.971
	EVna			-3.521	9.850	0.006	-8.727	2.479	-14.262	-3.192
Bank's process integration with customers' businesses	EVa	4.991	0.039	1.067	17	0.301	0.307	0.288	-0.300	0.914
	EVna			1.187	15.032	0.254	0.307	0.259	-0.244	0.858
Board members combination	EVa	73.570	0.000	-4.032	17	0.001	-11.284	2.799	-17.189	-5.379
	EVna			-3.443	7.377	0.010	-11.284	3.278	-18.955	-3.613
Asset portfolio management	EVa	34.002	0.000	-3.233	17	0.005	-10.773	3.332	-17.803	-3.743
	EVna			-2.827	8.189	0.022	-10.773	3.811	-19.525	-2.020

NOTE:"EVa" (Equal Variances assumed), "EVna" (Equal Variances not assumed)

6.2.4.6. Digital technologies-Financial performance

Descriptive analysis

Findings of comparison analysis of digital technology's Importance for financial performance are presented in Figure 16.

In terms of financial performance, Low-Code/No-Code technology emerges as the most important technology for Canadians, ranking at the top, while for Iranians, it holds the 9th position. Conversely, Conversational Technology takes precedence as the most crucial technology for Iranians. Notably, Digital Banking Platforms, which held the top position for non-financial performance, now occupy the second spot for both Iranian and Canadian respondents. The most significant differences between these two groups are evident in the prioritization of Roboadvisor technology, which is considerably more important for Canadians, and API Banking, which holds significantly greater importance for Iranians. It's intriguing to note that API Banking remains crucial for Iranians even in the context of financial performance, as observed in the previous section. In the existing literature, there is limited research that compares and categorizes these technologies comprehensively. This highlights the novelty of our study, which leverages Gartner (2021b) data to conduct a comparative analysis, shedding light on these distinctions.

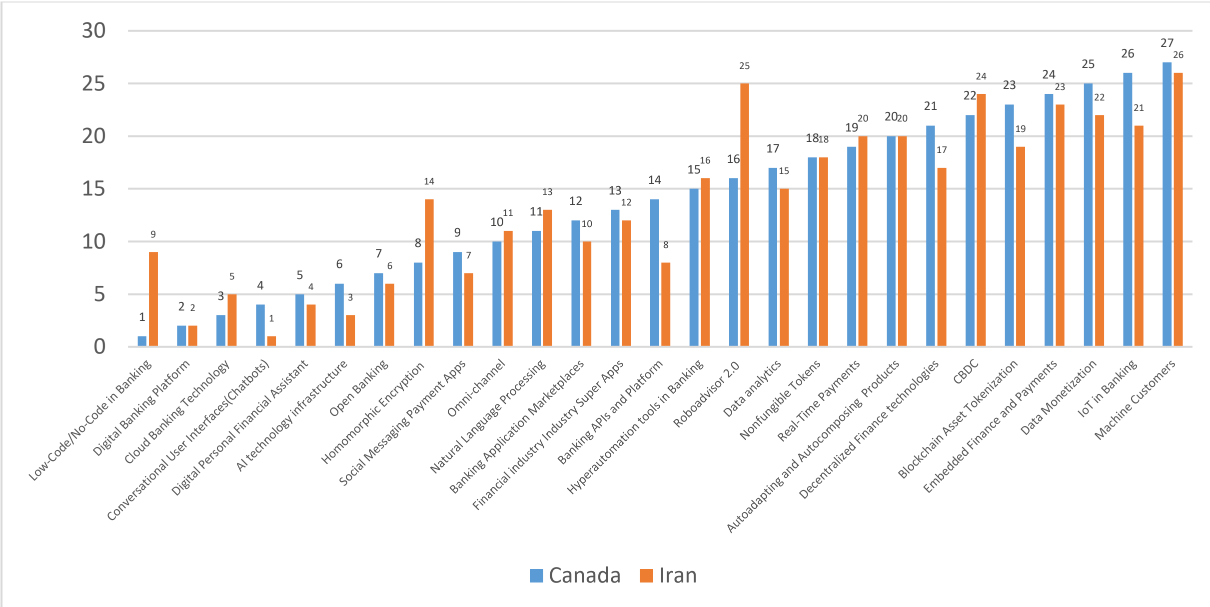


Figure 16- Ranking Importance of Digital Technologies in Terms of Impact on Financial Performance

Factor Importance Ranking (1 = Most Important, 2 = Second Most Important, 3 = Third Most Important, ..., 27 = Less Important; Higher numbers indicate lower importance)

Statistical tests for comparing the importance of digital technologies for financial performance

The t-test results indicate that several digital technologies have a statistically significant impact on financial performance according to Table 17. In this test, as the total number of the tests are 27, the alpha Bonferroni corrected is 0.0018. Our t-test results have unveiled a noteworthy distinction in the mean rankings of digital technologies aimed at improving financial performance between Iranian and Canadian respondents. However, it's important to note that for some technologies we did not observe a significant difference between the two groups. This lack of significance might be attributed to several factors, including similar perceptions or evaluations of these specific technologies by both Iranian and Canadian respondents, resulting in comparable rankings. It's possible that these technologies have a more universally accepted importance or role in enhancing financial performance, irrespective of the respondents' nationality, leading to non-significant differences in their rankings.

Table 17- T-test- digital technologies- Financial performance

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Banking Application Marketplaces	EVa	4.182	0.057	4.111	17	0.001	1.989	0.484	0.968	3.009
	EVna			4.637	13.959	0.000	1.989	0.429	1.069	2.909
Data analytics	EVa	3.648	0.073	2.259	17	0.037	2.216	0.981	0.146	4.286
	EVna			2.622	11.510	0.023	2.216	0.845	0.366	4.066
Decentralized Finance technologies	EVa	0.165	0.690	2.762	17	0.013	1.659	0.601	0.392	2.926
	EVna			2.839	16.508	0.012	1.659	0.584	0.423	2.895
Digital Banking Platform	EVa	0.808	0.381	3.484	17	0.003	1.114	0.320	0.439	1.788
	EVna			3.197	10.287	0.009	1.114	0.348	0.340	1.887
IoT in Banking	EVa	14.246	0.002	2.535	17	0.021	4.000	1.578	0.671	7.329
	EVna			2.939	11.626	0.013	4.000	1.361	1.024	6.976
Low-Code/No-Code in Banking	EVa	1.888	0.187	-10.322	17	0.000	-6.636	0.643	-7.993	-5.280
	EVna			-10.970	16.968	0.000	-6.636	0.605	-7.913	-5.360
Nonfungible Tokens	EVa	0.100	0.756	-2.265	17	0.037	-1.364	0.602	-2.634	-0.093
	EVna			-2.157	12.329	0.051	-1.364	0.632	-2.737	0.010
Open Banking	EVa	2.552	0.129	3.577	17	0.002	1.307	0.365	0.536	2.078
	EVna			3.761	16.987	0.002	1.307	0.348	0.574	2.040
Real-Time Payments	EVa	3.457	0.080	-2.316	17	0.033	-1.659	0.716	-3.171	-0.148
	EVna			-2.630	13.408	0.020	-1.659	0.631	-3.018	-0.300
Social Messaging Payment Apps	EVa	2.498	0.132	2.121	17	0.049	1.148	0.541	0.006	2.289
	EVna			2.285	16.693	0.036	1.148	0.502	0.086	2.209
AI technology infrastructure	EVa	0.058	0.813	3.821	17	0.001	1.614	0.422	0.723	2.505
	EVna			3.847	15.615	0.001	1.614	0.419	0.723	2.505
Autoadapting and Autocomposing Products	EVa	0.034	0.857	-1.427	17	0.172	-0.784	0.550	-1.944	0.375
	EVna			-1.405	14.349	0.181	-0.784	0.558	-1.979	0.410
APIBanking	EVa	4.710	0.044	13.771	17	0.000	5.386	0.391	4.561	6.212
	EVna			15.380	14.726	0.000	5.386	0.350	4.639	6.134
Blockchain Asset Tokenization	EVa	11.371	0.004	2.257	17	0.037	2.386	1.057	0.155	4.617
	EVna			2.590	12.483	0.023	2.386	0.921	0.388	4.385
CBDC	EVa	0.566	0.462	-2.899	17	0.010	-1.443	0.498	-2.493	-0.393
	EVna			-3.017	16.849	0.008	-1.443	0.478	-2.453	-0.433
Cloud Banking Technology	EVa	4.848	0.042	-1.966	17	0.066	-2.455	1.248	-5.089	0.180
	EVna			-1.716	8.133	0.124	-2.455	1.430	-5.743	0.834
Conversational User Interfaces(Chatbots)	EVa	0.991	0.333	4.784	17	0.000	2.455	0.513	1.372	3.537
	EVna			4.530	11.992	0.001	2.455	0.542	1.274	3.635
Data Monetization	EVa	8.009	0.012	1.694	17	0.109	2.341	1.382	-0.575	5.257
	EVna			1.932	13.025	0.075	2.341	1.212	-0.276	4.958
Digital Personal Financial Assistant	EVa	1.424	0.249	1.608	17	0.126	0.773	0.481	-0.241	1.787
	EVna			1.536	12.525	0.149	0.773	0.503	-0.318	1.863
Embedded Finance and Payments	EVa	8.070	0.011	0.738	17	0.471	1.068	1.448	-1.987	4.124
	EVna			0.835	13.675	0.418	1.068	1.279	-1.682	3.819
Financial industry Super Apps	EVa	11.012	0.004	1.752	17	0.098	0.795	0.454	-0.162	1.753
	EVna			1.984	13.623	0.068	0.795	0.401	-0.066	1.657
Homomorphic Encryption	EVa	2.512	0.131	-11.317	17	0.000	-5.852	0.517	-6.943	-4.761
	EVna			-12.574	15.096	0.000	-5.852	0.465	-6.844	-4.861
Hyperautomation tools in Banking	EVa	2.419	0.138	0.502	17	0.622	0.250	0.498	-0.800	1.300
	EVna			0.573	13.043	0.576	0.250	0.436	-0.692	1.192
Machine Customers	EVa	11.781	0.003	1.358	17	0.192	0.591	0.435	-0.327	1.509
	EVna			1.510	15.025	0.152	0.591	0.391	-0.243	1.425

Natural Language Processing	EVa	1.117	0.305	-4.355	17	0.000	-2.670	0.613	-3.964	-1.377
	EVna			-4.424	16.030	0.000	-2.670	0.604	-3.950	-1.391
Omni-channel	EVa	3.872	0.066	-0.778	17	0.447	-0.761	0.979	-2.826	1.304
	EVna			-0.914	10.459	0.381	-0.761	0.833	-2.606	1.083
Roboadvisor 2.0	EVa	4.034	0.061	-8.532	17	0.000	-8.239	0.966	-10.276	-6.201
	EVna			-9.776	12.637	0.000	-8.239	0.843	-10.065	-6.413

NOTE:"EVa" (Equal Variances assumed), "EVna" (Equal Variances not assumed)

6.2.5. Assessing the readiness of strategic, functional, and operational capabilities for different technology categories and their subcategories in both Iran and Canada

We conducted a descriptive analysis to summarize and present the data in a meaningful way. This analysis involved calculating measures such as means and standard deviations to provide an overview of the readiness scores for each capability and technology category. Additionally, we compared the readiness scores between Iran and Canada to identify any differences or similarities in the perceived readiness of capabilities for different technology categories.

In this analysis, we treated non-applicable answers as 0 to ensure quantifiability and consistency in the data. By doing so, we aimed to include all responses in the analysis and capture the overall readiness scores accurately. In this research, we employed a scale ranging from 1 (not ready) to 5 (completely ready).

A snapshot of the findings is available in Figure 17. In this section, we will delve into each of these technologies readiness.

The most significant findings in this figure highlight a pronounced readiness level for digital engagement platforms in both Iranian and Canadian settings. However, it is apparent that capabilities for other technologies, notably automation, are not yet fully prepared. Despite some exceptions, overall observations suggest that Canada demonstrates greater readiness in strategic, operational, and functional capacities to implement digital technologies compared to Iran.

		Canada			Iran		
Category	***Technology***	***Strategic capability***	***Functional capability***	***Operational capability***	***Strategic capability***	***Functional capability***	***Operational capability***
Payment and Transaction technologies	NFTs	1.6	2.3	1.9	1.5	1.8	1.8
	Embedded Finance and Payments	2.0	2.1	1.9	1.2	1.9	1.4
	Decentralized Finance technologies	3.6	2.2	2.5	2.0	2.3	2.1
	CBDC	2.8	2.2	3.0	2.0	2.8	1.8
	Blockchain Asset Tokenization	2.3	2.4	1.9	1.3	1.9	1.5
	Real-Time Payments	3.1	2.0	2.8	1.5	2.4	2.3
	Data Monetization	4.9	2.9	4.8	3.0	4.8	3.1
Digital engagement	Digital platform	4.6	4.5	4.6	4.6	4.1	4.7
	Digital Personal Financial Assistant	3.8	3.6	3.6	3.9	3.0	3.8
	Conversational User Interfaces(Chatbots)	4.3	2.6	4.0	3.3	3.5	2.8
	Social Messaging Payment Apps	3.1	3.5	2.8	4.0	2.3	4.1
	Banking Application Marketplaces	3.1	2.5	2.3	2.6	2.0	2.7
	Low-Code/No-Code in Banking	3.9	3.6	2.6	3.5	2.4	4.1
	Financial industry Super Apps	1.8	3.1	1.9	2.9	1.6	2.3
	Open Banking	3.9	3.7	2.4	4.1	2.0	3.5
	Omni-channel	4.4	3.5	3.0	4.5	3.1	4.1
	Machine Customers	0.1	0.1	0.1	0.1	0.1	0.1
Artificial Intelligence and Analysis	Homomorphic Encryption	0.4	0.1	0.4	0.1	0.4	0.1
	NLP	3.4	1.5	2.8	1.8	2.8	1.6
	Data analytics	4.8	4.6	4.1	2.1	4.1	2.0
	AI technology	3.8	1.6	2.3	2.0	2.3	1.5
Automation technologies	IoT in Banking	2.4	1.2	1.8	0.9	2.3	1.2
	Hyperautomation tools in Banking	1.6	1.0	2.3	0.9	2.3	0.9
	Autoadapting and Autocomposing Products	1.4	0.5	1.4	0.5	1.4	0.5
	Roboadvisor 2.2	1.3	0.5	1.4	0.5	1.4	0.5
Infrastructure technologies	Cloud Banking Technology	4.5	3.1	4.6	3.1	4.4	3.2
Security and Privacy technologies	Banking APIs and Platform	4.1	3.7	3.3	3.5	3.3	3.5

Figure 17- Snapshot of Capability Readiness

Readiness Levels (1 = Low Readiness, 5 = High Readiness)

6.2.5.1. Infrastructure technologies

Figure 17 shows the level of readiness of strategic, functional, and operational capabilities in the banking sector related to cloud banking technology infrastructure technology. The readiness scores for capabilities in cloud banking technology in the two countries show their similarities and differences below.

The Infrastructure Technologies category solely encompasses Cloud Banking Technology, as evident from Figure 17. Iran's readiness in terms of capabilities, including strategic, functional, and operational aspects, stands at around 3.1, while Canada exhibits a significantly higher readiness level, nearing 4.4. This disparity underscores Canada's more advanced capabilities, indicating a greater maturity in implementing Cloud Banking Technology. While the literature contains several studies on Cloud Banking, they primarily focus on aspects like security, as seen in studies such as Rani and Gangal (2012), or adoption rates, as explored in Asadi et al. (2017)'s research. Consequently, our study's novelty lies in its exploration of banks' readiness to adopt Cloud Technology, with a unique comparative analysis between different countries.

6.2.5.2. Artificial Intelligence and Analytics technologies

Figure 17 shows findings from the assessment of the readiness of strategic, functional, and operational capabilities in the banking sector for different technologies related to Artificial Intelligence and Analysis. It shows this comparison between countries.

There are four technologies within the Artificial Intelligence and Analysis category. The readiness for Homomorphic Encryption technology in Canada is generally low across all types of capabilities, scoring at 0.4. In Iran, it is even lower, with a score of 0.1.

When it comes to NLP and AI technology, Canada demonstrates a significantly higher readiness compared to Iran. This higher readiness is primarily focused on strategic capabilities rather than functional and operational ones.

A particularly noteworthy aspect here is data analytics. In Canada, the readiness for data analytics surpasses a score of 4, with a strategic capability readiness of 4.8. In contrast, Iran exhibits an interesting disparity. While the strategic capability readiness for data analytics is relatively high at 4.6, it drops significantly to around 2 for functional and operational capabilities.

In the literature, there have been some studies about the impact of AI in banking like the study by Crosman (2018), or its adoption like the study by Rahman et al. (2021b) but our research introduces a novel aspect by assessing the readiness of different capabilities for AI technologies, namely homomorphic encryption, NLP, AI technology, and data analytics in Canada and Iran. This detailed analysis provides specific readiness scores, shedding light on the preparedness of these countries for AI adoption.

6.2.5.3. Digital Engagement technologies

The data in Figure 17 shows the mean ratings for each capability (strategic, functional, operational) and technology category for both Canada and Iran. The following observations can be made from the data:

1 .Digital Platform:

Digital platforms serve as the backbone for various banking services. In Canada, the digital platform exhibits strong strategic, functional, and operational capabilities, scoring 4.6, 4.5, and 4.6, respectively. Similarly, Iran also demonstrates a robust performance with scores of 4.6, 4.1, and 4.7. Both countries showcase a solid foundation for digital banking through advanced digital platforms.

2 .Digital Personal Financial Assistant:

In this category, Canada performs moderately well with scores of 3.8, 3.6, and 3.6, indicating a balanced performance across strategic, functional, and operational aspects. On the other hand, Iran shows slightly higher scores of 3.9, 3.0, and 3.8, suggesting a more efficient deployment of digital personal financial assistants.

3 .Conversational User Interfaces (Chatbots):

Canada exhibits a superior strategic capability with a score of 4.3 but faces challenges in functional (2.6) and operational (4.0) aspects. In contrast, Iran lags behind in all three dimensions, scoring 3.3, 3.5, and 2.8. Both countries need to address functional and operational gaps to enhance the effectiveness of conversational user interfaces.

4 .Social Messaging Payment Apps:

Canada and Iran showcase varied performances in this category. While Canada scores relatively low in operational capability (2.8), Iran excels with scores of 4.0, 2.3, and 4.1 in strategic, functional, and operational capabilities, respectively. This indicates a notable strength in social messaging payment apps within the Iranian banking sector.

5 .Banking Application Marketplaces:

Both countries demonstrate comparable scores, with Canada slightly ahead in strategic (3.1) and functional (2.5) capabilities. However, both nations need improvement in operational capabilities (2.3 and 2.7 for Canada and Iran, respectively) to optimize the potential of banking application marketplaces.

6 .Low-Code/No-Code in Banking:

Upon closer examination, the analysis of Low-Code/No-Code adoption in the banking sector highlights a nuanced comparison between Canada and Iran. While Canada exhibits superior strategic and functional capabilities with scores of 3.9 and 3.6, Iran excels in operational capability, scoring significantly higher at 4.1 compared to Canada's 2.6. Canada's higher scores in strategic and functional dimensions underscore its advanced approach and proficiency in Low-Code/No-Code solutions. This positions Canada as a front-runner in strategic planning and functional execution within the domain. However, Iran's notably higher operational capability score of 4.1 suggests a remarkable strength in the practical implementation and operationalization of Low-Code/No-Code solutions. This operational excellence in Iran may serve as a valuable model for effective deployment in real-world banking scenarios. All in all, both nations can benefit from sharing insights to achieve a more comprehensive and well-rounded approach to Low-Code/No-Code solutions in the banking sector.

7 .Financial Industry Super Apps:

Iran scores lower across all dimensions, indicating a need for strategic, functional, and operational improvements in the adoption of financial industry super apps. Canada also faces challenges in strategic and operational aspects.

8 .Open Banking:

In the domain of Open Banking, Iran surpasses Canada in both strategic and operational dimensions, scoring 4.1 and 3.5 compared to Canada's 3.9 and 2.4, respectively. However, Canada maintains an edge in functional capability, scoring 3.7, while Iran scores 2.0. Iran's superior scores in both strategic and operational capabilities suggest a robust overall approach to Open Banking. This implies a well-defined strategy and effective operational implementation. Canada's higher functional capability score showcases its strength in executing Open Banking functionalities. This proficiency suggests a more comprehensive understanding and successful implementation of functional aspects within the Open Banking framework. Recognizing the strengths of each country, there is an opportunity for a bilateral exchange of knowledge. Canada can benefit from Iran's strategic and operational successes, while Iran can glean insights from Canada's efficient execution of Open Banking functionalities. Combining the strengths of both nations can contribute to the advancement of Open Banking practices globally.

9 .Omni-channel:

Both Canada and Iran demonstrate strong performances in strategic and operational capabilities, with Iran slightly ahead in strategic aspects. Both countries should continue to emphasize functional improvements for a seamless omni-channel experience.

10 .Machine Customers:

Scores across all dimensions are notably low for both countries, indicating a need for substantial improvements in the adoption and utilization of machine customers.

In conclusion, the assessment of digital banking dimensions in Canada and Iran not only underscores their unique strengths and areas for improvement but also suggests the presence of discernible patterns that could be influenced by regulatory and other external factors. Canada emerges as a trailblazer in digital platforms, conversational user interfaces, low-code/no-code solutions, financial industry super apps, and omni-channel experiences. The strategic planning and functional execution showcased by Canada could be attributed, in part, to a conducive regulatory environment fostering innovation. Conversely, Iran excels in social messaging payment apps and open banking, possibly influenced by regulatory frameworks encouraging the adoption of these technologies. Notably, Iran's operational proficiency in deploying low-code/no-code solutions and implementing open banking practices opens avenues for mutual learning between the two nations. As both countries address specific weaknesses, such as Canada's operational gaps in conversational user interfaces and social messaging payment apps, and Iran's challenges in financial industry super apps and machine customers, external factors like regulatory support can play a pivotal role in shaping their digital banking landscapes. The implications extend beyond individual nations, offering the potential for collaborative advancements in global digital banking practices with a keen awareness of regulatory influences.

6.2.5.4. Payment and Transaction Technologies

Figure 17 analyzes the readiness of strategic, functional, and operational capabilities related to various payment and transaction technologies in the banking sector.

In the realm of Data Monetization, Canada demonstrates a remarkable readiness with all types of capabilities scoring above 4.8, indicating complete preparedness. In contrast, Iran lags behind with readiness scores hovering around 3, signifying a notable disparity.

When it comes to Decentralized Finance technologies, Central Bank Digital Currency (CBDC), Blockchain Asset Tokenization, and Real-Time Payments, Canada outshines Iran across all capabilities.

In the domain of Embedded Finance and Payments, both countries exhibit similar levels of readiness, with scores nearly approaching 2 for all capabilities. Notably, in the case of NFTs, while Iran boasts a more prepared strategic capability compared to Canada, the functional and operational aspects show minimal differences.

The novelty of this study lies in its unique approach of comparing various technologies with each other and assessing the disparities in readiness across different capabilities. Additionally, it adds value by conducting these comparisons between countries, offering valuable insights into the varying levels of preparedness.

6.2.5.5. Security and Privacy Technologies

Figure 17 aims to identify the similarities and differences between Canada and Iran in terms of readiness of strategic, functional, and operational capabilities for security and privacy technologies in the banking sector.

We are focusing on Security and Privacy technologies in the form of Banking APIs and Platforms.

The readiness of this technology in both countries lies within the range of approximately 3.3 to 4.1 for all capabilities. Notably, the strategic capabilities surpass both operational and functional aspects in both countries.

6.2.5.6. Automation technologies

Figure 17 indicates the readiness of different capabilities for Automation technologies. We examined IoT in Banking, Hyperautomation tools in Banking, Autoadapting and Autocomposing Products, and Roboadvisor 2.0 within the Automation technologies category.

In this category, it's evident that Iran lags significantly behind Canada across all capabilities and technologies. It's worth noting that Canada itself is not highly prepared in these areas. Autoadapting and Autocomposing Products and Roboadvisor 2.0 score approximately 1.4 for all capabilities in Canada, while in Iran, they are at a mere 0.5. IoT in Banking and Hyperautomation tools in Banking exhibit slightly higher readiness levels, particularly in terms of strategic capabilities, with scores of around 1.6 and 2.4, respectively, for Canada and 1.0 and 1.2, respectively, for Iran. However, it's crucial to highlight that these technologies are not extensively prepared in either country, especially in Iran.

6.3. Structural Equation Model findings

In the following section, we will delve into the SEM findings for Iran and Canada separately.

6.3.1. Iran

To perform Structural Equation Modeling (SEM), we initially employed the PLS-SEM algorithm with outer weight/loading analysis using SMART PLS 4. As per the guidelines provided by Hair (2014), we assessed the convergent validity of these constructs by examining the item loadings and the Average Variance Extracted (AVE) statistic. Hair (2014) recommends the exclusion of items with loadings less than 0.70. Consequently, items marked in red in the table below were removed. Appendix 7 depicts the loadings factor for Iran’s model.

Convergent validity, discriminant validity, and the reliability of the capabilities, regulatory environment, and performance constructs were evaluated through the application of Partial Least Squares Structural Equation Modeling (PLS-SEM), as recommended by Hair (2014), and Binz Astrachan et al. (2014).

As depicted in Table 18, the AVE statistic for all factors demonstrates satisfactory convergent validity, given that the AVE should exceed 0.50 (Hair, 2014). In Table 19, the highest HTMT ratio observed was 0.825, comfortably below the recommended threshold of 0.90 (Henseler et al., 2015), further confirming the overall discriminant validity.

As shown in Table 18, Cronbach's alpha for all factors exceeds 0.7, indicating strong reliability.

Table 18- Average variance extracted (AVE) and Cronbach's alpha for Iran

	Cronbach's alpha	Average variance extracted (AVE)
Customer-centric capability	0.931	0.785
Digital strategy	0.813	0.642
Employees' knowledge and skills	0.945	0.645
Financial performance	0.872	0.91
Innovation capabilities	0.911	0.616
Marketing strategy	0.865	0.752
Non-financial performance	0.915	0.703
Partnership	0.863	0.637
Regulatory environment	0.95	0.838

Table 19- Heterotrait-monotrait (HTMT) ratio for Iran

	Customer -centric capability	Digital strategy	Employees' knowledge and skills	Financial performance	Innovation capabilities	Marketing strategy	Non-financial performance	Partnership	Regulatory environment
Customer-centric capability									
Digital strategy	0.123								
Employees' knowledge and skills	0.707	0.421							
Financial performance	0.787	0.239	0.825						
Innovation capabilities	0.25	0.787	0.488	0.52					
Marketing strategy	0.337	0.308	0.468	0.523	0.336				
Non-financial performance	0.144	0.851	0.613	0.36	0.784	0.391			
Partnership	0.606	0.333	0.422	0.693	0.651	0.335	0.398		
Regulatory environment	0.545	0.241	0.392	0.576	0.2334	0.275	0.275	0.738	

As shown in Table 20, SRMR in this model sounds fit.

Table 20- SRMR for Iran's model

	Saturated model	Estimated model
SRMR	0.079	0.072

The results presented in Table 21 and illustrated in Figure 18 provide a comprehensive understanding of the intricate relationships between various factors and their implications for both financial and non-financial performance in the studied context. These findings not only shed light on the individual impacts of customer-centric capability, digital strategy, employees' knowledge and skills, innovation capabilities, marketing strategy, partnership, and regulatory environment but also unveil the interconnectedness of these factors.

Our analysis reveals a negative coefficient (-0.222) between customer-centric capability and financial performance, indicating that a stronger focus on customer-centricity is associated with lower financial performance. However, it's important to note the significance of this relationship (p-value = 0.001), suggesting a meaningful impact. Conversely, there's a positive relationship (0.122) between customer-centric capability and non-financial performance, implying that banks with enhanced customer-centric approaches tend to excel in non-financial metrics.

Digital strategy demonstrates a negative impact on financial performance (-0.173), with a significant association (p-value = 0.001), suggesting that banks heavily invested in digital strategies might face challenges in immediate financial gains. However, the positive coefficient (0.123) regarding non-financial performance indicates that digital strategy positively influences non-financial metrics, such as customer satisfaction and operational efficiency.

A strong positive relationship exists between employees' knowledge and skills and both financial (0.526) and non-financial (0.407) performance, highlighting the critical role of skilled human capital in driving overall bank performance during digital transformations.

Innovation capabilities exhibit a positive impact on financial performance (0.202), although it is important to note the relatively lower significance (p-value = 0.014). However, the relationship with non-financial performance is weaker (0.072), suggesting that while innovation drives financial gains, its impact on non-financial metrics might be less pronounced.

The coefficient for marketing strategy is minimal for financial performance (0.008), indicating a negligible direct impact, although its association with non-financial performance (0.078) is slightly stronger. The significance of these relationships (p-values of 0.04 and 0.047, respectively) suggests a modest influence of marketing strategies on overall performance.

Partnership demonstrates significant positive relationships with financial (coefficient = 0.226, p = 0.001) and negative relationships with non-financial performance (coefficient = -0.292, p = 0.093). Collaborations can enhance financial performance through expanded market reach and shared resources, but challenges in managing partnerships may affect non-financial aspects negatively.

The regulatory environment significantly influences various capabilities. Higher coefficients indicate stronger relationships, implying that regulatory compliance is crucial for shaping organizational capabilities and strategies in the Iranian banking sector

In conclusion, this analysis provides valuable insights into the complex interplay between capabilities, regulatory and performance indicators in Iran's banking sector digital transformation journey. While certain factors like employees' knowledge and skills consistently demonstrate positive impacts on performance, others like digital strategy and partnerships exhibit nuanced relationships. Understanding these dynamics is crucial for Iranian banks to navigate digital transformations successfully, optimize resource allocation, and sustain competitive advantage in an increasingly digital banking landscape.

In integrating the SI and DC theories, we analyzed how external systems and internal capabilities influence organizational outcomes. For example, the regulatory environment demonstrates SI's impact by shaping capabilities, reflecting the influence of external factors on strategy. Similarly, the strong performance links to employees' knowledge highlight the DC aspect, emphasizing the importance of internal capabilities in responding to external changes. This dual approach helps us understand how external pressures and internal responses drive strategic outcomes in digital transformations, offering a clear view of the interplay between innovation systems and dynamic capabilities in the banking sector.

Table 21- Path coefficient for Iran's model

	Coefficient	Standard deviation (STDEV)	P values
Customer-centric capability -> Financial performance	-0.222	0.064	0.001
Customer-centric capability -> Non-financial performance	0.122	0.064	0.049
Digital strategy -> Financial performance	-0.173	0.053	0.001
Digital strategy -> Non-financial performance	0.123	0.06	0
Employees' knowledge and skills -> Financial performance	0.526	0.06	0

Employees’ knowledge and skills -> Non-financial performance	0.407	0.067	0
Innovation capabilities -> Financial performance	0.202	0.082	0.014
Innovation capabilities -> Non-financial performance	0.072	0.065	0
Marketing strategy -> Financial performance	0.008	0.04	0.04
Marketing strategy -> Non-financial performance	0.078	0.039	0.047
Partnership -> Financial performance	0.226	0.066	0.001
Partnership -> Non-financial performance	-0.292	0.059	0.093
Regulatory environment -> Customer-centric capability	0.102	0.041	0
Regulatory environment -> Digital strategy	0.218	0.063	0.001
Regulatory environment -> Employees’ knowledge and skills	0.386	0.068	0
Regulatory environment -> Innovation capabilities	0.189	0.064	0
Regulatory environment -> Marketing strategy	0.263	0.084	0.002
Regulatory environment -> Partnership	0.449	0.058	0

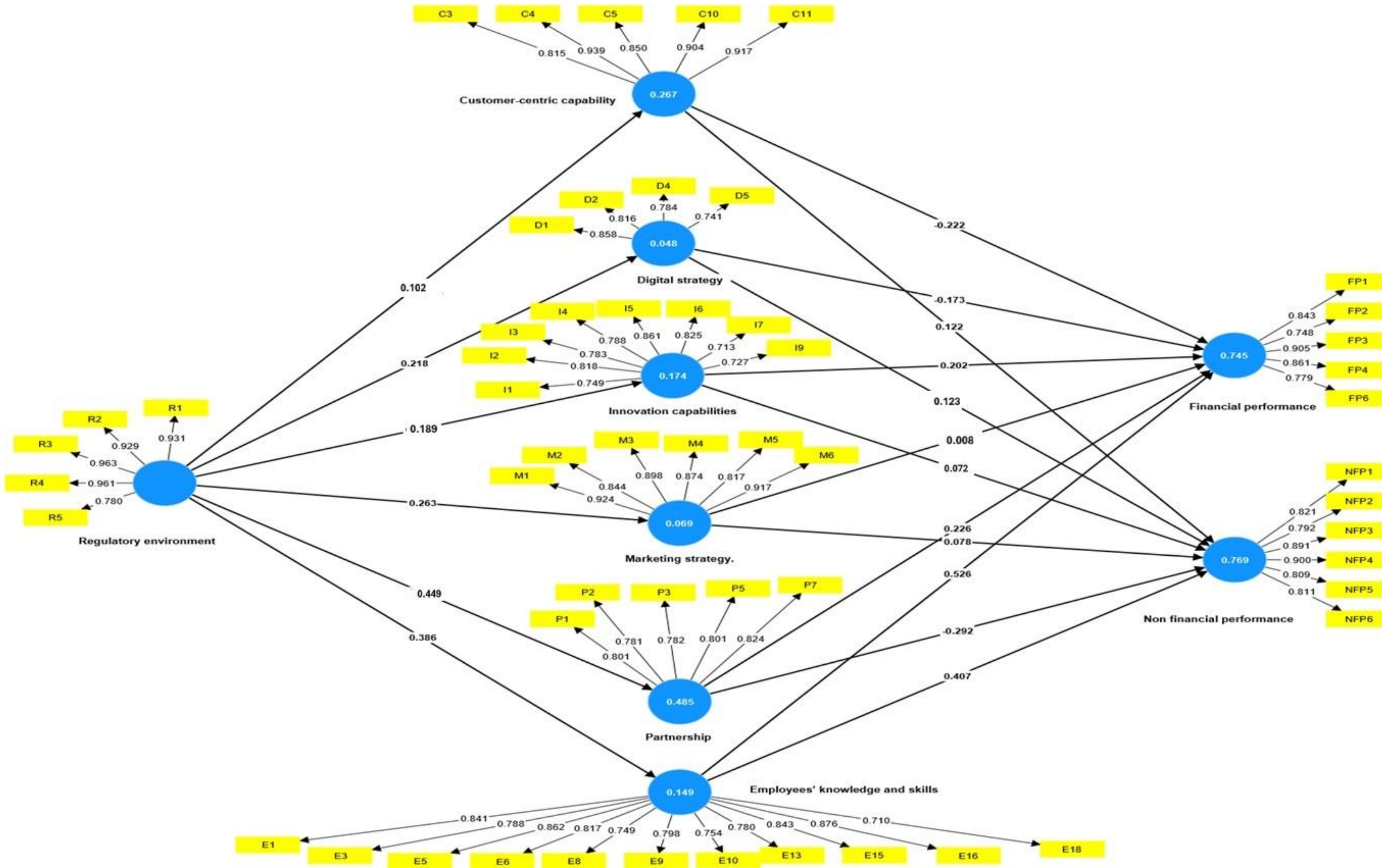


Figure18 - SEM model for Iran

6.3.2. Canada

In our examination of SEM tests using the Canadian dataset, we meticulously followed the identical procedural framework outlined in the preceding section, which was initially applied to the Iranian dataset. Variable loadings are available in Appendix 7 . Items with loadings below the 0.7 threshold were systematically excluded from our analysis.

Subsequent to the removal of low-loadings items, we embarked on a comprehensive evaluation of convergent validity, discriminant validity, and the reliability of the constructs encompassing capabilities, regulatory environment, and performance.

Table 22 provides insight into the Average Variance Extracted (AVE) statistics, a critical component of convergent validity assessment. All factors demonstrate satisfactory convergent validity, with AVE values exceeding the recommended threshold of 0.50 (Hair, 2014).

Furthermore, in Table 23, we scrutinized the Highest Triangular Matrix of Correlations (HTMT) ratios, a crucial facet of discriminant validity analysis. The highest HTMT ratio observed, standing at 0.825, comfortably falls below the established threshold of 0.90 (Henseler et al., 2015), affirming the overall discriminant validity of our constructs.

Our final step encompassed an evaluation of the reliability of the latent constructs. This was accomplished by examining both Cronbach's alphas and Composite Reliability (CR) scores, as showcased in Table 22. Impressively, Cronbach's alpha values for all factors surpass the 0.7 threshold, signifying robust reliability.

Table 22- Average variance extracted (AVE) and Cronbach's alpha for Canada

	Cronbach's alpha	Average variance extracted (AVE)
Customer-centric capability	0.972	0.947
Digital strategy	0.785	0.701
Employees' knowledge and skills	0.899	0.633
Financial performance	0.955	0.818
Innovation capabilities	0.824	0.657
Marketing strategy	0.921	0.723
Non-financial performance	0.898	0.62
Partnership	0.911	0.79
Regulatory environment	0.902	0.753

Table 23- Heterotrait-monotrait (HTMT) ratio for Canada

	Customer-centric capability	Digital strategy	Employees' knowledge and skills	Financial performance	Innovation capabilities	Marketing strategy	Non-financial performance	Partnership	Regulatory environment
Customer-centric capability									
Digital strategy	0.148								
Employees' knowledge and skills	0.293	0.17							
Financial performance	0.07	0.177	0.418						
Innovation capabilities	0.097	0.291	0.124	0.726					
Marketing strategy	0.132	0.1	0.353	0.165	0.225				
Non-financial performance	0.372	0.313	0.703	0.156	0.202	0.348			
Partnership	0.176	0.342	0.526	0.074	0.177	0.387	0.45		
Regulatory environment	0.338	0.562	0.453	0.148	0.271	0.154	0.316	0.484	

To assess model fit, we closely examined the Standardized Root Mean Residual (SRMR) value, a key indicator of model compatibility. As indicated in Table 24, the SRMR within our model aligns with the expectations of a well-fitting model.

Table 24- SRMR for Canada's model

	Saturated model	Estimated model
SRMR	0.069	0.063

Following this extensive analysis, we undertook bootstrapping with 5000 resampled datasets, yielding path coefficients that are prominently presented in Table 25 and Figure 19.

Both financial (coefficient = 0.118, p = 0.002) and non-financial performance (coefficient = 0.189, p = 0) exhibit significant positive relationships with customer-centric capability. This indicates that banks in Canada benefit from focusing on customer needs and preferences, leading to improvements in both financial metrics and customer satisfaction.

Digital strategy demonstrates positive relationships with both financial (coefficient = 0.116, p = 0.019) and non-financial performance (coefficient = 0.148, p = 0.018). This suggests that well-defined digital strategies contribute to enhanced financial performance and operational efficiency, ultimately improving overall performance in the Canadian banking sector.

Strong positive relationships exist between employees' knowledge and skills and both financial (coefficient = 0.605, p = 0) and non-financial performance (coefficient = 0.471, p = 0). Investing in employee training and development is paramount for Canadian banks to remain competitive and deliver high-quality services to customers.

Innovation capabilities significantly influence financial performance (coefficient = 0.621, p = 0) but have a weaker impact on non-financial performance (coefficient = 0.081, p = 0.004). This underscores the importance of fostering a culture of innovation within Canadian banks to drive financial gains and stay ahead in a rapidly changing market.

While marketing strategy exhibits a modest positive relationship with non-financial performance (coefficient = 0.153, p = 0.006), its impact on financial performance is not statistically significant (coefficient = 0.047, p = 0). Nevertheless, effective marketing remains crucial for enhancing brand perception and customer engagement in the Canadian banking sector.

Partnership shows significant positive relationships with both financial (coefficient = 0.241, p = 0) and non-financial performance (coefficient = 0.137, p = 0). Collaborations with fintech companies, other financial institutions, and strategic partners can drive innovation and expand market reach for Canadian banks.

The regulatory environment significantly influences various aspects of banking operations and strategies in Canada. Higher coefficients indicate stronger relationships, emphasizing the need for banks to comply with regulations while adapting to changes to maintain competitiveness and trust among stakeholders.

In conclusion, this analysis highlights the multifaceted nature of digital transformations in Canadian banking and the interconnectedness of various factors influencing performance outcomes. To succeed in the digital era, Canadian banks must prioritize customer-centricity, digital strategy formulation, employee development, innovation, strategic partnerships, and regulatory compliance. By leveraging these insights, banks can navigate the evolving landscape, enhance their competitive position, and deliver value to customers and stakeholders alike.

The insights derived from this semester's results provide valuable guidance for Canadian banks to strategically prioritize and invest in key areas that drive organizational success in the dynamic banking landscape. Continuous attention to these factors will contribute to sustained growth and competitiveness in the Canadian banking sector.

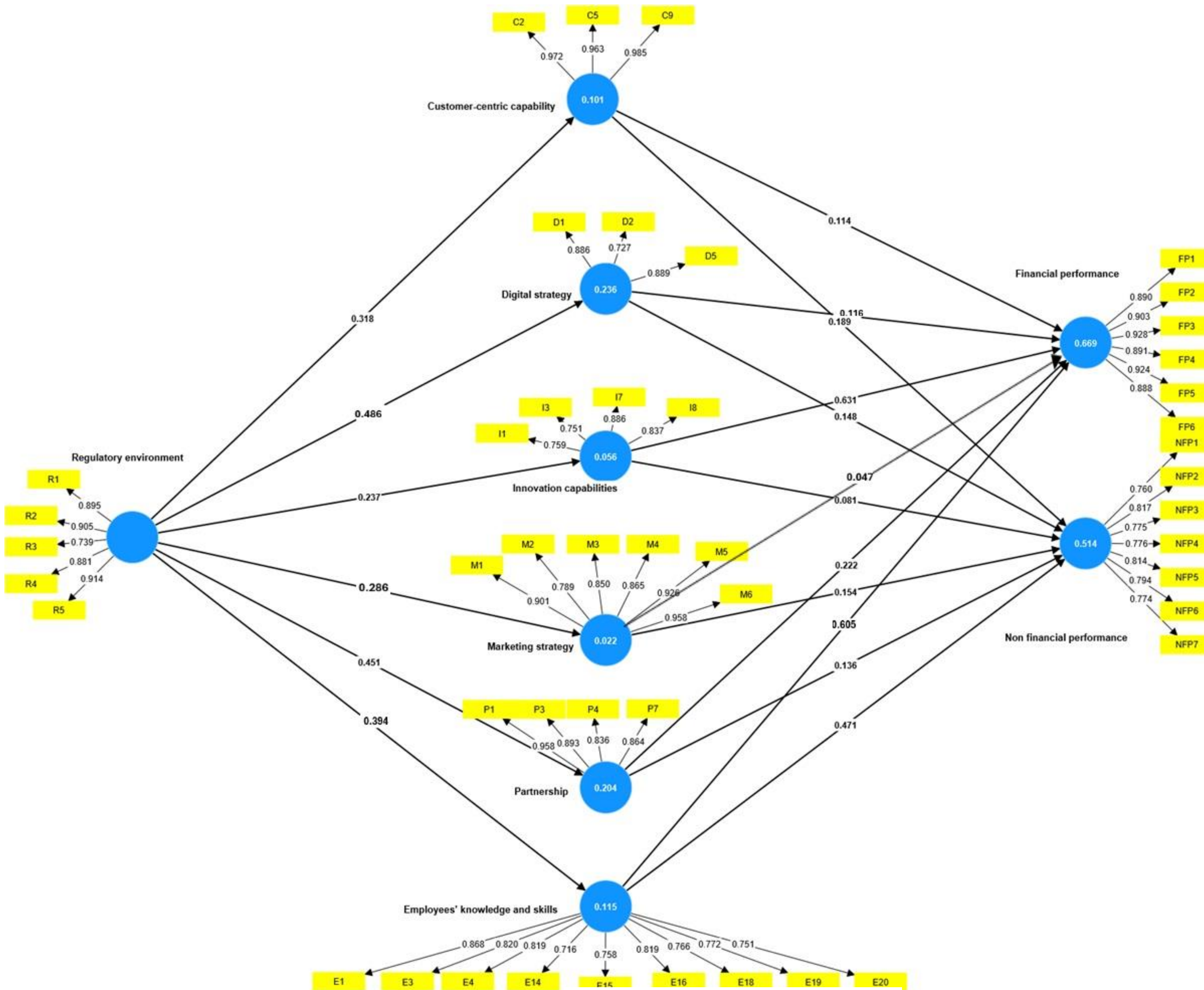
This extensive analysis of the Canadian banking sector, underpinned by SI and DC theories, illustrates how external and internal factors are deeply intertwined and pivotal to achieving strategic success. By integrating SI, we see how regulatory environments and partnerships significantly shape operational strategies, mirroring external innovation systems' influence. Simultaneously, the DC perspective is evident as internal capabilities like customer-centric approaches, digital strategies, and employee skills directly impact financial and non-financial performance. This dual-framework analysis not only aligns with theoretical expectations but also pragmatically guides banks on prioritizing areas crucial for leveraging both internal strengths and external opportunities to navigate the complex landscape of digital banking successfully.

Table 25- Path coefficient for Canada's model

	Coefficient	Standard deviation (STDEV)	P values
Customer-centric capability -> Financial performance	0.118	0.037	0.002
Customer-centric capability -> Non-financial performance	0.189	0.045	0
Digital strategy -> Financial performance	0.116	0.049	0.019
Digital strategy -> Non-financial performance	0.148	0.063	0.018
Employees' knowledge and skills -> Financial performance	0.605	0.054	0
Employees' knowledge and skills -> Non-financial performance	0.471	0.058	0
Innovation capabilities -> Financial performance	0.621	0.05	0
Innovation capabilities -> Non-financial performance	0.081	0.074	0.004
Marketing strategy -> Financial performance	0.047	0.045	0
Marketing strategy -> Non-financial performance	0.153	0.056	0.006
Partnership -> Financial performance	0.241	0.054	0

Partnership -> Non-financial performance	0.137	0.081	0
Regulatory environment -> Customer-centric capability	0.318	0.061	0
Regulatory environment -> Digital strategy	0.486	0.07	0
Regulatory environment -> Employees’ knowledge and skills	394.	0.059	0
Regulatory environment -> Innovation capabilities	0.237	0.057	0
Regulatory environment -> Marketing strategy	0.286	0.078	0.032
Regulatory environment -> Partnership	0.451	0.065	0

Figure19 - SEM model for Canada



6.4. FsQCA findings

In this step, we analyze the data using fsQCA to find the best combination of capabilities enhancing either the financial or non-financial performance of banks in Iran and Canada.

6.4.1. Iran

As is customary in similar quantitative studies, we first assessed the reliability and validity of the constructs, the results of which are detailed in the previous section under SEM analysis.

Analysis of necessity

The findings regarding necessary conditions for Iran are presented in Table 26.

As it is clear in Table 26, for financial performance:

- Customer-centric capability:

Customer-centric capability shows moderate consistency and coverage. This suggests that while it is associated with positive financial performance to some extent, its presence is not as consistent across cases with positive financial outcomes, and it does not cover a large proportion of such cases.

- Digital strategy:

Digital strategy exhibits moderate consistency, indicating a moderate association with positive financial performance. However, its coverage is relatively lower, suggesting that while it is consistently present in cases with positive financial performance, it does not cover as many cases with positive financial outcomes compared to other conditions.

- Innovation capability:

Innovation capability demonstrates both high consistency and coverage, indicating a robust association with positive financial performance. It is consistently present in cases with positive financial performance and covers a significant proportion of such cases.

- Marketing strategy:

Marketing strategy shows moderate consistency but high coverage. This suggests that while it may not always be present when positive financial performance occurs, it is prevalent among a vast majority of cases with positive financial performance, indicating its importance.

- Partnership:

Partnership exhibits moderate consistency and coverage. This implies that while it is moderately associated with positive financial performance, it does not cover as many cases with positive financial performance as some other factors.

- Employee’s knowledge and skills:

Employee’s knowledge and skills show high consistency and coverage, indicating a strong and prevalent association with positive financial performance.

Overall, the interpretation suggests that innovation capability, digital strategy, marketing strategy, and employee knowledge and skills are consistently associated with positive financial performance across cases. Innovation capability demonstrates the highest coverage among them, indicating its significant role in contributing to positive financial outcomes.

However, for non-financial performance:

- Customer-centric capability demonstrates both high consistency and coverage. This suggests that it is consistently associated with positive non-financial performance across cases, and it covers a significant proportion of cases with positive non-financial performance.

- Digital strategy exhibits high consistency, indicating a moderate association with positive non-financial performance. However, its coverage is relatively lower, suggesting that while it is consistently present in cases with positive non-financial performance, it does not cover as many cases with positive non-financial outcomes compared to other conditions.

- Innovation capability demonstrates both high consistency and coverage, indicating a robust association with positive non-financial performance. It consistently appears in cases with positive non-financial performance and covers a significant proportion of such cases.

- Marketing strategy demonstrates moderate consistency but high coverage. This suggests that while it may not always be present when positive non-financial performance occurs, it is prevalent among the vast majority of cases with positive non-financial performance, highlighting its importance.

- Partnership exhibits moderate consistency and coverage. This implies that while it is moderately associated with positive non-financial performance, it does not cover as many cases with positive non-financial performance as some other factors.

- Employee’s knowledge and skills demonstrate high consistency and coverage, indicating a strong and prevalent association with positive non-financial performance.

Overall, the interpretation suggests that customer-centric capability, innovation capability, marketing strategy, and employee knowledge and skills are consistently associated with positive non-financial performance across cases. Marketing strategy and employee knowledge and skills exhibit the highest coverage among them, indicating their significant roles in contributing to positive non-financial outcomes.

Table 26- Analysis of Necessary Conditions for Iran

Conditions tests*	Financial performance		Non-financial performance	
	Consistency	Coverage	Consistency	Coverage
Customer-centric capability	0.628	0.489	0.804	0.801
~Customer centric capability	0.998	0.407	0.916	0.608
Digital strategy	0.691	0.490	0.927	0.787
~Digital strategy	0.824	0.453	0.633	0.566
Innovation capability	0.972	0.575	0.858	0.826
~Innovation capability	0.819	0.400	0.751	0.597
Marketing strategy	0.801	0.785	0.803	0.937
~Marketing strategy	0.973	0.324	0.959	0.521
Partnership	0.823	0.673	0.590	0.786
~Partnership	0.891	0.355	0.909	0.589
Employee’s knowledge and skills	0.859	0.697	0.810	0.914
~Employee’s knowledge and skills	0.923	0.368	0.863	0.561

*Following the nomenclature, the symbol (~) represents the negation of the characteristic.

Complex configurations

In our study, following Kent (2008) and Pappas, Giannakos and Sampson (2016), we set a threshold of 1 leading to the removal of configurations with lower frequencies from further analysis.

Subsequent to the elimination of configurations with limited frequency, we arranged the truth table according to "raw consistency." The determination of a consistency threshold is essential. In our study, we chose a threshold of 0.75 according to Ragin (2009) and Ragin (2017).

Table 27 shows the analysis of configuration for both financial and non-financial performance in Iran in terms of the intermediate solution.

As it is clear for financial performance the overall solution consistency is 0.872, and the overall solution coverage is 0.697.

In solution 1, includes marketing strategy, and employees' knowledge and skills, are present (●). This configuration achieves a consistency of 0.786 and a raw coverage of 0.521. The unique coverage, representing the distinct cases covered by this solution, is 0.0002.

In solution 2, digital strategy, innovation capability, partnership, and employees' knowledge and skills are present (●) for financial performance. This configuration achieves a consistency of 0.760 and a raw coverage of 0.756. The unique coverage in this configuration is 0.041, representing the cases unique to this solution.

In solution 3, innovation capability, partnership, and employees' knowledge and skills are present (●), yielding a consistency of 0.836 and a raw coverage of 0.737. The unique coverage for this solution is 0.017.

In solution 4, customer-centric capability , marketing strategy, employees' knowledge and skills are present (●). This configuration results in a consistency of 0.764 and a raw coverage of 0.729. The unique coverage in this configuration is 0.064, showcasing the distinct cases covered exclusively by this specific solution.

However, for non-financial performance, the overall solution consistency is 0.910, and the overall solution coverage is 0.727.

In solution 1, customer-centric capability and marketing strategy, innovation capability and employees' knowledge and skills are present (●). This configuration achieves a consistency of 0.807 and a raw coverage of 0.631. The unique coverage, representing the distinct cases covered uniquely by this solution, is 0.061.

In solution 2, marketing strategy and employees' knowledge and skills, and partneship are present (●) for non-financial performance. This results in a consistency of 0.783 and a raw coverage of 0.559. However, there's no unique coverage for this solution.

In solution 3, customer-centric capability, digital strategy, innovation capability, and marketing strategy are present (●), yielding a consistency of 0.839 and a raw coverage of 0.574. The unique coverage for this configuration is 0.017.

In solution 4, customer-centric capability, digital strategy , marketing strategy are present (●), resulting in a consistency of 0.940 and a raw coverage of 0.382. The unique coverage for this solution is 0.0005.

In solution 5, innovation capability, employees' knowledge and skills, marketing strategy are present (●). This configuration achieves a consistency of 0.908 and a raw coverage of 0.620. The unique coverage in this configuration is 0.012, showcasing the distinct cases covered uniquely by this specific solution.

In solution 6, digital strategy, innovation capability, partnerships are present (●), yielding a consistency of 0.910 and a raw coverage of 0.557. The unique coverage for this solution is 0.002.

Overall, the presence or absence of specific factors in each solution configuration sheds light on their importance for both financial and non-financial performance in the context of Iran. Also, decision-makers can use these findings to make informed strategic decisions based on the variety of solutions that suggest that organizations may need to tailor their strategies based on the specific combination of factors relevant to their context. The analysis encourages a holistic understanding of performance by considering both financial and non-financial aspects, providing a more comprehensive view of banks in Iran.

Table 27- Combinations of conditions of sufficiency for Iran

Configuration	Financial performance				Non-financial performance					
	Solution1	Solution2	Solution3	Solution4	Solution1	Solution2	Solution3	Solution4	Solution5	Solution6
Customer centric capability	⊗	⊗	⊗	●	●	⊗	●	●	⊗	⊗
Digital strategy		●		⊗			●	●	⊗	●
Innovation capability	⊗	●	●	⊗	●		●	⊗	●	●
Marketing strategy	●		⊗	●	●	●	●	●	●	
Partnership	⊗	●	●	⊗	⊗	●		⊗	⊗	●
Employee’s knowledge and skills	●	⊗	●	●	●	●		⊗	●	⊗
Raw coverage	0.521	0.756	0.737	0.729	0.631	0.559	0.574	0.382	0.620	0.557

Unique Coverage	0.0002	0.041	0.017	0.064	0.061	0	0.017	0.0005	0.012	0.002
Consistency	0.786	0.760	0.836	0.764	0.807	0.783	0.839	0.940	0.908	0.910
Solution consistency	0.872				0.910					
Solution coverage	0.697				0.727					

6.4.2. Canada

To conduct fsQCA for data in Canada, we followed the same steps as we did for Iran, including data calibration and various analyses. In this section, we present the findings for the Canadian region.

Analysis of necessity conditions

Table 28 shows the analysis of necessity conditions for Canada. Considering the 0.8 threshold we can find that:

Financial Performance:

- Customer-Centric Capability: The high consistency score (0.973) emphasizes the necessity for Canadian banks to prioritize and enhance their customer-centric capabilities. In the competitive banking industry, focusing on customer satisfaction, personalized services, and effective relationship management is crucial for financial success.
- Digital Strategy: With a consistency score of 0.913, the analysis underscores the importance of a robust digital strategy for financial performance in Canadian banking. Investing in digital channels, online banking services, and innovative financial technologies is imperative to meet the evolving needs of customers and stay competitive.
- Innovation Capability: The critical importance of innovation (consistency score: 0.986) suggests that Canadian banks must continually innovate in

their products, services, and processes. Embracing technological advancements and fostering a culture of innovation can contribute significantly to financial success.

- Marketing Strategy: The necessity of a well-defined marketing strategy (consistency score: 0.950) implies that effective communication and brand positioning are vital for Canadian banks. Aligning marketing efforts with customer preferences and market trends is crucial for attracting and retaining customers.
- Partnership: The high consistency score (0.977) for partnership highlights the importance of collaboration for financial success in the Canadian banking sector. Building strategic partnerships with fintech companies, other financial institutions, and relevant stakeholders can enhance service offerings and market reach.
- Employees' Knowledge and Skills: The emphasis on the necessity of employees' knowledge and skills (consistency score: 0.933) implies that investing in training and development programs is essential for Canadian banks. A knowledgeable and skilled workforce is critical for delivering high-quality financial services and adapting to industry changes.

Non-Financial Performance:

- Customer-Centric Capability: The consistent importance of customer-centric capability (consistency score: 0.958) for non-financial performance reiterates the need for a holistic approach. Beyond financial metrics, customer satisfaction and loyalty contribute significantly to the overall success and reputation of Canadian banks.

- Digital Strategy: A robust digital strategy (consistency score: 0.897) is essential not only for financial success but also for enhancing non-financial aspects. It can improve operational efficiency, customer experience, and the overall agility of Canadian banks.
- Innovation Capability: The necessity of innovation (consistency score: 0.952) for non-financial performance suggests that innovation contributes to organizational effectiveness, adaptability, and competitiveness in the banking sector.
- Marketing Strategy: The importance of a well-defined marketing strategy (consistency score: 0.945) extends to non-financial aspects, emphasizing the role of branding and communication in shaping the public perception of Canadian banks.
- Partnership: The emphasis on partnership (consistency score: 0.973) as a necessary condition for non-financial performance highlights the collaborative nature of the banking industry. Strategic alliances can contribute to regulatory compliance, ethical practices, and community engagement.
- Employees’ Knowledge and Skills: The necessity of employees' knowledge and skills (consistency score: 0.928) for non-financial performance emphasizes the role of a competent workforce in maintaining a positive organizational culture and ethical standards.

In summary, the implications of the analysis emphasize the multifaceted nature of success in the Canadian context, where both financial and non-financial aspects are interlinked. Businesses should focus on building and sustaining customer-centric capabilities, implementing robust digital and marketing strategies, fostering innovation, maintaining strong partnerships, and investing in the knowledge and skills of their employees to achieve comprehensive success in the Canadian market.

Table 28- Analysis of Necessary Conditions for Canada

*Conditions tested	Financial performance		Non-financial performance	
	Consistency	Coverage	Consistency	Coverage
Customer-centric capability	0.973	0.845	0.958	0.972
~Customer centric capability	0.213	1.000	0.182	1.000
Digital strategy	0.913	0.840	0.897	0.966
~Digital strategy	0.277	0.992	0.239	1.000
Innovation capability	0.986	0.863	0.952	0.975
~Innovation capability	0.222	0.996	0.191	1.000
Marketing capability	0.950	0.836	0.945	0.972
~Marketing capability	0.227	0.992	0.196	1.000
Partnership	0.977	0.831	0.973	0.968
~Partnership	0.190	1.000	0.163	1.000
Employee's knowledge and skills	0.933	0.851	0.928	0.990
~Employee's knowledge and skills	0.269	1.000	0.230	1.000

*Following the nomenclature, the symbol (~) represents the negation of the characteristic.

Complex configurations

We followed the same steps as the complex configuration for Iran and set the frequency at 1 and consistency at 0.75. The solutions found for Canada are presented in Table 29.

For financial performance, the overall solution consistency is 0.918, and the overall solution coverage is 0.873.

Solution 1 includes customer-centric capability, digital strategy, innovation capability, partnership, and employees' knowledge and skills, are present (●). This configuration achieves a consistency of 0.873 and a raw coverage of 0.851. The unique coverage, representing the distinct cases covered exclusively by this solution, is 0.016.

In solution 2, customer-centric capability, innovation capability, marketing strategy, partnership, and employees' knowledge and skills are present (●) for financial performance. This configuration achieves a consistency of 0.876 and a raw coverage of 0.891. The unique coverage in this configuration is 0.055.

In solution 3, all conditions, except customer-centric capability, and partnership are present (●). This configuration results in a consistency of 0.878 and a raw coverage of 0.847. The unique coverage in this configuration is 0.011, showcasing the distinct cases covered uniquely by this specific solution.

For non-financial performance, the overall solution consistency is 0.892, and the overall solution coverage is 0.993.

Solution 1 includes customer-centric capability, digital strategy, innovation capability, and employees' knowledge and skills, are present (●). This configuration achieves a consistency of 0.995 and a raw coverage of 0.830. The unique coverage, representing the distinct cases covered exclusively by this solution, is 0.018.

In solution 2, customer-centric capability, innovation capability, marketing strategy, partnership, and employees' knowledge and skills are present (●) for non-financial performance. This configuration achieves a consistency of 0.995 and a raw coverage of 0.865. The unique coverage in this configuration is 0.053.

In solution 3, all conditions, except customer-centric capability, are present (●). This configuration results in a consistency of 0.997 and a raw coverage of 0.821. The unique coverage in this configuration is 0.009, showcasing the distinct cases covered uniquely by this specific solution.

In summary, these findings suggest that a combination of factors, including customer-centric capability, innovation, marketing, partnerships, and employee skills, is crucial for both financial and non-financial success in the Canadian banking sector. Digital strategy, while important, may not be the sole determinant of performance, particularly in the financial domain.

Table 29- Combinations of conditions of sufficiency for Canada

Conditions	Financial performance			Nonfinancial performance		
	Solution1	Solution2	Solution3	Solution1	Solution2	Solution3
Customer centric capability	●	●	⊗	●	●	
Digital strategy	●		●	●		●
Innovation capability	●	●	●	●	●	●
Marketing strategy		●	●	⊗	●	●
Partnership	●	●			●	●
Employee’s knowledge and skills	●	●	●	●	●	●
raw coverage	0.851	0.891	0.847	0.830	0.865	0.821
Unique Coverage	0.016	0.055	0.011	0.018	0.053	0.009
Consistency	0.873	0.876	0.878	0.995	0.995	0.997
Solution consistency	0.918			0.892		
Solution coverage	0.873			0.993		

6.5. Summary

In conclusion, through the utilization of the Delphi method, we identified a range of capabilities and resources that significantly impact the performance of banks in digital banking. These encompassed elements such as social capital, brand perception, consistency in innovation, strategic flexibility, integration of the bank's processes with customers' businesses, the composition of board members, and the asset portfolio management. Notably, we also recognized the pivotal role of the suggested resource, the physical branch.

Further, by determining the ranking of each capability, resource, and digital technology, we gained insights into how these factors contribute to the enhancement of both financial and non-financial aspects within the realm of digital banking. Our comparative analysis between Iran and Canada unveiled distinctions in the importance of these factors across different contexts.

The evaluation of technological readiness, along with comparisons between the two countries, highlighted disparities and emphasized the significance of strategies, collaborations, and knowledge-sharing initiatives in driving improvement. The implementation of Structural Equation Modeling (SEM) sheds light on the impact of each capability on financial and non-financial performance in both Iran and Canada. Notably, certain capabilities exhibited positive effects, while others demonstrated negative impacts. Interestingly, our findings in Canada indicated a lack of a significant relationship between innovation capabilities and non-financial performance.

Furthermore, our examination of the positive and negative effects of regulatory factors on capabilities, coupled with cross-country comparisons, provided valuable insights into the varying degrees of importance placed on these factors. The application of Fuzzy Set Qualitative Comparative Analysis (fsQCA) allowed us to explore diverse combinations of capabilities and identify context-specific solutions for enhancing overall performance. It became evident that there is no one-size-fits-all approach, and optimal solutions varied depending on the specific context.

Ultimately, our research contributes to a nuanced understanding of the multifaceted dynamics at play in the digital banking landscape, offering valuable insights for banks seeking to optimize their performance in diverse regulatory environments.

Chapter7: Discussion

7.1. Overview

In this chapter, we embark on a comprehensive exploration of our study's findings, meticulously dissecting their significance while drawing insightful comparisons with existing literature to elucidate the distinctive contributions of our research. Our analytical journey unfolds in two major segments. Firstly, we delve into the intricate details of Study One, a critical examination of the Delphi method, offering profound insights into its outcomes. Subsequently, we navigate through Study Two, a rigorous exploration utilizing SEM and fsQCA, which casts a spotlight on the regulatory landscape. By dissecting each study individually and scrutinizing their respective findings, we aim to provide a comprehensive and insightful overview of this chapter, enriching our understanding of the research contributions.

7.2. Additional input analysis

In the Delphi study, we employed open-ended inquiries, empowering participants to articulate various unexplored capabilities and resources. By uncovering these new factors, enumerated below, we significantly augmented the digital banking literature (Al-dmour et al., 2021; Al-Dmour, 2022; Cao et al., 2022; Cheng & Feng, 2021; Dmour et al., 2020; Edu, 2022; Gul & Ellahi, 2021; Gul et al., 2021; Liu et al., 2011; Manser Payne et al., 2021; Setia, Venkatesh, & Joglekar, 2013; Suandi et al., 2022; Vijayalakshmi & Jayalakshmi, 2019). The subsequent elucidation outlines the definitions and implications of these identified factors. These findings represent the primary contributions of the Depli method, introducing novel elements previously absent from existing literature. Their inclusion not only expands but also enriches the discourse on digital transformation within the banking industry.

Strategic Capabilities

1.Social capital: As defined in this study, it encompasses the structural, relational, and cognitive dimensions of resources inherent in networks of relationships. It fosters efficient actions, improves information diffusion, and cooperative behavior among individuals and collectives (Nahapiet & Ghoshal, 1998). Recognized as a strategic capability, social capital is advantageous for both its originators and the broader group of members. It represents the positive regard accessible to individuals or collectives, rooted in the arrangement and quality of an individual's social connections (Kemper et al., 2013). The inclusion of Social capital as a strategic capability is of paramount importance for several reasons. Firstly, it recognizes the crucial role that relationships and networks play in the success of organizations undergoing digital transformation. In the context of strategic capabilities, Social capital becomes a dynamic force influencing institutional dynamics, innovation, and value creation. The quality and structure of social connections contribute significantly to the long-term success and competitive advantage of organizations navigating the complexities of digital transformation. Furthermore, the participant's suggestion to consider Social capital as a factor impacting non-financial performance underscores the strategic nature of this capability. It extends beyond traditional financial metrics and emphasizes the broader influence of social relationships on organizational dynamics. Social capital becomes instrumental in shaping a collaborative culture, facilitating knowledge sharing, and fostering innovation, all critical components of strategic success in the digital era. By incorporating Social capital into the discussion of strategic capabilities, the analysis gains depth and comprehensiveness. This addition underscores the dynamic and multifaceted nature of strategic capabilities within the context of digital transformation. It highlights the importance of fostering strong social connections and networks as a strategic capability that contributes to long-term organizational success, particularly when operating within diverse regulatory frameworks such as those of Iran and Canada.

2.Strategic flexibility: Strategic flexibility does not possess a singular, universally accepted definition. However, within the context of digital banking, one closely aligned interpretation of this concept views it primarily as a reactive capability. This interpretation encompasses responsiveness and adaptation to shifts in the business environment, emphasizing the capacity for swift, quick, prompt, and timely responses to emerging challenges and opportunities (Brozovic, 2018). Recognized as a strategic capability, it empowers the organization to dynamically adapt and align strategies with changing external conditions, ensuring sustained competitiveness and success. The inclusion of Strategic flexibility as a strategic capability is pivotal as it extends the scope of strategic capabilities beyond proactive planning and execution, acknowledging the need for adaptability in the face of unpredictable and rapidly changing circumstances. In the dynamic landscape of digital banking, where technological advancements and market shifts are frequent, a strategic approach that incorporates flexibility becomes imperative for sustained success. Including Strategic flexibility as a strategic capability underscores the importance of not only proactive strategic planning but also the ability to react swiftly to external stimuli. Consequently, it enhances the comprehensiveness of the strategic capabilities framework, providing a more holistic perspective on the factors influencing non-financial performance in the context of digital transformation within the banking industry.

3.Board members combination: Board composition capability" is the ability to create an effective board, akin to assembling a high-performing team. While other teams are meticulously crafted with a mix of skills and talents, boards are sometimes formed without careful consideration(effectivegovernance). This capability is considered strategic because it strategically guides the organization in enhancing decision-making, risk management, innovation, and overall organizational performance. It is crucial for sustained success in a dynamic business environment. The inclusion of Board members combination as a strategic capability is of paramount importance for several reasons. Firstly, it recognizes that the effectiveness of a board is not just about individual expertise but about strategically assembling a group of diverse talents and skills. In the context of strategic capabilities, Board members combination becomes a dynamic force that influences the overall strategic direction of the organization through the composition and collaboration of its board members. Moreover, the participant's suggestion to consider Board members combination as a factor impacting organizational performance underscores the strategic nature of this capability. It extends beyond routine governance functions and emphasizes the broader influence of a well-composed board on decision-making, risk management, and innovation — all critical components of strategic success in the digital era. By incorporating Board members combination into the discussion of strategic capabilities, the analysis gains depth and comprehensiveness. This addition underscores the strategic and organizational dimensions of board composition in the digital era. It highlights the importance of having a board with a well-thought-out combination of skills and talents as a strategic capability that contributes to organizational performance, particularly when operating within diverse regulatory frameworks such as those of Iran and Canada. Ultimately, the inclusion of Board members combination adds a layer of nuance to the understanding of how strategic capabilities shape the impact of digital transformation on the banking industry.

4.Asset portfolio management: as defined in this study, encompasses the strategic capability of skillfully selecting and managing a collection of investments aligned with enduring financial goals and risk tolerance. This capability involves the effective allocation and leveraging of resources to achieve organizational objectives. Recognized as a strategic capability, Asset portfolio management aligns with an organization's long-term goals, providing a competitive advantage through effective resource allocation, risk management, and adaptability to changing market conditions (Hayes, 2023). The inclusion of Asset portfolio management as a strategic capability is of paramount importance for several reasons. Firstly, it recognizes that the management of assets goes beyond routine financial activities and is integral to an organization's ability to achieve long-term success. In the context of strategic capabilities, Asset portfolio management becomes a dynamic force that influences the overall strategic direction of the organization through effective resource allocation and risk management. Moreover, the participant's suggestion to consider Asset portfolio management as a factor impacting organizational performance underscores the strategic nature of this capability. It emphasizes the importance of aligning the organization's investment choices with its overarching financial goals and risk tolerance. Asset portfolio management becomes instrumental in providing a competitive advantage by strategically managing resources and adapting to dynamic market conditions. By incorporating Asset portfolio management into the discussion of strategic capabilities, the analysis gains depth and comprehensiveness. This addition underscores the strategic and financial dimensions of asset management in the digital era. It highlights the importance of having a well-crafted asset portfolio as a strategic capability that contributes to organizational performance, particularly when operating within diverse regulatory frameworks such as those of Iran and Canada. Ultimately, the inclusion of Asset portfolio management adds a layer of nuance to the understanding of how strategic capabilities shape the impact of digital transformation on the banking industry.

This thesis contributes valuable insights to Dynamic Capability Theory (DCT) by identifying and elaborating on strategic capabilities within the context of digital transformation in the banking industry.

The identification of social capital as a strategic capability aligns with the DCT emphasis on a firm's ability to adapt and evolve its resources over time (Teece, 2007). Social capital, rooted in networks and relationships, represents a dynamic force influencing institutional dynamics, innovation, and value creation. This addition enriches DCT by recognizing the crucial role that relationships and networks play in the success of organizations undergoing digital transformation. It highlights the dynamic and multifaceted nature of strategic capabilities, emphasizing the importance of fostering strong social connections and networks for long-term organizational success.

Moreover, the concept of strategic flexibility aligns with DCT's core principle of adaptability. DCT posits that a firm's competitive advantage lies in its ability to dynamically adapt and align strategies with changing external conditions (Eisenhardt & Martin, 2000). By including strategic flexibility as a strategic capability, our findings extend the scope of strategic capabilities beyond proactive planning. It emphasizes the need for adaptability in the face of unpredictable and rapidly changing circumstances, contributing to a more holistic understanding of factors influencing performance in digital transformation within the banking industry.

Also, DCT focuses on the dynamic capabilities of organizations (Teece, 2007), and our identification of board members combination aligns with the idea of assembling a high-performing team. It recognizes the strategic nature of a well-composed board in enhancing decision-making, risk management, and overall organizational performance. This addition adds nuance to DCT by emphasizing the organizational dimensions of board composition in the digital era. It highlights the strategic influence of a well-thought-out combination of skills and talents in shaping the impact of digital transformation on the banking industry.

In addition, DCT underscores the importance of managing resources effectively (Teece, 2007), and our identification of asset portfolio management aligns with this principle. It recognizes the dynamic force of managing a collection of investments aligned with enduring financial goals and risk tolerance. Our findings add depth to DCT by emphasizing the strategic and financial dimensions of asset management in the digital era. It underscores the importance of a well-crafted asset portfolio as a strategic capability contributing to organizational performance.

In summary, our findings provide nuanced insights into specific strategic capabilities within the digital transformation context, enhancing the understanding of how these capabilities contribute to the dynamic capabilities of organizations, as outlined by DCT. Furthermore, this work complements the studies of Wang et al. (2022), Tsou and Chen (2021), and Caputo et al. (2019), which also employed dynamic theory in the digital banking literature. Together, these studies contribute to a comprehensive understanding of how dynamic capabilities shape the success of organizations in the evolving landscape of digital banking.

Operational Capabilities

Consistency in innovation: Consistency in innovation capability is crucial for organizations to maintain a competitive edge. It involves the ability to generate new ideas, develop them into prototypes, and bring them to market in a timely and efficient manner (Cramm, 2008). This capability is operational as it involves the ongoing execution of systematic processes, resource allocation, coordination, and performance metrics within the organization to consistently generate novel ideas, products, or processes. The participant's suggestion to consider Consistency in innovation as a factor influencing financial outcomes underscores the operational nature of this capability. It aligns with the day-to-day activities and processes within the organization, emphasizing the need for a structured and persistent approach to innovation. This operational capability becomes instrumental in fostering a culture of continuous improvement and adaptation, essential for sustained success in the digital banking landscape. By incorporating Consistency in innovation into the discussion of operational capabilities, the analysis gains depth and comprehensiveness. This addition underscores the dynamic nature of operational capabilities within the context of digital transformation and highlights the importance of ongoing, systematic innovation for financial success. Ultimately, it contributes to a more nuanced understanding of the operational dimensions that drive performance in the banking industry, especially when operating within diverse regulatory frameworks such as those of Iran and Canada.

Our findings on "Consistency in innovation" as an operational capability in the context of digital banking contribute meaningful insights to DCT. DCT emphasizes a firm's capacity to adapt and evolve its resources and capabilities over time as a key determinant of competitive advantage (Teece et al., 1997). Our identified capability, "Consistency in innovation," aligns with this core tenet by highlighting the importance of ongoing, systematic innovation for organizations to maintain a competitive edge in the digital banking landscape. Then, our findings on "Consistency in innovation" contribute to DCT by highlighting the operational dimension of dynamic capabilities and emphasizing the ongoing, systematic nature of innovation as crucial for sustained success in the digital banking landscape.

Functional Capabilities

1.Bank's process integration with customers' businesses: It refers to the strategic initiative taken by banks to incorporate digital collaboration tools and technologies into their core business processes to enhance communication, streamline operations, and improve customer experiences. This integration involves using digital collaboration solutions to facilitate seamless and efficient interactions between the bank and its customers at various stages of financial transactions and services (Mangla, 2020). This capability extends beyond routine operations and transactional efficiency, encompassing the broader strategic objective of cultivating mutually beneficial relationships with business clients. The importance of this expanded functional capability lies in its ability to address the evolving landscape of the banking industry. The integration of digital collaboration tools signifies a proactive approach to staying relevant in an increasingly interconnected and technologically advanced environment. It serves as a conduit for fostering stronger ties with customers and adapting to changing market dynamics. Furthermore, the additional input analysis brings forth nuanced insights into the specific nuances of the Canadian banking sector, showcasing the contextual relevance of this functional capability within the regulatory framework of Canada. The emphasis on the importance of the Bank's process integration with customers' businesses by participants from Canada reinforces the idea that this capability is not one-size-fits-all; rather, its significance may vary based on regional regulatory nuances and industry dynamics.

2.Brand preference, as defined in this study, involves establishing robust connections between the brand and consumer needs, emphasizing the brand's effectiveness in meeting specific consumer requirements over time(Alreck & Settle, 1999). Considered a functional capability, it necessitates the proficient execution of functions related to branding, advertising, and positioning. The focus is on cultivating and sustaining a favorable bond with consumers throughout the product life cycle. The inclusion of Brand preference as a functional capability is of paramount importance for several reasons. Firstly, it recognizes that the strength of a brand is not merely a symbolic representation but a functional aspect that directly impacts consumer choices and loyalty. In the context of functional capabilities, Brand preference becomes a dynamic force that requires the efficient execution of various functions related to branding and consumer engagement. Moreover, the participant's suggestion to consider Brand preference as a factor impacting non-financial performance underscores the functional nature of this capability. It emphasizes the operational aspects of managing and promoting a brand effectively. The execution of branding, advertising, and positioning strategies becomes crucial for cultivating and maintaining a positive relationship with consumers throughout the product life cycle, which directly influences non-financial performance metrics such as customer satisfaction and loyalty. By incorporating Brand preference into the discussion of functional capabilities, the analysis gains depth and comprehensiveness. This addition underscores the operational and functional dimensions of managing a brand in the digital era. It highlights the importance of proficiency in branding-related functions as a functional capability that contributes to non-financial performance, particularly when operating within diverse regulatory frameworks such as those of Iran and Canada. Ultimately, the inclusion of Brand preference adds a layer of nuance to the understanding of how functional capabilities shape the impact of digital transformation on the banking industry.

Our findings contribute significantly to DCT by identifying and elaborating on specific functional capabilities within the context of digital transformation in the banking industry.

Bank's Process Integration with Customers' Businesses aligns with DCT's emphasis on a firm's capacity to adapt and evolve its resources and capabilities over time (Teece et al., 1997). The integration of digital collaboration tools represents a strategic initiative that goes beyond routine operations, emphasizing the importance of staying relevant in an interconnected and technologically advanced environment. The findings contribute to DCT by highlighting the dynamic and evolving nature of functional capabilities in response to changing market dynamics .

DCT focuses on a firm's ability to dynamically adapt and reshape its resources and capabilities (Teece, 2007). Brand preference, as a functional capability, aligns with this concept by emphasizing the importance of efficient execution in branding, advertising, and positioning to cultivate and sustain a favorable bond with consumers. Our findings add depth to DCT by emphasizing the operational and functional dimensions of managing a brand in the digital era. It recognizes the dynamic force of Brand preference and its impact on non-financial performance metrics like customer satisfaction and loyalty. This aligns with DCT's recognition of the link between dynamic capabilities and performance outcomes.

In summary, Our findings contribute to DCT by highlighting specific functional capabilities and their dynamic nature within the context of digital transformation in the banking industry. The emphasis on adaptability, efficiency in execution align well with the core principles of DCT.

Resources

A bank's physical branch, as defined in this study, represents a tangible and traditional resource, encompassing the physical locations of a banking corporation.

These brick-and-mortar branches offer in-person services, including activities like withdrawing money, depositing checks, and interacting with tellers. They also serve as hubs for access to professionals such as mortgage officers and financial advisors (Thompson, 2021). The inclusion of the Physical branch as a resource is of paramount importance for several reasons. Firstly, it acknowledges the enduring relevance of physical locations in the banking sector, even in the era of digital transformation. In the context of resources, the Physical branch becomes a dynamic asset that provides tangible, face-to-face interactions and specialized services, contributing to the overall customer experience. Moreover, the participant's suggestion to consider the Physical branch as a resource underscores its importance in serving specific customer needs and preferences. While digital channels have become prevalent, the Physical branch remains a critical resource for customers who prefer in-person interactions or require personalized financial advice. It complements the digital offerings, offering a hybrid approach to banking services. By incorporating the Physical branch into the discussion of resources, the analysis gains depth and comprehensiveness. This addition underscores the importance of recognizing and leveraging traditional resources alongside digital advancements. The Physical branch, as a resource, remains relevant for fostering customer relationships, providing specialized services, and catering to a diverse clientele. In the ever-evolving landscape of digital transformation, acknowledging the significance of both digital and physical resources becomes crucial for a holistic understanding of how banks navigate the challenges and opportunities of the digital era.

Our findings on a bank's physical branch as a resource in the context of digital transformation contribute important insights to DCT. DCT emphasizes the capacity of a firm to adapt and evolve its resources over time (Teece et al., 1997). Our acknowledgment of the enduring relevance of physical branches, even in the digital era, aligns with DCT's recognition that banks need to adapt and leverage a mix of resources to sustain a competitive advantage. By recognizing the ongoing importance of physical branches as dynamic assets, our findings contribute to DCT by illustrating how firms can maintain and adapt traditional resources alongside digital advancements. This suggests that a dynamic approach to resources involves recognizing and leveraging both traditional and modern elements.

7.3. Capabilities

7.3.1. Capabilities- Non-financial performance

Delphi study

In the foundational stages of our study, employing the rigorous Delphi method, we discerned key capabilities crucial for elevating performance in the realm of digital banking. Notably, within the Canadian context, marketing strategy, customer-centric strategy, and digital strategy emerged as pivotal. In stark contrast, the Iranian landscape prioritized customer-centric strategy, innovation-driven capability, and digital strategy as the most impactful for enhancing performance in digital banking. This revelation underscores the overarching significance of strategic capabilities, surpassing the influence of functional and operational capabilities in both countries.

Noteworthy is the consensus across borders, as both nations underscored the universal importance of customer-centric strategy and digital strategy as common denominators in the pursuit of enhanced non-financial performance. This alignment, despite nuanced differences, highlights the transcendent relevance of these strategic capabilities, showcasing their indispensability in the ever-evolving landscape of digital banking.

These findings contribute a critical layer to the academic discourse by shedding light on the specific capabilities that wield substantial influence over performance. The emphasis on strategic capabilities challenges conventional assumptions, signalling a shift in focus from operational intricacies to the broader, strategic dimensions that propel digital transformation success. Moreover, the nuanced differences in the prioritization of capabilities between Canada and Iran offer a nuanced understanding of the contextual variations that shape digital banking strategies. This comparative analysis enriches the literature by providing insights into how regional disparities influence the perceived importance of specific capabilities in the pursuit of enhanced performance.

Our study extends beyond a singular assessment of the impact of capabilities on performance within a specific context. Instead, we delve into the nuanced exploration of their significance, meticulously identifying and comparing their importance. In doing so, our research broadens the scope of understanding, offering insights that transcend the confines of a single context. By illuminating the universal importance of strategic capabilities while acknowledging the contextual variations between Canada and Iran, our findings contribute to a more comprehensive understanding of the intricate dynamics driving success in digital transformation within the banking industry.

Our findings provide valuable insights at both the micro-level, in the context of DCT, and at the macro-level, with relevance to the System of Innovation theory.

Our findings emphasize the overarching significance of strategic capabilities in elevating performance in digital banking. This aligns with DCT, which posits that a firm's capacity to adapt and evolve its resources and capabilities over time is crucial for gaining a competitive advantage (Teece et al., 1997). The focus on strategic capabilities challenges conventional assumptions, indicating a shift in attention from operational intricacies to broader, strategic dimensions. This aligns with DCT's core premise of adapting and reshaping capabilities over time to maintain a competitive edge.

SEM study

The structural equation modelling (SEM) results obtained from the Iranian banking sector, analyzing the impact of various capabilities on non-financial performance in digital transformation, provided intriguing insights. Contrasting these findings with analogous studies in the Canadian banking sector revealed notable disparities and some similarities, warranting a detailed discussion. Notably, partnership non-financial performance in Iran was non-significant. Several factors could contribute to this outcome, including small sample sizes, contextual differences, sample characteristics, industry representation, or specific differences, sample the sampled banks (Hair et al., 2022). Future research endeavors could address these limitations by employing alternative measures, expanding sample sizes, and exploring additional contextual variables to further elucidate the observed relationships. However, we employed fsQCA to address this issue in this research and explore it using other method. Our implementation of the fsQCA method in this study added a different perspective, potentially yielding new and insightful results compared to traditional methods.

<u>Customer-centric capability</u>

In evaluating customer-centric capabilities, Setia (2013) underscored its significance in Indian banks, affirming our Delphi findings. In our Structural Equation Modeling (SEM) analysis, the Iranian sample exhibited a coefficient of 0.122. In contrast, the Canadian banking study demonstrated a more robust coefficient of 0.189. These findings indicate a subtle yet positive impact of customer-centric capabilities on non-financial performance. While slight discrepancies may stem from cultural perspectives or environmental factors like regulatory influences, our SEM results largely corroborate Setia (2013)'s study, which found that customer-centric capabilities enable firms to adeptly sense and respond to local customer needs—a facet akin to non-financial performance. Notably, Setia (2013) proposed Information Quality as the antecedent to this capability, whereas our study delves into the regulatory impact on customer-centric capabilities. Thus, our research, utilizing two different SEM approaches, aligns with existing literature while introducing a novel regulatory dimension to the understanding of customer-centric capabilities, contributing to the enhancement of previous models. The positive impact of customer-centric capabilities on non-financial performance aligns with DCT's emphasis on a firm's capacity to adapt. It suggests that organizations capable of sensing and responding to customer needs have a dynamic capability that contributes to their competitive advantage.

Digital strategy

In the existing literature, Yudaruddin (2023) delved into the application of digital strategy by banks in Indonesia, emphasizing its positive correlation with lending decisions. Our Delphi findings align with this perspective, underscoring the pivotal role of digital strategy in shaping non-financial performance. Employing Partial Least

Squares Structural Equation Modeling (PLS-SEM), we identified positive coefficients for digital strategy in both Iranian and Canadian banks, underscoring its significant impact. Notably, the Canadian banking sector displayed a considerably higher coefficient (0.148) in comparison to Iran (0.123), suggesting potential variations in the implementation of digital strategy or technological adaptation between the two nations It’s noteworthy that the impact of digital strategies on non-financial performance has been scarcely explored in the banking literature, constituting a distinctive contribution from our study to this realm. While studies in other industries, such as manufacturing firms surveyed by Chi et al. (2018), have investigated the impact of digital business strategy on firm performance or Leischnig et al. (2017)’s study about positive impact of a firm’s digital business strategy on market performance with firms from different industries, these insights are parallel to our banking-oriented research. Despite the diverse industries, these studies collectively reinforce and complement our findings, highlighting the universal relevance of the positive impact of digital strategies on overall non-financial performance. This finding aligns with DCT by recognizing digital strategy as a dynamic capability within banks. DCT emphasizes a firm's capacity to adapt and evolve its resources and capabilities over time for sustained competitive advantage (Teece et al., 1997). In this context, digital strategy is identified as a strategic capability that influences non-financial performance.

Innovation capabilities

In the context of Innovation capabilities, Farida et al. (2019)'s study on Micro, Small, and Medium Enterprises (MSMEs) in Indonesia underscored a significant and positive direct effect of innovation capability on both competitive advantage and performance. This resonates with findings from Christa et al. (2020)'s work on Indonesian banks, which also highlights the substantial positive impact of innovation capability on business performance. Our study aligns closely with these positive impacts of innovation capability on non-financial performance, despite revealing differing levels of influence in the two national banking sectors. While both Iranian and Canadian banks displayed positive coefficients, the Canadian sample demonstrated a notably higher impact on non-financial performance. It's crucial to note that our examination specifically focused on the domain of digital banking, introducing a nuanced perspective to this relationship.

The positive impact of innovation capabilities on non-financial performance aligns with DCT's core idea of continuous adaptation (Teece, 2007). The ability to innovate and introduce new capabilities reflects a dynamic and evolving organizational capacity.

Marketing strategy

In the intricate landscape of marketing strategy, Alfayad (2021)'s examination among Saudi Banks' customers stands out, illuminating its substantial positive impact on Omni-channel adoption—a resonance with the robust findings derived from our Delphi method. Our SEM analysis, a powerful tool in unravelling intricate relationships, underscores this impact, revealing a coefficient of 0.078 for the influence of marketing strategy in Iran and a more pronounced 0.153 in Canada. Venturing into the literature, Mekonen et al. (2022)'s scrutiny of the effect of marketing strategy on bank performance at Abyssinia Bank in Ethiopia, and KASSAHUN (2020)'s comprehensive study on Oromia International Banks (OIBs) performance echo similar themes, showcasing the profound influence of marketing strategy elements such as product, price, promotion, and place on bank performance. While these findings resonate with our study, it's imperative to note the meticulous approach we took.Our evaluation was conducted within the transformative realm of digitalization, marking a distinctive contribution to the existing body of research. Our holistic consideration of marketing strategy within the digitalization context contributes to DCT by recognizing the need for firms to adapt marketing strategies in the face of technological advancements.

Employees' knowledge and skills

The examination of the impact of employees' knowledge and skills on non-financial performance, a dimension scarcely explored in the existing literature, distinguishes our study. While prior research, such as the work of Chatzoglou and Vraimaki (2009) on knowledge sharing and Nasikhin and Danila (2018) on knowledge management, has touched on related aspects, our contribution lies in specifically focusing on the effects of employees' knowledge and skills on non-financial performance in the context of digital banking—a novel dimension not extensively covered before. Our SEM results underscore the significance of employees' knowledge and skills as potent drivers of non-financial performance, revealing notable coefficients and substantial effect sizes in both Iranian and Canadian studies. Intriguingly, despite the similarity in coefficients between the two samples, the effect size in the Canadian context (0.471) surpassed that of Iran (0.407), indicating potential subtleties in how employees' competencies are harnessed or assessed within these distinct banking environments. This finding contributes valuable insights to the evolving discourse on the role of human capital in the digital banking landscape. The recognition of employees' knowledge and skills as potent drivers of non-financial performance contributes to DCT by highlighting the importance of human capital as a dynamic capability. It suggests that the continuous development of employee competencies is essential for organizational adaptation.

Partnership with technology companies

The impact of partnerships on non-financial performance varies between Iran and Canada, with a negative coefficient of -0.292 in Iran and a positive one of 0.137 in Canada. This disparity underscores the nuanced nature of partnership dynamics in digital transformation. Dussauge et al. (2000) explore scale and link alliances across regions, shedding light on strategic alliances' complexities and their effects on organizational performance globally. Additionally, Shin et al. (2019) investigate partnership orientation's impact on commitment, innovation, and firm performance, emphasizing investment-based and contractual-based orientations' role in fostering commitment. Oliveira and Lumineau (2018) delve into the negative aspects of interorganizational relationships (IORs), highlighting conflicts, failures, opportunism, and unethical practices. Their study proposes an integrative framework for exploring IORs' complexities further. These findings suggest that partnerships can have both positive and negative impacts on performance due to their complex nature and they are aligned with our study. This dissimilarity may be rooted in several factors, highlighting the nuanced nature of partnership dynamics in the context of digital transformation. Firstly, the variance in cultural norms, business practices, and regulatory landscapes between Iran and Canada could shape their distinct approaches to partnerships. The perceived value and strategic importance assigned to collaborations in achieving non-financial performance goals might significantly differ. Secondly, our exploration of the readiness of these countries for propelling digital technologies indicates that Canada's higher readiness in digital technologies potentially contributes to the development of a more interconnected technology ecosystem, fostering effective and mutually beneficial partnerships compared to Iran. While this study sheds light on the initial disparities, further in-depth investigations are warranted to unearth the root causes of these variations. Importantly, our study introduces a novel dimension to the literature of digital banking by delving into the scarcely explored territory of the impact of partnerships with technology companies on performance. The observed differences in the impact of partnerships on non-financial performance between Iran and Canada highlight the contextual nature of dynamic capabilities. It suggests that the effectiveness of partnerships as a dynamic capability may vary based on cultural, regulatory, and technological readiness factors. Moreover, observed variations like the impact of partnerships between Iran and Canada underscores the importance of considering cultural norms and regulatory landscapes. This aligns with the System of Innovation Theory's recognition of the role of institutions in shaping the rules of digital banking.

Summary of capabilities - non-financial

The findings indicate that several strategic capabilities such as customer-centric capability, digital strategy, innovation capabilities, and marketing strategy show varying degrees of impact on non-financial performance in both Iran and Canada. The findings provide empirical evidence supporting the hypothesis that strategic capabilities significantly influence bank performance during digital transformation. This highlights the importance of strategic planning and execution in leveraging capabilities such as digital strategy, customer-centricity, and innovation to enhance non-financial performance outcomes.

Partnership, categorized under operational capabilities, shows mixed results across the two countries. In Iran, partnership demonstrates a negative impact on non-financial performance, whereas in Canada, it shows a positive impact. These findings suggest that the role of operational capabilities, such as partnerships, may vary in different contexts and underscore the importance of further investigation into the factors influencing their effectiveness. The mixed results regarding operational capabilities, particularly partnership, suggest that contextual factors play a crucial role in determining their impact on bank performance in digital transformation. Further research is needed to explore the specific conditions under which operational capabilities contribute most effectively to non-financial performance.

Employees' knowledge and skills, representing functional capabilities, emerge as a significant positive predictor of non-financial performance in both Iran and Canada. This underscores the importance of investing in human capital development to enhance organizational capabilities and drive successful digital transformation initiatives. The significant positive impact of employees' knowledge and skills underscores the critical role of human capital in driving organizational success during digital transformation. Banks should prioritize initiatives aimed at enhancing employee competencies to adapt to evolving digital technologies and market dynamics.

By examining the impact of capabilities on non-financial performance metrics, the study contributes to a more comprehensive understanding of the multifaceted nature of bank performance in the digital era. This nuanced perspective can inform strategic decision-making and resource allocation to optimize performance outcomes amidst digital transformation challenges.

Overall, our research provides valuable insights into the relationships between strategic, operational, and functional capabilities and bank performance in digital transformation. The findings contribute to the existing literature by offering empirical evidence and highlighting the complexities involved in leveraging capabilities for successful digital transformation in the banking sector.

FsQCA study

In this study, the fsQCA method showcases its adeptness in handling complex, non-linear relationships among variables. It accommodates multiple causal paths, allowing for the examination of conditions' configurations that lead to outcomes. This feature proves invaluable when dealing with multifaceted phenomena. Additionally, fsQCA proves effective in handling small to medium-sized samples, making it particularly useful in fields like social sciences or niche research areas (Vis, 2012). For example, despite the seemingly insignificant impact of partnership capability on non-financial performance in Iran, when combined with other factors, it becomes evident how beneficial this capability can be. This becomes apparent in Solution 2. For these configutaions several key metrics were analyzed.

Firstly, raw coverage, which reflects the extent to which the identified capabilities cover the spectrum of non-financial performance, was found to be higher in Canada compared to Iran. This suggests that a wider range of factors contributes to non-financial performance in Canadian digital banking. Conversely, Iran exhibited lower raw coverage values, indicating a narrower set of identified capabilities.

Unique coverage, which signifies the uniqueness or specificity of the identified factors contributing to non-financial performance, was also higher in Canada. This implies that the factors driving performance in Canada may be more distinct or specialized compared to those in Iran.

Consistency, indicating the strength of association between capabilities and non-financial performance, was consistently high in both countries. However, Canada demonstrated slightly higher consistency across solutions, indicating stronger associations between capabilities and non-financial performance compared to Iran.

Moreover, solution consistency, which represents the coherence of patterns across identified solutions, was marginally higher in Iran. This suggests a more consistent pattern across solutions in Iran compared to Canada.

Finally, solution coverage, reflecting the comprehensiveness of identified capabilities contributing to non-financial performance, was significantly higher in Canada. This indicates a more comprehensive identification of capabilities in Canadian digital banking compared to Iran.

In conclusion, while both Iran and Canada exhibit strong associations between digital banking capabilities and non-financial performance, there are notable differences in the breadth, uniqueness, and consistency of identified factors. Canada generally demonstrates broader coverage, higher uniqueness, and slightly stronger consistency across solutions compared to Iran. These findings underscore the importance of considering contextual factors and tailored strategies in optimizing non-financial performance in digital banking across different countries. Ultimately, these comprehensive analyses across methodologies shed light on the intricate dynamics of capability impacts on non-financial performance in digital banking, emphasizing the need for a multifaceted approach to understand the nuances across different countries and contexts.

Our findings contribute to both DCT and System of Innovation Theory. Firsly, the study reveals that, despite seemingly insignificant individual impacts, innovation capability becomes valuable when combined with other factors. This aligns with

DCT's emphasis on the firm's capacity to adapt and evolve (Teece et al., 1997). It suggests that innovation capability, when integrated with a broader set of capabilities, contributes significantly to non-financial performance. Secondly, the variations in configurations and their impact on non-financial performance between Iran and Canada imply that the institutional and regulatory contexts play a crucial role. System of Innovation Theory emphasizes the role of institutions in shaping innovation behavior (Edquist, 2012). The differences in consistency and uniqueness suggest that institutional frameworks may impact how capabilities contribute to non-financial performance.

7.3.2. Capabilities- Financial performance

This study demonstrates that regional factors significantly influence the priorities assigned to different capabilities for enhancing financial performance in digital banking. Canadians and Iranians have notably distinct views on what drives financial success in this context.

Delphi study

In Delphi, we found that for Canadian banks, when it comes to the most important capabilities, customer-centric approaches and marketing strategies were highly ranked, maintaining the same priority as non-financial performance. Canadian participants consistently prioritize customer-centric approaches and marketing strategies for both financial and non-financial performance. This suggests that in the

Canadian digital banking landscape, customer satisfaction and effective marketing play a central role in achieving overall success.

However, there was a noticeable shift in the ranking of partnerships with technology companies, which now occupies the third position for financial performance, differing from its ranking in non-financial performance. Strategic capabilities, interestingly, retained their place as one of the top three most important capabilities. Canadians diverge from their non-financial performance priorities when it comes to the importance of partnerships with technology companies. This shift suggests that while collaboration with tech firms remains crucial, its relative importance in driving financial performance might be less pronounced compared to non-financial outcomes.

In contrast, Iranian participants held different views. They considered partnership with technology companies as the most critical capability for financial performance, followed closely by customer-centric capabilities. However, in the third position, Iranians introduced a new perspective, emphasizing functional capabilities, specifically employees' skills and knowledge. This reflects a departure from the Iranian perspective on non-financial performance and differs from the Canadian viewpoint, where functional capabilities were not among the top three priorities. Iranian participants, on the other hand, place a higher importance on functional capabilities, particularly employees' skills and knowledge, for enhancing financial performance. This emphasis on workforce expertise suggests that Iranian digital banks may view skilled and knowledgeable employees as key drivers of financial success.

These capabilities align with previous literature. For instance, Alfayad (2021) conducted a survey among Saudi Banks' customers holding credit cards. The results showed that bank performance in technology had no direct effect on Omni-channel adoption. However, marketing strategy had a significantly positive effect on Omni-channel adoption. Additionally, the study found that customer technology usage attitude played a mediating role between bank performance in technology, marketing strategy, and Omni-channel adoption among Saudi Bank's credit card customers.

Our findings contribute to both DCT and System of Innovation Theory by highlighting the dynamic and context-specific nature of capabilities at the micro level and the influence of regional and institutional factors at the macro level. Firstly, the emphasis on customer-centric approaches and marketing strategies as top priorities for financial performance in the Canadian digital banking landscape supports DCT. It reflects the ability of Canadian banks to continually adjust and reshape their customer-focused capabilities to respond to changing market conditions. This aligns with the dynamic capabilities of sensing, seizing, and reconfiguring resources to stay ahead of competitors (Teece et al., 1997). Secondly, the Iranian emphasis on functional capabilities, particularly employees' skills and knowledge, aligns with the System of Innovation Theory's recognition of the importance of human capital in innovation processes. This suggests that the workforce is a crucial element in the innovation systems of Iranian digital banks. Thirdly, the findings highlight notable differences between Canadian and Iranian perspectives, indicating the influence of cultural and institutional factors. This aligns with System of Innovation Theory, which emphasizes how institutions shape the innovation landscape (Edquist, 2012). The divergence in priorities suggests that institutions play a role in determining the perceived importance of different capabilities for financial success.

SEM study

In this section, we discuss our findings about capabilities impact on financial performance.

Customer-centric capability

Our study contributes to the digital banking literature by extending the findings of previous research on customer service capabilities and customer concentration. Setia et al. (2013) explored customer service capabilities in Indian banks, laying a foundation for our investigation into customer-centric strategies. Additionally, studies such as those by Kwak and Kim (2020) reported customer concentration have positive effect on firms' profitability, while, Dong et al. (2021) suggested it to be negative, indicating a complex relationship. Kwak and Kim (2020) further examines this relationship and identifies a U-shaped curve, indicating that while customer concentration may initially benefit firms, there is a point at which further concentration becomes detrimental to profitability. Moreover, Lee et al. (2015) reveals that while a customer-centric organizational structure can enhance customer satisfaction, it also incurs coordinating costs. Our findings aligned with this body of literature and add by uncovering a significant disparity in the impact of customer-centric capabilities on financial performance between Iran and Canada. Specifically, while our study identifies a negative impact in Iran, we observe a positive impact in Canada. This divergence aligns with previous research and underscores the contextual nature of organizational strategies within the banking sector.

This discrepancy may be attributed to the distinctive market dynamics in Iran, characterized by unique regulatory constraints as per Gholami et al. (2023) . These factors may hinder Iranian banks' ability to effectively implement customer-centric strategies, leading to a heightened negative influence on financial performance. Additionally, given that digital banking is still in its nascent stages in Iran the costs associated with implementing and managing customer-centric capabilities may pose significant challenges, particularly for banks in the early stages of digital transformation. Moreover, differences in the maturity of the digital banking ecosystem and technological readiness between the two countries may further contribute to these discrepancies (according to our findings about readiness in chapter 6).

Our study advances existing literature by highlighting the nuanced and context-dependent nature of customer-centric capabilities and their impact on financial performance in distinct banking environments. By shedding light on these complexities, our research contributes to a deeper understanding of the intricate interplay between market dynamics, regulatory environments, and the effectiveness of customer-oriented strategies across different contexts in the realm of digital banking.

From a theoretical standpoint, our findings have implications for both Dynamic Capability Theory and Institutional Theory. Dynamic Capability Theory emphasizes the adaptability of organizations to changing environments, and our study underscores the importance of considering contextual factors (Teece, 2007) such as regulatory constraints and cultural norms in the implementation of customer-centric strategies. Similarly, Institutional Theory posits that institutional factors shape organizational behavior and outcomes (Edquist, 2010), and our findings highlight the role of institutional contexts in shaping the effectiveness of customer-centric strategies within the banking sector. Overall, our study contributes to a deeper understanding of the complex dynamics at play in the digital banking industry and provides insights for future research in this area.

Marketing strategy

In our comprehensive SEM analysis, we uncovered nuanced insights into the impact of marketing strategy on financial performance in the banking sectors of Iran and Canada. Notably, Canada exhibited a moderately stronger impact (0.047), surpassing Iran's weaker impact (0.008), suggesting distinctive market responsiveness in these regions. This positive impact aligns with the findings of Mekonen et al. (2022) in the Ethiopian banking sector and the study by Yirgalem (2019) in the Nigerian banking sector. However, our contribution lies in extending this area of study to the realm of digital transformation.

The stronger impact observed in Canada signifies a more effective utilization of marketing strategies to enhance financial performance compared to Iran. This disparity may be attributed to several factors, including differences in technological infrastructure, regulatory environments, and corporate cultures fostering innovation and market adaptation. Canada's more advanced technological infrastructure and forward-thinking regulatory environment may provide banks with greater opportunities to leverage marketing strategies effectively, leading to the observed stronger impact on financial performance.

Our findings offer valuable insights into the dynamics of marketing strategy and financial performance within the context of digital transformation in banking. Specifically, they underscore the importance of considering market responsiveness and the adaptability of marketing strategies in driving financial success in different banking ecosystems.

From the perspective of DCT, our findings suggest that the ability of banks to adapt and utilize marketing strategies effectively in response to changing market dynamics is critical for achieving sustainable competitive advantage and superior financial performance. Institutions that can continuously develop and deploy marketing capabilities tailored to their specific market contexts are more likely to thrive amidst digital transformation.

Institutional theory posits that the regulatory environment and institutional factors significantly influence organizational behavior and performance (Edquist, 2010). Our findings support this perspective by highlighting the differential impact of marketing strategy on financial performance in Canada and Iran, which can be partly attributed to the regulatory frameworks and institutional contexts prevalent in each country.

Innovation capability

In the dynamic landscape of the banking industry's digital transformation, the exploration of innovation capability's impact on financial performance remains an underexplored domain, reminiscent of Kivuitu et al. (2022)’s groundbreaking study revealing the positive influence of bank innovation on profitability in Kenya. Our study delves into this uncharted territory, providing a comparative analysis of innovation capability's impact on financial performance in Iran and Canada in digital transformation. Remarkably, our findings align with Kivuitu et al. (2022)'s findings in Kenya. In Iran, the innovation capability's effect on financial performance stands at 0.202, underscoring a discernible but moderate impact. Conversely, in Canada, the impact is more pronounced, measuring at a robust 0.621. This divergence highlights the varying degrees to which innovation capability contributes to financial success across different banking ecosystems. The heightened impact observed in Canada may be attributed to several factors, reinforcing our earlier discussions on the readiness of capabilities to implement digital technologies. The Canadian banking sector appears more adept at harnessing innovation, potentially due to a combination of technological infrastructure, a forward-thinking regulatory environment, and a corporate culture that fosters innovation. This enhanced readiness in Canada underscores the importance of organizational preparedness in maximizing the impact of innovation on financial performance. Furthermore, the nuanced interplay of external factors and regulatory frameworks cannot be overlooked. Canada's regulatory landscape and external influences may contribute to the elevated impact observed, creating an environment conducive to innovation-driven financial success. These external elements, when favorable, amplify the positive outcomes stemming from innovation capability, providing a conducive backdrop for the thriving banking ecosystem in Canada.

As we navigate this comparative analysis, it becomes evident that the contextual intricacies of each banking environment significantly shape the impact of innovation capability on financial performance. While our findings align with Kivuitu et al. (2022)'s study, the nuanced differences highlight the importance of considering the unique attributes of each banking system.

From theoretical point of view, our findings align with DCT by showcasing how the impact of innovation capability varies based on the readiness of capabilities and the contextual factors within each banking ecosystem. The differing impact of innovation capability on financial performance between Iran and Canada suggests variations in the ability of banks to effectively reconfigure resources to capitalize on digital transformation. Dynamic Capability Theory posits that firms must continuously adapt and reconfigure their resource base to sustain competitive advantage (Teece, 2007). In Canada, where the impact is more pronounced, it indicates a higher level of successful resource reconfiguration, possibly due to superior organizational readiness and adaptability. Also, our findings highlight the influence of regulatory environments on the relationship between innovation capability and financial performance. Institutional Theory emphasizes the impact of regulatory frameworks and external influences on organizational behavior (Edquist, 2010). In Canada, the more robust impact of innovation capability may be attributed, in part, to a forward-thinking regulatory environment that encourages innovation and supports digital transformation initiatives.

Digital strategy

In Wang et al. (2020), a comprehensive exploration of digital transformation strategies across diverse Chinese industries illuminated a positive correlation between these strategies and both short- and long-term financial performance.

However, it's imperative to distinguish that Wang et al. (2020) examined multiple industries, whereas our research focused solely on the banking sector. Our study, conducted specifically in Canada, resonates with Wang's findings, demonstrating a positive influence of digital strategy on financial performance with a coefficient of 0.116.

Contrarily, our investigation in Iran reveals a distinct outcome, manifesting a negative impact of -0.177. This aligns with research such as Wielgos et al. (2021), which illustrates that digital business capability increasingly drives firm performance after reaching a critical level of internal dynamism (U-shaped moderation). Their study highlights digital business capability as comprising three complementary facets: digital strategy, digital integration, and digital control.

These divergent outcomes suggest that country-specific contextual factors profoundly shape the relationship between digital strategy and financial performance. A significant contributor to this disparity is the readiness of capabilities for digital technologies, a factor underscored in our earlier findings. The heightened readiness of capabilities for digital technologies in Canada (according to our findings about readiness in chapter 6) may account for its more positive impact on financial performance compared to Iran. In Canada, the banking industry has demonstrably embraced digital strategies more effectively, leveraging technological advancements to enhance overall financial performance. Moreover, the regulatory framework in each country appears to be a contributing factor, with Canada's regulatory environment fostering more positive outcomes from digital strategies, while potential regulatory constraints as per Gholami et al. (2023) in Iran may contribute to the observed negative impact.

Our findings emphasize the importance of recognizing and adapting to contextual factors, reflecting the core tenets of Dynamic Capability Theory. The readiness of capabilities for digital technologies and the ability to adapt to changing environments underscore the theory's emphasis on firms' capacity to reconfigure resources effectively to capitalize on digital transformation.

Moreover, the influence of regulatory environments on the relationship between digital strategy and financial performance aligns with Institutional Theory, which emphasizes the impact of external factors on organizational behavior and outcomes (Edquist, 2010). The differing outcomes in Iran and Canada highlight how regulatory frameworks shape firms' responses to digital strategies, reflecting the theory's focus on institutional influences on organizational practices.

Partnerships

In the arena of establishing partnerships with technology companies, Cao et al.'s recent study (2022) illuminates the advantageous moderating impact of collaborating with technology firms, especially benefiting larger banks. It is noteworthy that the vigor of this effect may not be as pronounced for smaller banks. Building on this insightful perspective, our independent investigation highlights substantial positive impacts on financial performance observed in both Iran (0.226) and Canada (0.241).

The findings underscore a striking similarity in the positive impacts experienced by banks in both Iran and Canada through their partnerships with technology companies. This parallel suggests a noteworthy convergence in the effectiveness of such collaborations across these two diverse contexts. Despite the potential variations in banking ecosystems and technological landscapes between Iran and Canada, the shared positive impact on financial performance indicates a common thread in the benefits derived from these strategic partnerships. This alignment in outcomes underscores the robust and universal nature of the positive moderating influence that collaboration with technology firms can exert on banks, irrespective of their geographical location or market size.

In the context of dynamic capability theory, our findings reinforce the theory's emphasis on the importance of firms adapting and reconfiguring their resources to effectively respond to changing environments (Teece, 2012). The positive impacts observed in both Iran and Canada through partnerships with technology companies suggest that banks are successfully leveraging external collaborations to enhance their capabilities and improve financial performance. This aligns with dynamic capability theory's notion that firms must continuously evolve and adapt to remain competitive, showcasing how partnerships with technology firms contribute to banks' ability to innovate and thrive in dynamic markets.

Regarding institutional theory, our findings highlight the role of external factors, such as partnerships with technology companies, in shaping organizational behavior and outcomes. The positive impacts observed across diverse contexts in Iran and Canada suggest that the benefits of these collaborations transcend institutional differences, indicating a universal influence on banks' financial performance. This underscores institutional theory's recognition of the importance of external influences on organizational practices and outcomes, showcasing how partnerships with technology firms represent a shared strategy for banks to navigate and succeed within their respective institutional environments.

Employees' knowledge and skills

Our own investigation sheds light on a notable disparity in the impact of employee skills on financial performance between Iran (0.526) and Canada (0.606) within the context of digital transformation in banking. This finding is aligned with existing literature, such as the study conducted by Nsabagasani(2022) on Unguka Bank SME, which found a significant contribution of professional training to financial performance. Similarly, study by Sowunmi et al. (2015) examining human resource development as a correlate of performance in the banking industry in Ogun State have provided insights into the importance of employee skills in driving financial outcomes. However, our contribution lies in extending this literature to the realm of digital transformation within the banking sector.

The stronger impact observed in Canada regarding the influence of employee skills on financial performance suggests a more pronounced effect of skilled employees on driving financial success compared to Iran. This disparity may be attributed to various factors, including differences in the quality and availability of educational resources, the effectiveness of training programs, and the overall sophistication of the labor market in each country. Canada's robust educational infrastructure and emphasis on continuous professional development may contribute to a higher level of skill attainment among banking employees, thus enhancing their ability to positively impact financial performance. Our findings offer valuable insights into the dynamics of employee skills and financial performance in the digital transformation era of banking. Specifically, they highlight the significance of investing in employee training and skill development as a strategic imperative for achieving competitive advantage and financial success in today's rapidly evolving banking landscape.

From the perspective of dynamic capability theory, our findings underscore the importance of organizations' abilities to continuously develop and leverage employee skills as a source of competitive advantage. Banks that prioritize investments in human capital development and foster a culture of continuous learning are better positioned to adapt to changing market conditions and capitalize on emerging opportunities presented by digital transformation.

Institutional theory suggests that the regulatory and institutional environment significantly shapes organizational behavior and performance. Our findings in this context imply that differences in institutional frameworks and labor market dynamics between Iran and Canada may contribute to the observed disparity in the impact of employee skills on financial performance. Understanding these institutional nuances is crucial for designing effective human resource strategies tailored to the specific contexts of different banking ecosystems.

Summary of capabilities-financial performance

Overal this section findings support second hypothesis, as several strategic capabilities such as innovation capabilities, marketing strategy show significant impacts on financial performance. These capabilities play crucial roles in shaping a bank's strategic direction and ability to adapt to the digital landscape.

Partnership, categorized under operational capabilities, shows a significant impact on financial performance in both Iran and Canada. This suggests that forming strategic partnerships is essential for banks to enhance their operational efficiency and effectiveness in navigating digital transformation and this support third hypothesis.

Employees' knowledge and skills, representing functional capabilities, exhibit a strong positive impact on financial performance in both settings. This underscores the importance of investing in human capital development to equip employees with the necessary competencies to drive digital initiatives successfully and this confirm fourth hypothesis.

Overall, our research contributes to the literature by providing empirical evidence on the importance of strategic, operational, and functional capabilities in driving bank performance amidst digital transformation in different contexts. The insights derived from findings can inform strategic decision-making and guide banks in effectively navigating the complexities of the digital landscape.

Our research findings contribute to both DCT and System of Innovation Theory by highlighting the importance of contextual adaptation, the dynamic nature of capabilities over time, the influence of regulatory environments, and the universal nature of certain innovation strategies. DCT emphasizes a firm's ability to evolve over time (Teece et al., 1997). Also, our findings underscore the importance of institutions and regulations in shaping the rules of the game for technology creation, innovation processes, and the delivery of innovations. Our study provides empirical evidence of how distinctive market dynamics, regulatory constraints, and cultural factors significantly influence the adoption and impact of customer-centric approaches, marketing strategies, innovation capabilities, digital strategies, partnerships, and employee skills in different banking environments.

FsQCA study

In this study we employed fsQCA and we got advantages of this method. For instance, although, the impact of marketing strategy on financial performance in

Canada seems to be weak in the SEM method, it can be seen that in combination with other capabilities it can enhance the perfroamnce well.

In Canada, the analysis reveals robust banking capabilities enhancing financial performance across three solutions. The raw coverage values range from 0.847 to 0.891, indicating a comprehensive coverage of factors contributing to financial performance in the digital transformation era. Unique coverage values range from 0.011 to 0.055, suggesting a moderate level of uniqueness in the identified factors. The consistency values are consistently high, ranging from 0.873 to 0.878, indicating strong associations between banking capabilities and financial performance across solutions. The solution consistency is also high, at 0.918, demonstrating a coherent pattern across identified solutions. Overall, Canada exhibits strong banking capabilities with high consistency and coverage across various solutions, highlighting its effectiveness in leveraging digital transformation for financial performance enhancement.

In Iran, the analysis unveils banking capabilities influencing financial performance across four solutions. The raw coverage values range from 0.521 to 0.756, indicating a relatively narrower coverage compared to Canada. Unique coverage values range from 0.0002 to 0.064, indicating variability in the uniqueness of the identified factors contributing to financial performance. Consistency values range from 0.760 to 0.836, suggesting relatively strong associations between banking capabilities and financial performance across solutions, albeit slightly lower compared to Canada. The solution consistency is high, at 0.872, indicating a coherent pattern across identified solutions. However, Iran demonstrates slightly lower raw coverage and unique coverage compared to Canada, suggesting a narrower range of identified factors contributing to financial performance.

Overall, both Canada and Iran demonstrate strong associations between banking capabilities and financial performance, as indicated by high consistency and solution consistency values. However, Canada generally exhibits broader coverage, higher uniqueness, and stronger consistency compared to Iran. This suggests a more comprehensive and diverse set of factors contributing to financial performance in Canadian digital banking. On the other hand, Iran exhibits slightly lower coverage and consistency but still maintains a coherent pattern across identified solutions, indicating a focused approach to banking capabilities and financial performance in the context of digital transformation.

In conclusion, while both Canada and Iran exhibit strong associations between banking capabilities and financial performance, there are notable differences in the breadth, uniqueness, and consistency of identified factors. Canada generally demonstrates broader coverage, higher uniqueness, and stronger consistency compared to Iran. These findings underscore the importance of considering contextual factors and tailored strategies in optimizing financial performance in digital banking across different countries.

The comparative analysis of banking capabilities enhancing financial performance in Canada and Iran presents insights with implications for both dynamic capability theory and institutional theory. In Canada, where banking capabilities demonstrate broader coverage, higher uniqueness, and stronger consistency, this aligns well with dynamic capability theory, suggesting Canadian banks possess the adaptability to reconfigure resources in response to market changes and technological advancements. This adaptability enables them to leverage digital transformation effectively for financial performance enhancement. Conversely, the slightly lower coverage and consistency observed in Iran may indicate a need for Iranian banks to further develop their resource flexibility to capitalize fully on digital transformation opportunities. Moreover, the differences between the two countries may also reflect institutional factors. In Canada, a more conducive regulatory environment and institutional framework may facilitate innovation and investment in digital transformation initiatives, whereas regulatory constraints or institutional barriers in Iran could hinder banks' ability to develop and deploy digital banking capabilities. Overall, these findings underscore the significance of organizational adaptability, learning orientation, and institutional context in shaping banks' responses to digital disruption and their ability to thrive in a competitive landscape.

7.4. Regulator- Capabilities

Although the importance of regulators in the digital transformation of banking has been explored in the literature (Amstad, 2019; Tsindeliani et al., 2021), there have been few studies assessing their impact on capabilities, particularly in different contexts. In this study, in analyzing the impact of the regulatory environment on various capabilities within the digital transformation of the banking industry, distinct patterns emerge between Canada and Iran. These findings shed light on the nuanced influence of regulations on specific capabilities crucial for performance within each country's banking sector.

The contrasting associations between the regulatory environment and various capabilities in Iran and Canada unveil nuanced insights into the unique regulatory landscapes of each country, shaping the strategic dimensions of their respective banking sectors.

In both Iran and Canada, the regulatory environment has a positive but comparatively lower impact on customer-centric capability, with Canada having a slightly higher influence (0.318 in Canada vs. 0.102 in Iran). This suggests that while regulations do play a role in shaping customer-centric practices in banking, other factors might be more influential in Iran.

The impact of the regulatory environment on digital strategy is notably higher in both countries, with Canada having a stronger influence again (0.486 in Canada vs. 0.218 in Iran). This could imply that Canadian banks are more responsive to regulatory requirements in shaping their digital strategies compared to those in Iran.

The regulatory environment significantly affects the knowledge and skills of employees in both countries, with a notably higher impact in Iran (0.386) compared to Canada (0.394). This suggests that regulations in both Iran and Canada emphasis on ensuring employees possess the necessary expertise and competencies for digital transformation in banking.

While the impact is lower compared to employees' knowledge and skills, regulations still play a significant role in shaping innovation capabilities in both countries. Iran shows a slightly lower impact (0.189) compared to Canada (0.237), indicating that despite differences in regulatory frameworks, both countries recognize the importance of innovation in banking.

The regulatory environment influences marketing strategy in both countries, with a higher impact observed in Iran (0.263) compared to Canada (0.286). This suggests that Iranian banks might face more regulatory constraints or opportunities regarding their marketing activities in the digital realm.

Regulatory environment has strong impact on partnership capabilities in both countries, with slightly higher influence in Canada (0.451) compared to Iran (0.449). This indicates that regulations play a crucial role in shaping collaborative efforts and partnerships within the banking sector, regardless of the country.

Overall, while both countries exhibit similar trends in how the regulatory environment influences various capabilities in digital transformation within banking, the magnitude of impact varies. Canada generally shows higher impacts across most capabilities compared to Iran. This could be attributed to differences in regulatory frameworks, market dynamics, technological infrastructures, or cultural factors.

The differences observed may also reflect variations in the stringency or adaptability of regulatory frameworks between the two countries. Canadian banks might operate within a more flexible regulatory environment that encourages innovation and digitalization, whereas Iranian banks might face more stringent regulations that shape their strategies and capabilities differently. The study highlights the importance of regulatory adaptability in fostering digital transformation within the banking sector. Countries with more flexible and supportive regulatory frameworks tend to exhibit higher impacts on digital capabilities, indicating the need for regulatory agility to keep pace with technological advancements and market changes.

Regarding the hypothesis stating that the regulatory environment can impact the capability of banks in digital transformation, the findings strongly support this assertion. In both Iran and Canada, the coefficients associated with the regulatory environment are consistently positive and statistically significant across various capabilities, including customer-centric capability, digital strategy, employees' knowledge and skills, innovation capabilities, marketing strategy, and partnership. These results indicate that a favorable regulatory environment is conducive to enhancing the capabilities of banks in adapting to digital transformation initiatives. By empirically demonstrating the impact of the regulatory environment on various facets of digital transformation within the banking sector, our research contributes to the literature by highlighting the regulatory landscape as a critical determinant of banks' digital readiness and success.

Our study's findings on the impact of the regulatory environment on various capabilities within the digital transformation of the banking industry have meaningful implications for both DCT at the micro level and SI Theory at the macro level. Firstly, the varying associations between the regulatory environment and different capabilities in Iran and Canada suggest that organizations need to adapt their dynamic capabilities in response to the regulatory context. DCT emphasizes the importance of firms being able to sense changes in their environment and adjust their capabilities accordingly (Teece et al., 1997). Secondly, the positive associations between the regulatory environment and capabilities such as employees' knowledge and skills, innovation capabilities, marketing strategy, and partnerships in both Iran and Canada emphasize the strategic alignment of capabilities with the regulatory context. Successful firms, as emphasized by DCT, not only develop capabilities but also align them with the external environment (Eisenhardt & Martin, 2000). This alignment is particularly crucial in areas where the regulatory landscape directly impacts the strategic dimensions of the banking sector. Thirdly, our findings underscore the importance of institutions (regulatory environment) in shaping the innovation system within the banking sector. SI Theory emphasizes the role of institutions in defining the rules of the game for technology creation, innovation processes, and the delivery of innovations (Edquist, 2012). The study highlights how regulatory frameworks influence different capabilities crucial for innovation within the banking industry. Finally, the variations in associations between the regulatory environment and capabilities in Iran and Canada emphasize the significance of the national context in shaping innovation policies. The study suggests that the regulatory environment is a crucial aspect of the broader innovation ecosystem, influencing the direction and success of innovation initiatives in the banking sector. This aligns with the SI Theory's focus on the national context and the need for alignment between policies and innovation advancements (Edquist, 2010, 2012).

Our study makes a distinctive contribution to the existing literature by bridging the micro-level insights of DCT with the macro-level perspectives SI theory in the context of digital banking. While previous research, such as Wang et al. (2022), Caputo et al. (2019), and Tsou and Chen (2021), has explored capabilities in the digital banking literature, and studies by Anning-Dorson et al. (2017), Naimi-Sadigh et al. (2022), and Reitz et al. (2018) have delved into the regulator’s role in banking, our study takes a novel approach by integrating both micro and macro dimensions. By combining insights from the micro-level application of DCT to examine a firm's capacity to adapt in the dynamic landscape of digital technologies with the macro-level analysis of the SI framework, which considers the broader institutional context, our research provides a holistic understanding of the intricacies involved in digital transformation within the banking sector. This complementary perspective enriches the discourse on how banks strategically manage their internal capabilities while navigating the regulatory and institutional landscape to foster innovation and sustainable competitive advantage.

7.5. Resources

7.5.1. Resources- Non-financial performance

Some studies explored the relationship between resources and productivity in the banking sector. For example, Gul and Ellahi's (2021) study showcases a significant revelation regarding the impact of capital on the productivity of Pakistan's banking sector. In another study, T. Cao et al. (2022) delve deeper into the dynamics of capital adequacy, specifically within Bank Holding Companies (BHCs). and all these studies emphasize the significance of capital.

Our Delphi study aligns seamlessly with these findings, revealing striking similarities across diverse contexts. Both Iranian and Canadian participants in our research unequivocally identified capital as the paramount resource capable of enhancing non-financial performance during the digital transformation process. This finding underscores the universal relevance of capital's role, transcending geographical boundaries and industry nuances.Our findings not only corroborate and extend existing literature but also bring forth critical insights into the universal importance of capital adequacy. This universality underscores the foundational role of capital in shaping the efficiency and resilience of financial institutions during the digital transformation process. By emphasizing the significance of capital across diverse contexts, our study adds a robust layer to the academic knowledge on resource optimization within the banking sector, enriching the existing literature with nuanced insights into the universal relevance of capital in enhancing non-financial performance.

Moreover, our study goes beyond the current literature by delving into a comparative analysis of different resources. This distinctive approach adds a unique dimension to the existing knowledge base by elucidating how various resources, beyond capital alone, contribute to non-financial performance. By broadening the scope of inquiry, our study contributes to a more comprehensive understanding of the intricate dynamics involved in resource optimization within the banking sector during the digital transformation era.

7.5.2. Resources - Financial performance

Our findings reveal a remarkable similarity in the perspectives of Canadian and Iranian participants regarding the significance of resources in enhancing financial performance. In alignment with the importance attributed to resources for non-financial performance, capital emerges as the foremost crucial factor for participants from Iran, closely followed by participants from Canada. This underscores the overarching significance of capital for both financial and non-financial performance, transcending geographical boundaries and reflecting a shared understanding among participants from these two countries.

Of particular interest is the notable finding that the physical branch, identified as a potential marketing channel for digital banking and introduced in the second phase of the Delphi method based on expert suggestions, ranks as the least important resource for both financial and non-financial performance. This result highlights a divergence in perception, challenging the initial expectations regarding the perceived importance of physical branches in the context of digital banking. The consensus across both participant groups suggests a consensus that physical branches, while traditionally considered vital, may have a diminishing role in both financial and non-financial performance in the evolving landscape of digital banking.

Our study reinforces the universal relevance of capital as a paramount resource for enhancing non-financial performance during the digital transformation process in the banking sector. This aligns with the core tenets of DCT, emphasizing a firm's ability to adapt and evolve its resources over time for sustained competitive advantage (Teece et al., 1997). The findings underscore the foundational role of capital in shaping the efficiency and resilience of financial institutions. Our research findings reinforce the role of institutions, regulations, and structures in shaping the rules of the game for technology creation, innovation processes, and the delivery of innovations. The emphasis on capital in our study aligns with how institutions define property rights, standards, legal frameworks, and funding mechanisms, highlighting the interconnectedness between micro-level resource dynamics and macro-level institutional influence.

7.6. Digital Technologies

7.6.1. Capabilities readiness for implementing digital technologies

Various models in the literature have extensively explored the readiness and maturity of digital banking. For example, Bandara et al. (2019) proposed a Maturity Model with five levels, focusing on seven dimensions to assess a bank's readiness for Industry 4.0.Goumeh and Barforoush (2021) integrated Customer, Laws, Strategy, and Technology dimensions into their model, incorporating five levels for digital maturity assessment. bdc 's Digital Maturity Assessment evaluates a business's digital maturity across digital intensity and digital culture dimensions. Notably, existing models lack a comprehensive exploration of digital technology capabilities, setting apart the model used in this research, which emphasizes capabilities and technology intricacies, making it a unique contribution to the field.

In the domain of digital engagement technologies, both Iran and Canada demonstrate commendable readiness, showcasing their preparedness to leverage digital engagement tools, enrich customer experiences, and navigate the complexities of the evolving banking landscape. This study makes a significant contribution by highlighting the existing technology readiness gap between the two nations when it comes to transitioning to automation technologies. The identified gap suggests that both Canada and Iran find themselves in the early stages of implementing automation technologies, emphasizing the urgent need for substantial development efforts in this crucial domain. This novel finding underscores the importance of strategic planning and investment initiatives to bridge the technology readiness divide, propelling both countries toward the attainment of advanced automation capabilities within the banking sector.

Upon comparing Iran and Canada, the analysis unveils both similarities and differences in their respective journeys of grappling with the initial phases of automation technology adoption. Notably, Canada's overall readiness stands out, indicating more significant progress in laying the groundwork for advanced automation within the banking sector compared to Iran. This observed disparity signifies Canada's potential leadership in adopting cutting-edge technologies, offering insights into the nation's strategic vision and effective execution in the realm of banking automation.

In essence, this research contributes by shedding light on the divergent states of readiness in digital technologies between Iran and Canada. The highlighted technology readiness gap underscores the shared necessity for accelerated development efforts, emphasizing the pivotal role of automation in shaping the future of banking. The comparative analysis positions Canada as potentially leading in the adoption of advanced technologies, providing valuable insights for policymakers, industry stakeholders, and banking institutions aiming to navigate the dynamic landscape of digital transformation.

7.6.2. Digital technologies- Non-financial performance

In 2022, Gartner's nuanced evaluation depicted diverse trajectories for emerging technologies, ranging from Open Banking's poised advancement toward maturity to conversational technologies navigating challenges and digital banking platforms perched atop heightened expectations(Gartner, 2022) .Similarly, digital personal financial assistants, residing at the peak of inflated expectations, underscored substantial potential (Gartner, 2021b).

Our study strategically leveraged Gartner's technological insights to critically evaluate their real-world impact on performance enhancement. In the realm of digital banking's non-financial performance, the findings carry significant weight. Participants unequivocally identified Digital Engagement Technologies as the most crucial category, marking its undeniable significance. Within this category, Digital Banking Platforms emerged as the preeminent technology, holding the top position for both Iranian and Canadian respondents. Notably, Open Banking claimed the second position for Iranians and the third for Canadians, while Conversational Technologies secured the second spot for Canadians, and Digital Personal Financial Assistants held the third position for Iranians. The collective emphasis on these technologies underscores their pivotal role within Digital Engagement Technologies.

Examining the rankings reveals intriguing insights. While there are no substantial disparities in the rankings, except for Banking APIs and Platforms, where Iran assigns significantly greater importance compared to Canada, the divergence highlights unique technology preferences among Iranian respondents. This emphasizes the contextual relevance and variation in technology priorities between the two countries, shedding light on the nuanced impact of regulatory and cultural factors.

Our study not only focuses on ranking these technologies by importance but also distinguishes between Iranian and Canadian respondents. This differentiation unveils potential regional disparities in technology priorities shaped by distinct regulatory environments and cultural contexts. In contrast, Gartner's assessments, while providing a broader view of the technology landscape, lack the granularity required to capture such regional intricacies.

Moreover, our study's contribution extends beyond existing literature, such as Edu (2022), which primarily explores the relationship between capabilities and performance within specific technologies. In contrast, our study takes a panoramic view, encompassing all digital technologies and providing comprehensive rankings based on their significance. This broader perspective adds richness to the academic discourse, offering a more holistic understanding of the complex interplay between diverse digital technologies and their impact on non-financial performance within the dynamic landscape of digital banking. The nuanced regional insights uncovered by our study further enrich the literature by highlighting the need for context-specific approaches to understanding the implications of digital transformation in the banking industry.

7.6.3. Digital technologies – Financial performance

The findings of our study underscore the significance of digital engagement technologies in enhancing both financial and non-financial performance for Iranian and Canadian respondents. This category emerged as the most crucial, emphasizing its pivotal role. Interestingly, while low code/no code technology takes the top spot for enhancing financial performance in Canada, it ranks much lower, at the 9th position, for Iranian respondents, who instead prioritize conversational technology in this context. Digital banking platforms, previously leading the pack for non-financial performance, now hold the second position for both Iranian and Canadian participants. It's worth noting that these top-ranking technologies, including low code/no code, digital banking platforms, and conversational technology, all fall under the umbrella of digital engagement technologies, highlighting their collective importance and interestingly we found a good level of readiness in both counties for digital engagement technologies.

Our study's novelty lies in its comparative analysis of these technologies, a relatively unexplored area in the existing literature. Additionally, leveraging Gartner data enhances the robustness of our comparative study, providing valuable insights into these technologies' roles and importance in digital banking.

While Gartner's (2022) report paints a picture of evolving expectations for various technologies, our study's specific focus on the importance of these technologies for enhancing performance in digital banking contexts. Also, our study employs survey-based rankings from Iranian and Canadian participants, while Gartner's assessments are based on a more extensive analysis of technology trends, often including market research and expert opinions.

Our research findings contribute to the literature by demonstrating how the adoption of digital technologies in the banking sector is influenced by dynamic capabilities at the micro level and institutional factors at the macro level. Firms demonstrating capabilities in adapting and evolving their resources and competencies to incorporate digital technologies are more likely to gain a competitive advantage. Also, our findings resonate with the System of Innovation Theory by highlighting the significance of technology adoption and the role of institutions, regulations, and structures. The technology readiness gap between Iran and Canada suggests that institutional factors may play a crucial role in shaping the trajectory of technological advancement in different countries.

7.7. Theoretical contributions

Within this section, we illuminate the theoretical contributions derived from our exploration. The following insights delineate the advancements and conceptual impact of our research, offering valuable additions to existing knowledge in the field. These theoretical contributions serve to broaden perspectives and deepen the understanding of fundamental principles.

First and foremost, this study makes a significant contribution by seamlessly integrating micro-level insights derived from Dynamic Capability Theory with macro-level considerations grounded in System of Innovation theory. Our research underscores the imperative for firms to harmonize their strategic initiatives with the wider institutional context, acknowledging that triumph hinges not only on internal capabilities but also on external elements such as regulations. By elucidating the intricate interplay between micro-level resource optimization strategies and macro-level institutional frameworks, our work enriches the scholarly discourse with a comprehensive understanding of how organizations navigate the complexities of innovation processes within broader socio-economic contexts. This integration offers a nuanced perspective that sheds light on the holistic dynamics shaping firms' approaches to innovation and competitive advantage.

This study contributes to addressing the challenges of SI and DC theories by examining the interplay between these theoretical frameworks within the context of digital transformation in the banking sector. By focusing on the banking sector's digital transformation within diverse regulatory environments, this research bridges the gap between the macro-level influences of SI (such as institutional frameworks and policies) and the micro-level strategic adaptations required by DC. It demonstrates how banks can align their internal capabilities with broader innovation systems to effectively respond to environmental changes. Secondly, this study enhances theoretical coherence by showing practical instances where SI and DC not only coexist but are mutually reinforcing. It provides studies where banks have leveraged regulatory frameworks (SI) to enhance their strategic capabilities (DC) for competitive advantage, thus illustrating the interplay between internal processes and external innovation drivers. Finally, through the use of methodologies like SEM and fsQCA, the thesis attempts to develop a unified measurement framework that captures both the broad impacts of systemic innovations and the specific contributions of organizational capabilities. This approach addresses the challenge of differing metrics and indicators used in SI and DC, offering a model for how these can be integrated within empirical research.

In advancing the theoretical understanding of the digital transformation landscape in the banking industry, our study delves into the nuanced relationship between regulatory environments and key capabilities, a facet that has received limited attention in existing literature. While previous research has acknowledged the significance of regulators in the broader context of digital transformation in banking, our study extends this understanding by exploring the specific impact of regulatory frameworks on diverse capabilities crucial for performance. By uncovering distinct patterns in the associations between the regulatory environment and capabilities in both Canada and Iran, our findings contribute novel insights into the contextual nuances and unique regulatory landscapes that shape the strategic dimensions of each country's banking sector. This theoretical contribution broadens the discourse on the intricate interplay between regulatory frameworks and organizational capabilities, offering a more nuanced understanding of how regulations influence strategic dimensions within the digital transformation journey.

Moreover, the findings of this study significantly contribute to the theory of digital transformation in the banking sector by empirically demonstrating the pivotal role of strategic, operational, and functional capabilities in driving performance outcomes. By supporting hypotheses related to the impact of these capabilities on both financial and non-financial performance measures in diverse contexts such as Iran and Canada, the research enhances our understanding of how banks can effectively leverage various capabilities to navigate digital transformation challenges and capitalize on emerging opportunities. These insights provide a foundation for further theoretical development in the field, offering valuable implications for scholars exploring the dynamics of organizational capability-building and digitalization strategies within the banking industry.

An other key theoretical contributions of this Delphi study enriches the digital banking literature by employing an innovative open-ended inquiry approach. By allowing participants to articulate previously unexplored capabilities and resources, the study introduces novel elements such as the bank's process integration with customers' businesses, consistency in innovation, strategic flexibility, social capital, brand preference, board members' combination, asset portfolio management, and the recognition of the enduring relevance of physical branches. These theoretical advancements challenge existing frameworks and contribute to a more comprehensive understanding of the complexities inherent in digital transformation within the banking sector.

Additionally, our study introduces a novel contribution to the field of management science by employing the fuzzy set qualitative comparative analysis (fsQCA), a method rarely utilized in this domain. This methodological choice sets our research apart, as fsQCA has been underexplored in the context of digital banking and the study of organizational capabilities. Our innovative use of fsQCA expands the methodological repertoire in management science and enhances the depth of our analysis, providing a unique lens to examine complex, non-linear relationships among variables. This method proves particularly valuable for our study, allowing practitioners to discern the intricate configurations of capabilities that consistently contribute to successful performance outcomes during digital transformation, thus advancing theoretical understanding and pioneering the application of a less-explored methodology.

Furthermore, our research significantly advances the theoretical landscape of digital banking by unravelling the nuanced and context-dependent nature of capabilities' impact on financial performance, drawing distinctive comparisons between Canada and Iran. While existing literature acknowledges the importance of capabilities such as customer-centric approaches, marketing strategies, innovation, partnerships, and employee knowledge in various banking contexts, our study uniquely contributes by comprehensively exploring these capabilities within the broader concept of digital banking and conducting a comparative analysis between two distinct economies. The nuanced differences in the priorities assigned to these capabilities in Canada and Iran shed light on the regional factors that significantly influence strategic decision-making, enriching the theoretical understanding of the multifaceted dynamics driving financial performance in digital banking across diverse global contexts.

Moreover, this study significantly contributes to the theoretical understanding of resource optimization in the banking sector during the digital transformation era. The identification of capital as a paramount resource for enhancing non-financial performance aligns with existing literature, emphasizing the universal relevance of capital's role across diverse contexts. Our findings corroborate and extend these insights, shedding light on the foundational significance of capital in shaping the efficiency and resilience of financial institutions amid digital transformation. The study's distinctive approach includes a comparative analysis of various resources beyond the capital, providing a nuanced exploration of how different resources contribute to non-financial performance. By broadening the scope of inquiry, this research enriches the existing literature, offering critical insights into the intricate dynamics of resource optimization within the banking sector.

This study significantly advances the theoretical landscape of digital banking by introducing a unique model that comprehensively explores the readiness of digital technologies, specifically focusing on capabilities and technology intricacies.

Existing literature primarily relies on maturity models with limited exploration of digital technology capabilities. In contrast, our research contributes by emphasizing the crucial role of digital engagement technologies and uncovering a technology readiness gap between Iran and Canada, shedding light on their distinct states of readiness. The comparative analysis positions Canada potentially as a leader in adopting advanced technologies, enriching the literature with nuanced insights into the regional dynamics shaping the digital transformation in banking. The study also provides a panoramic view of diverse digital technologies, offering comprehensive rankings based on their significance and uncovering regional disparities in technology preferences, thus contributing to a more holistic understanding of the complex interplay between digital technologies and their impact on non-financial and financial performance within the dynamic landscape of digital banking.

7.8. Practical implications

In this section, we explore the practical implications of our findings, outlining real-world applications and the significance of the research outcomes. Understanding these implications is crucial for implementing effective strategies and leveraging the insights gained.

The practical implications of our study have substantial relevance for banking practitioners and policymakers. The universal recognition of capital as a crucial resource for enhancing financial and non-financial performance underscores its strategic importance in the digital transformation landscape. Banking institutions, regardless of geographical location, can leverage these insights to prioritize and allocate resources effectively, emphasizing the significance of maintaining capital adequacy. Moreover, the divergence in perception regarding the importance of physical branches challenges traditional expectations, signalling a shift in the role of physical branches in the evolving landscape of digital banking. This insight has practical ramifications for decision-makers shaping the future of banking operations and marketing strategies, urging a reconsideration of resource allocation and investment in alignment with the changing dynamics of digital banking. The comparative analysis of various resources provides a practical framework for strategic decision-making, offering guidance on optimizing resources beyond capital to enhance overall non-financial performance in the digital era.

From a practical standpoint, our study offers actionable insights for practitioners and policymakers in the digital banking industry. The detailed examination of the impact of various capabilities on financial performance, coupled with the comparative analysis between Canada and Iran, provides a strategic roadmap for navigating the complexities of digital transformation. Stakeholders can leverage these insights to tailor their approaches to the unique contextual factors influencing the effectiveness of capabilities in each region. For instance, the positive impact of partnerships with technology companies on financial performance in both countries highlights the universal benefits of such collaborations. Conversely, the contrasting impact of marketing strategy on financial performance underscores the need for nuanced, region-specific strategies. These practical implications equip industry professionals with a deeper understanding of the diverse regional perspectives on capability-driven financial success in digital banking, enabling them to make informed decisions that align with the distinct dynamics of each market.

Our study on capabilities influencing non-financial performance in digital banking yields practical insights for the industry. The Delphi study emphasizes the universal importance of strategic capabilities, challenging conventional views and highlighting their crucial role in digital transformation success. The comparative analysis between Canada and Iran provides nuanced contextual understanding, aiding practitioners in tailoring strategies to regional priorities. The SEM and fsQCA studies offer actionable insights, emphasizing the subtle yet positive impact of customer-centric capabilities, the varied influence of innovation capabilities, and the importance of cultural considerations in partnerships and human capital. The fsQCA method identifies distinctive capability configurations in Canada, suggesting optimization opportunities, while in Iran, it signals a need for refining configurations for enhanced impact. These findings underscore the complexity of capability dynamics, advocating for a tailored, multifaceted approach to achieve sustained success in digital banking transformations.

From a practical perspective, our study provides actionable insights for banking industry practitioners and policymakers by unravelling the practical implications of regulatory environments on various capabilities during digital transformation. The detailed analysis of associations between regulations and capabilities in Iran and Canada offers a strategic roadmap for navigating regulatory challenges and capitalizing on opportunities. For instance, the positive association between the regulatory environment and customer-centric capability in Canada suggests a conducive regulatory framework for customer-focused strategies, guiding practitioners to prioritize such initiatives. Conversely, the negative association in Iran highlights potential regulatory hurdles for customer-centric initiatives, prompting stakeholders to adopt strategies that navigate these challenges effectively. This practical contribution aids industry professionals in aligning their strategic initiatives with the regulatory landscape, fostering a more effective and context-specific approach to digital transformation in the banking sector.

The practical implications of our study are substantial for policymakers, industry stakeholders, and banking institutions. The identification of a technology readiness gap between Iran and Canada underscores the urgent need for substantial development efforts, emphasizing the pivotal role of automation in shaping the future of banking. The insights into technology preferences and rankings for both countries offer practical guidance for strategic planning and investment initiatives. Policymakers can use these findings to shape regulatory environments that foster the adoption of advanced technologies. Banking institutions, armed with the knowledge of regional disparities, can tailor their digital strategies to align with specific market conditions. The emphasis on digital engagement technologies as crucial for both financial and non-financial performance provides actionable insights for decision-makers, urging them to prioritize investments and efforts in enhancing capabilities related to these technologies. Overall, our study provides practical frameworks and strategic guidance for navigating the evolving landscape of digital banking, enabling informed decision-making in technology adoption and resource allocation.

7.9. Summary

In this chapter, we discussed and compared our significant findings with existing literature, unveiling our contributions. Employing a Delphi study approach, our research made notable theoretical contributions to the digital banking literature. It unravelled the context-dependent impact of capabilities on financial performance through a comparative analysis between Canada and Iran. The introduction of the rarely utilized fuzzy set qualitative comparative analysis (fsQCA) method expanded the methodological repertoire in management science. Our exploration of the nuanced relationship between regulatory environments and key capabilities, coupled with recognizing capital as a paramount resource, added depth to the understanding of digital transformation dynamics in the banking sector. We also addressed practical implications, providing valuable insights for banking practitioners, policymakers, and industry stakeholders. Recognizing capital's strategic importance guided effective resource allocation, and insights into changing dynamics prompted a reconsideration of investment strategies. Comparative analysis offered actionable insights for tailoring approaches to unique regional factors. The study guided practitioners in aligning strategies with regulatory landscapes, emphasizing the urgency for development efforts and offering practical guidance on technology preferences. Policymakers could shape regulatory environments, and banking institutions could tailor digital strategies based on regional disparities. Emphasizing the vital role of digital engagement technologies, our research urged prioritized investments in related capabilities, providing practical frameworks for navigating the past evolution of the digital banking landscape.

Chapter8: Conclusion

8.1. Overview

The dissertation lays the groundwork by emphasizing the pivotal role of digital transformation within the banking sector and the essential organizational competencies required to navigate this paradigm shift effectively. It underscores the immense significance of digital transformation in fostering business growth, enhancing quality standards, ensuring sustainability, and elevating customer service. The banking landscape has undergone significant shifts due to digital transformation, ushering in e-banking, virtual banking, and service point platforms.

While pinpointing gaps in current literature, we argue that there's a lack of comprehensive exploration into the pivotal capabilities crucial for success within the digital economy, especially within the banking domain. Our proposal revolves around the notion that organizational capabilities form the bedrock for endorsing digital transformation in banking, aiming to pinpoint the most influential capabilities impacting banks' performance.

Furthermore, we highlight the dearth of studies scrutinizing the regulatory implications of digital transformation within the banking sector. To tackle these voids, the dissertation outlines two primary research inquiries: identifying critical capabilities influencing banks' digital transformation performance and examining the role of regulatory environment in shaping these capabilities. To address these queries, the study embraces the Dynamic Capability Theory at a micro-level and the Systems of Innovation approach at a macro-level.

The research methodology encompasses a systematic literature review, the Delphi method, Structural Equation Modeling (SEM), and Fuzzy-Set Qualitative

Comparative Analysis (fsQCA). These methodologies aim to comprehensively explore capabilities, prioritize them, and scrutinize their combinations within diverse regulatory environments.

The significance of this dissertation lies in its contribution to unravelling the indispensable capabilities requisite for a successful digital transformation within the banking sector. By bridging the gap between theory and practice, its goal is to identify critical capabilities, their amalgamations, and their interplay with regulatory frameworks. This study is poised to offer valuable insights to academia, banking leaders, and policymakers, facilitating the formulation of effective strategies for digital innovation within the banking landscape.

The approach showcased here illustrates a structured methodological process designed to scrutinize capabilities and regulatory influences, thereby providing a holistic comprehension of digital transformation's impact on banking performance. Through this thorough exploration, the dissertation aims to fill the existing voids in literature and furnish invaluable insights to both academia and the banking industry.

In this chapter, we'll outline the primary findings and limitations of this study while also suggesting future directions.

8.2. Main findings

The main findings of this study are listed below:

- Using the Delphi method we found that Canadian's participants Emphasized the Bank's process integration with customers' businesses as influential on financial performance. They highlighted consistency in innovation as a factor impacting financial outcomes. Also, they recommended strategic flexibility for non-financial performance (Section 6.2.1.) .
- Similarly, the Delphi method revealed that Iranians Identified social capital and brand Perception as crucial for non-financial performance. They proposed board members' combination and asset portfolio management for direct impact on financial performance. Also, they recognized the significance of the physical branch as a resource affecting both financial and non-financial aspects of digital transformation (Section 6.2.1.).
- Using the Delphi method, we found that both groups (Iran and Canada) ranked capital and investment in IT as the most important resources for non-financial performance during digital transformation. Also, the Delphi method showed that both Canadian and Iranian participants aligned in ranking digital strategy and innovation-driven capabilities among the top four crucial capabilities for non-financial performance during digital transformation. Moreover, we found that the rankings of resource importance for enhancing financial performance show a substantial consistency between Iran and Canada. Also, capital emerges as the most crucial resource for improving

financial performance in Iran. In Canada, however, asset portfolio management take precedence over capital (Section 6.2.4.4.).

- The Delphi method revealed that the rankings of capabilities for financial performance between Iranian and Canadian participants reveal both commonalities and distinctions. Canadian participants prioritize customer-centric approaches and marketing strategies, similar to their priorities for non-financial performance. Iranian participants prioritize partnerships with technology companies and customer-centric approaches but highlight functional capabilities as well, diverging from Canadian priorities (Section 6.2.4.5.).
- Using the Delphi method, we found that Canadian and Iranian perceptions of the importance of digital technologies for non-financial performance show both similarities and differences. Digital banking platforms are highly significant for both countries (Section 6.2.5.).
- The comparative analyses consistently highlight Canada's generally higher readiness across multiple technology categories within the banking sector when compared to Iran. However, disparities exist across specific capabilities within each category, emphasizing different strengths and weaknesses between the two nations (Section 6.2.5.).
- The SEM findings for Iran and Canada reveal comprehensive insights into the relationships between various factors and their impact on financial and non-financial performance (Section 6.3.).
- FsQCA showed that in both countries, certain capabilities consistently emerge as critical for performance, but the combinations and emphasis of

these capabilities vary. Digital strategy appears pivotal across both financial and non-financial performance in both contexts (Section 6.4.).

- Using the SEM method, we found that in both Canada and Iran, the regulatory environment has a significant positive impact on various capabilities. However, the effect size was different, and it was generally lower in Iran (Section 6.3.).

8.3. Research limitations

While this dissertation presents valuable contributions, it also has certain limitations:

Insufficient Details on Incentive Structures:

While the thesis effectively addresses several challenges associated with integrating SI and DCT theories and despite efforts to bridge the gap between the macro (SI) and micro (DCT) levels, the complexity of coordinating actions and strategies across these levels can lead to inefficiencies. The broader systemic innovations might not always translate smoothly into actionable strategies at the organizational level due to differing goals, timelines, and stakeholders involved. For example, this study does not provide in-depth mechanisms or strategies for aligning the differing incentives of various stakeholders involved in the innovation ecosystems, such as regulatory bodies, financial institutions, and technology providers. Without detailed mechanisms, it can be challenging to ensure that all parties are motivated towards common strategic objectives.

Complexity in Operationalization:

The complexity of integrating SI and DCT theories at different levels may lead to operational challenges in distinguishing the influence of external innovation systems from internal capabilities on organizational outcomes. Section 8.4. will discuss more about this.

Delphi Method Limitations:

While the Delphi method enhances consensus, challenges persist due to the complexity of scrutinized issues. Organizational differences, diverse viewpoints, and uncertainty may hinder full consensus, with efficacy varying across contexts or industries.

Specificity and Applicability of Capabilities:

Limitations arise from the specificity of identified capabilities, which may vary in relevance across banking contexts or regions. Focusing on certain capabilities might overlook crucial aspects of digital transformation, and effective implementation could be hindered by organizational constraints.

Scope and Regional Contexts:

The study's scope may not encompass all subtleties of regional contexts or the full spectrum of banking technologies. Dynamic regulatory changes impacting readiness levels over time might also be overlooked.

Subjectivity in Perceptions:

Reliance on respondents' perceptions introduces subjectivity influenced by personal experiences or biases. While regional differences are highlighted, nuances within each country and other cultural factors affecting technology preferences may not be fully captured.

Limited Global Generalizability:

Focusing on two countries limits the generalizability of findings to a broader global context.

Oversimplification of Contextual Factors:

Potential oversimplification of contextual factors influencing capability impacts might not capture the entirety of nuances affecting non-financial performance.

Methodological Limitations (SEM and fsQCA):

SEM and fsQCA results, while valuable, might be sensitive to sample size, industry representation, or specific data characteristics, potentially limiting generalizability to the broader banking sector.

Regulatory Inclusivity:

The study might not comprehensively capture all regulatory intricacies or the multifaceted impacts of regulations on capabilities within the banking sector. Specific contextual nuances and sectoral intricacies may be overlooked.

Data Availability and Regulatory Dynamics:

Limited data availability or access to specific regulatory details might restrict the depth of analysis. The snapshot approach may not capture ongoing developments accurately, and findings may not be universally applicable due to unique regulatory structures and cultural influences in each country.

Assumption of Rationality:

Both DCT and SI theory assume rational decision-making by firms. However, real-world decisions often involve bounded rationality, cognitive biases, and organizational politics.

8.4. Future directions

Based on these limitations, the following recommendations for future directions can be made:

Sufficient details on incentive structure:

Future work should develop detailed, actionable incentive alignment mechanisms tailored to different stakeholders within innovation ecosystems and explore case studies to empirically test these mechanisms across various regulatory and technological contexts to enhance strategic cohesion and operational efficiency.

Addressing complexity in Operationalization:

Future work could focus on developing integrated analytical frameworks and tools that explicitly map and measure the interactions between external innovation systems and internal capabilities and conducting empirical studies to validate these frameworks across various industries to ensure their efficacy in distinguishing and harmonizing these influences on organizational outcomes.

Enhancing Delphi Method Consensus:

Mitigating factors that influence consensus formation within the Delphi method requires investigating strategies, addressing complexities, and managing diverse viewpoints effectively.

Understanding Interconnected Capabilities:

Exploring how identified capabilities interact and influence each other within the digital banking landscape involves delving deeper into the hierarchy and interconnectedness of these factors.

Comprehensive Readiness Assessments:

Exploring the reasons behind regional differences in technology rankings and considering cultural, economic, or regulatory influences that contribute to varying perceptions requires a deeper investigation.

Expanding the Study to Diverse Countries:

Extending the study to encompass a more diverse set of countries involves a better understanding of how resource importance varies across different economic, cultural, and regulatory contexts.

Qualitative Enrichment:

Deeper qualitative exploration to complement quantitative analyses involves enriching the understanding of contextual factors influencing capability impacts.

Leveraging SEM and fsQCA Methodologies Effectively:

Leveraging SEM and fsQCA methodologies while addressing their limitations involves conducting longitudinal studies to track changes in capability impacts over time.

In-Depth Case Studies on Regulatory Measures:

Conducting more in-depth case studies on specific regulatory measures and their direct impacts on digital banking capabilities within each country requires an extensive and thorough examination.

Beyond Banking Sector Exploration:

"Extending beyond the banking sector to encompass a broader range of industries undergoing digital transformation involves broadening the scope of research and analysis.

Addressing PLS-SEM Discrepancies:

Exploring cases where PLS-SEM differs from CB-SEM involves identifying and understanding the variations between the two methods.

Exploring Negative or non-significance relationships:

Exploring negative relationships like the impact of marketing strategy on non-financial performance or investigating non-significant paths like Innovation capabilities on non-financial performance requires further research and analysis.

Behavioral Insights:

Investigating how deviations from rational decision-making impact firms' ability to develop and deploy dynamic capabilities. Consider factors such as heuristics, framing effects, and prospect theory and understanding how cognitive biases influence strategic choices can enhance our understanding of innovation processes.

Appendices

Appendix 1- REB Certification

SAINT MARY'S UNIVERSITY SINCE 1802 | RESEARCH ETHICS BOARD

CERTIFICATE OF RESEARCH ETHICS CLEARANCE

This is to certify that the Research Ethics Board has reviewed the research proposal:

SMU REB Registration Number:	23-017
Title of Research Proposal:	Exploring Capabilities Impacting Banks' Performance in Digital Transformation in Different Regulation Regimes.
Faculty, Department:	Sobey School of Business, Management
Faculty Supervisor:	Dr. Claudia DeFuentes
Student Principal Investigator:	Fariba Seyedjafarrangraz

and concludes that in all respects the proposed project meets appropriate standards of ethical clearance and is in accordance with the Tri-Council Policy Statement: Ethical Conduct of Research Involving Humans (TCPS2) and Saint Mary's University relevant policies.

Clearance Period: November 23, 2022 - November 23, 2023*

CONTINUING RESEARCH ETHICS REVIEW REPORTING REQUIREMENTS NEW

NEW INFORMATION AND UNANTICIPATED ISSUES

Any new information and unanticipated issue or event that increases the level of risk to participants or has other ethical implications is reported to the REB without delay, (within 1 business day).

REQUESTS FOR CHANGES TO CLEARED RESEARCH

FORM 2

Research ethics clearance needs to be secured prior to implementing any changes or additions different from the research proposal that received initial research ethics review and clearance throughout the life cycle of the research. This includes proposed changes to the proposal that affect research participants at any state of the process including, but not limited to, the informed consent process (form/script as relevant), changes to the tasks or interventions involved in the research or research materials.

ANNUAL STATUS REPORT*

FORM 3

Research ethics clearance is issued for **one year** at a time. When research continues beyond the specified time frame, researchers request an extension and receive an updated clearance to accommodate multi-year research projects. The SMU REB requests that researchers please submit requests 30 days prior to the expiry of the clearance.

END OF STUDY REPORT

FORM 5

Researchers submit a completion of the research request when the research ethics clearance period does not need extension. The SMU REB requests that researchers please submit requests 30 days prior to the expiry of the clearance.

*Researchers need to be aware that when research clearance expires, no activity on the project is permitted until the research ethics clearance is renewed. Failure to hold a valid SMU REB Certificate of Research Ethics Clearance of Continuation may result is delay, suspension of loss of funding as required by the federal granting Councils.

On behalf of the Saint Mary's University Research Ethics Board, I wish you success in your research.

E Kevin Kelloway

Dr. Kevin Kelloway
Chair, Research Ethics Board
Saint Mary's University

Appendix2- Delphi questionnaire (En)

Thank you for participating in this survey, which is part of a Ph.D. dissertation. It should take approximately 20-30 minutes to complete the questionnaire. If you have any questions or concerns, please do not hesitate to contact fariba.seyedjafarrangraz@smu.ca.

Kindly take note that the deadline for the completion of the questionnaire is fast approaching, specifically on the **13th of May**. Thank you for your prompt attention to this matter.

Please provide your contact information below. Email addresses will be used only to invite participants for round two of the survey, which will take place in less than a month. Once the study is completed, we will share with you a report with the aggregated results of the study.

Q1 Name:

____

Q2 Email address:

____

Please answer all the questions to the best of your knowledge. Space is also provided for you to comment in case it is necessary.

Here is a short definition of some terms:

- Financial performance: Financial performance is a subjective measure of how well a firm can use assets from its primary mode of business and generate revenues. The term is also used as a general measure of a firm's overall financial health over a given period. For example, ROA, ROE, ROI, and Net profit margin.
- Non-financial performance: non-financial measures of performance are metrics that companies use to gauge their success and performance in specific areas, without considering financial metrics. For example, customer satisfaction, employee turnover, and brand recognition. These measurements, avoid using monetary values to denote success or failure.
- Resources: Resources are the organization's assets, knowledge, and skills.
- Capability: Capabilities are defined as the organization's ability to effectively make use of its resources.
- Digital transformation: Digital transformation is the process of using digital technologies to create new — or modify existing — business processes, culture, and customer experiences to meet changing business and market requirements.

Q3: Please rank the following **capabilities** in terms of their importance for enhancing the **nonfinancial performance** of your industry, such as customer satisfaction, employee turnover, and brand recognition. You can drag and drop the capabilities.

______ Customer-centric capabilities
______ Marketing strategy
______ Marketing knowledge management
______ Marketing ethics
______ Partnership with technology companies
______ Income Diversification
______ Dynamic capabilities (ability to integrate internal and external competencies to address changing environment)
______ Fintech innovation
______ Innovation-driven capabilities
______ Digital servitization orientation
______ Digital strategy
______ Knowledge management functions (acquisition, integration, utilization)
______ Digital Transactions-ATM/Mobile transaction
______ Effective resource and capability management
______ Organization culture
______ Managers’s skills and experience
______ Employee’s skills and experience
______ Organizational digital literacy

Q4 Please rank the following **resources** in terms of their importance for enhancing the **non-financial performance** of your industry, such as customer satisfaction, employee turnover, and brand recognition. You can drag and drop the resources.

______ Capital
______ Infrastructure in digital technologies
______ Investment in Information Technology
______ Age of investment in data analytics
______ Investment in data analytics
______ Bank deposits
______ Non-Performing Loans

Q5 If you have any additional **capabilities or resources** that can enhance a bank's **non-financial performance**, please provide them below.

____

Q6 Please rank the following **capabilities** in terms of their importance for enhancing the **financial performance** of your industry, such as ROA, ROE, ROI, and Net profit margin. You can drag and drop the capabilities.

______ Customer-centric capabilities
______ Marketing strategy
______ Marketing knowledge management
______ Marketing ethics
______ Partnership with technology companies
______ Income Diversification
______ Dynamic capabilities (ability to integrate internal and external competencies to address changing environment)
______ Fintech innovation
______ Innovation-driven capabilities
______ Digital servitization orientation
______ Digital strategy
______ Knowledge management functions (acquisition, integration, utilization)
______ Digital Transactions-ATM/Mobile transaction
______ Effective resource and capability management
______ Organization culture
______ Managers's skills and experience
______ Employee's skills and experience
______ Organizational digital literacy

Q7 Please rank the following **resources** in terms of their importance for enhancing the **financial performance** of your industry, such as ROA, ROE, ROI, Net profit margin. You can drag and drop the resources.

______ Capital
______ Investment in Information Technology
______ Information Technology expense
______ Age of investment in data analytics
______ Investment in data analytics
______ Bank Deposits
______ Non-Performing Loans

Q8 If you have any additional **capabilities or resources** that can enhance a bank's **financial performance**, please provide them below.

____

Q9 **The following questions seek to assess the level of readiness to endorse digital transformation within your industry in terms of strategic, functional and operational capabilities**

Definition for this part:

Strategic capabilities are those that are necessary for the organization to achieve and sustain a competitive advantage over its rivals. These are typically the high-level capabilities that enable the organization to make strategic decisions and set direction. Examples of strategic capabilities include innovation, brand management, and customer relationship management.

Functional capabilities are those that are necessary for the organization to carry out its day-to-day business operations effectively. These are the capabilities that enable the organization to deliver products and services to its customers. Examples of functional capabilities include marketing, sales, logistics, and customer service.

Operational capabilities are those that are necessary for the organization to efficiently manage its resources and processes. These are the capabilities that enable the organization to execute its business operations effectively. Examples of operational capabilities include supply chain management, human resource management, and financial management.

Q10 On a scale of 1 to 5, with 1 being the lowest level of maturity and 5 being the highest level of maturity, how would you assess your industry's capabilities in terms of maturity to implement these **infrastructure technologies**?

	Strategic capabilities(1-5) (1)	Functional capabilities(1-5) (1)	Operational capabilities(1-5) (1)	Not Applicable (1)
Banking Application Marketplaces				☐

Q11 On a scale of 1 to 5, with 1 being the lowest level of maturity and 5 being the highest level of maturity, how would you assess your industry's capabilities in terms of maturity to implement these **Artificial Intelligence and Analytics technologies**?

	Strategic capabilities(1-5)	Functional capabilities(1-5)	Operational capabilities(1-5)	Not Applicable

Homomorphic Encryption (Performing computations on encrypted data without decryption)				☐
Natural Language Processing				☐
Data analytics				☐
AI technology infrastructure				☐

Q12 On a scale of 1 to 5, with 1 being the lowest level of maturity and 5 being the highest level of maturity, how would you assess your industry's capabilities in terms of maturity to implement these **Digital Engagement technologies**?

	Strategic capabilities(1-5)	Functional capabilities(1-5)	Operational capabilities(1-5)	Not Applicable

Cloud Banking Technology				☐
Digital Banking Platform				☐
Machine Customers(Machines taking the place of actual human customers to get something done.)				☐
Digital Personal Financial Assistant				☐
Conversational User Interfaces(Chatbots)				☐
Social Messaging Payment Apps				☐
Banking Application Marketplaces				☐

Low-Code/No-Code in Banking(Developing software applications without traditional programming.)				☐
Financial industry Super Apps(All-in-one financial apps for banking and investing.)				☐
Open Banking				☐
Omni-channel				☐

Q13 On a scale of 1 to 5, with 1 being the lowest level of maturity and 5 being the highest level of maturity, how would you assess your industry's capabilities in terms of maturity to implement these **Payment and Transaction technologies**?

	Strategic capabilities(1-5)	Functional capabilities(1-5)	Operational capabilities(1-5)	Not Applicable

Nonfungible Tokens				
Embedded Finance and Payments				
Decentralized Finance technologies				
CBDC(Central bank digital currencies)				
Blockchain Asset Tokenization				
Real-Time Payments				
Data Monetization				

Q14 On a scale of 1 to 5, with 1 being the lowest level of maturity and 5 being the highest level of maturity, how would you assess your industry's capabilities in terms of maturity to implement these **Security and Privacy technologies**?

	Strategic capabilities(1-5)	Functional capabilities(1-5)	Operational capabilities(1-5)	Not Applicable
Banking APIs				☐

Q15 On a scale of 1 to 5, with 1 being the lowest level of maturity and 5 being the highest level of maturity, how would you assess your industry's capabilities in terms of maturity to implement these **Automation technologies**?

	Strategic capabilities(1-5)	Functional capabilities(1-5)	Operational capabilities(1-5)	Not Applicable

IoT in Banking				☐
Hyperautomation tools in Banking				☐
Autoadapting and Autocomposing Products				☐
Roboadvisor 2.0 (a digital platform that provides automated, algorithm-driven financial planning and investment services with little to no human supervision.)				☐

Q16 If you have any additional comments regarding the relationship between these **capabilities and digital transformation technologies**, please provide them below.

Q17 Please rank the following **digital technologies** in terms of their importance for enhancing the **nonfinancial performance** of your industry, such as customer satisfaction, employee turnover, and brand recognition. You can drag and drop the technologies.

______ Digital Banking Platform
______ Digital Personal Financial Assistant
______ Conversational User Interfaces(Chatbots)
______ Social Messaging Payment Apps
______ Banking Application Marketplaces
______ Low-Code/No-Code in Banking(Developing software applications without traditional programming.)
______ Financial industry Super Apps
______ Open Banking
______ Omni-channel
______ Homomorphic Encryption (Performing computations on encrypted data without decryption)
______ Cloud Banking Technology
______ Banking Application Marketplaces
______ Natural Language Processing
______ Data analytics
______ AI technology infrastructure
______ Nonfungible Tokens
______ Embedded Finance and Payments
______ Decentralized Finance technologies
______ CBDC
______ Blockchain Asset Tokenization
______ Real-Time Payments
______ Data Monetization
______ Machine Customers
______ Banking APIs
______ IoT in Banking
______ Hyperautomation tools in Banking
______ Autoadapting and Autocomposing Products
______ Roboadvisor 2.0 (a digital platform that provides automated, algorithm-driven financial planning and investment services with little to no human supervision.) (30)

Q18 If you have any additional comments regarding **digital transformation technologies** that can enhance a **bank's non-financial performance**, please provide them below.

____

Q19 Please rank the following **digital technologies** in terms of their importance for enhancing the **financial performance** of your industry, such as ROA, ROE, ROI, Net profit margin. You can drag and drop the technologies.

______ Digital Banking Platform
______ Digital Personal Financial Assistant
______ Conversational User Interfaces(Chatbots)
______ Social Messaging Payment Apps
______ Banking Application Marketplaces
______ Low-Code/No-Code in Banking(Developing software applications without traditional programming.)
______ Financial industry Super Apps
______ Open Banking
______ Omni-channel
______ Homomorphic Encryption (Performing computations on encrypted data without decryption)
______ Cloud Banking Technology
______ Banking Application Marketplaces
______ Natural Language Processing
______ Data analytics
______ AI technology infrastructure
______ Nonfungible Tokens
______ Embedded Finance and Payments
______ Decentralized Finance technologies
______ CBDC
______ Blockchain Asset Tokenization
______ Real-Time Payments
______ Data Monetization
______ Machine Customers
______ Banking APIs
______ IoT in Banking
______ Hyperautomation tools in Banking
______ Autoadapting and Autocomposing Products
______ Roboadvisor 2.0 (a digital platform that provides automated, algorithm-driven financial planning and investment services with little to no human supervision.)

Q20 If you have any additional comments regarding **digital transformation technologies** that can enhance a **bank's financial performance**, please provide them below.

____

Appendix3- SEM and fsQCA questionnaire (En)

Thank you for participating in this survey, which is part of a Ph.D. dissertation. It should take approximately 20-30 minutes to complete the questionnaire. If you have any questions or concerns, please do not hesitate to contact fariba.seyedjafarrangraz@smu.ca

Kindly take note that the deadline for the completion of the questionnaire is fast approaching, please send your response by the **20th of August**. Thank you for your prompt attention to this matter.

Q1 If you would like to receive a copy of the project results, please provide your name and email address.

Name:

Email address:

Your role:

Q2 Could you please assess the Canadian banking industry's capability to closely monitor customer needs?

	(Strongly Disagree) (1)	(Disagree) (3)	(Somewhat Disagree) (4)	(Neutral) (5)	(Somewhat Agree) (6)	(Agree) (7)	(Strongly disagree) (8)
1. Objectives are primarily driven by customer satisfaction.	○	○	○	○	○	○	○
2. Constantly monitors the level of commitment and orientation to serving customers' needs.	○	○	○	○	○	○	○
3. Strategy for competitive advantage is based on the understanding of customers' needs.	○	○	○	○	○	○	○
4. Strategies are driven by beliefs about how they can create greater value for customers.	○	○	○	○	○	○	○
5. Measures customer satisfaction systematically and frequently.	○	○	○	○	○	○	○
6. Gives close attention to repeated customer service.	○	○	○	○	○	○	○

Q3 Could you please assess the Canadian banking industry's ability to satisfy customer needs through effective and quick responses?

	(Strongly disagree) (1)	(Disagree) (2)	(Somewhat Disagree) (3)	(Neutral) (4)	(Somewhat Agree) (5)	(Agree) (6)	(Strongly Agree) (7)
1. Promptly responds to newly identified customer needs and addresses customer complaints in a timely manner.	○	○	○	○	○	○	○
2. When it discovers customer dissatisfaction with a product or service, it takes immediate corrective action.	○	○	○	○	○	○	○
3. Adopts a proactive approach to shape market demand rather than a reactive one.	○	○	○	○	○	○	○
4. Demonstrates the ability to easily satisfy new customer needs.	○	○	○	○	○	○	○

5. Compared to global banking industries, the Canadian banking industry excels in satisfying customers' needs, and they have built a reputation for effectively meeting customer demands.	○	○	○	○	○	○	○

Q4 Could you please assess the following statements about the digital strategy capability in the Canadian banking Industry?

	(Strongly Disagree) (1)	(Disagree) (2)	(Somewhat Disagree) (3)	(Neutral) (4)	(Somewhat Agree) (5)	(Agree) (6)	(Strongly Agree) (7)
1. Digitalization is among the top three most important elements of its business strategy.	○	○	○	○	○	○	○
2. Investigate the newest trends and future scenarios in digitalization to stay competitive.	○	○	○	○	○	○	○
3. Digital projects have high priority within this business.	○	○	○	○	○	○	○
4. Constantly updates and refines its digital strategy.	○	○	○	○	○	○	○
5. Is considered a leader in digital innovation in the world.	○	○	○	○	○	○	○

Q5 Please assess the level of development of product innovation capabilities in the Canadian banking industry over the last three years based on:

	(Strongly Disagree) (1)	(Disagree) (2)	(Somewhat Disagree) (3)	(Neutral) (4)	(Somewhat Agree) (5)	(Agree) (6)	(Strongly Agree) (7)
1. The development of new products.	○	○	○	○	○	○	○
2. The modification or improvement of existing products.	○	○	○	○	○	○	○
3. The introduction of new or improved products over the last three years.	○	○	○	○	○	○	○
4. Introducing more new or improved products in the last three years compared to earlier years.	○	○	○	○	○	○	○

Q6 Please assess the level of development of process innovation capabilities in the Canadian banking industry over the last three years based on:

	(Strongly Disagree) (1)	(Disagree) (2)	(Somewhat Disagree) (3)	(Neutral) (4)	(Somewhat Agree) (5)	(Agree) (6)	(Strongly Agree) (7)
1. New methods and process development.	○	○	○	○	○	○	○
2. Improved methods and process development.	○	○	○	○	○	○	○
3. The introduction of new or improved processes in the last three years.	○	○	○	○	○	○	○
4. The introduction of more new or improved processes in the last three years compared to earlier years.	○	○	○	○	○	○	○
5. The implementation of new processes that have shortened the cycle or improved service flexibility.	○	○	○	○	○	○	○
6. The implementation of new processes that have reduced costs.	○	○	○	○	○	○	○

Q7 Please assess the level of the following statements about the marketing strategy capability in the Canadian banking industry. This industry tries to:

	(Strongly Disagree) (1)	(Disagree) (2)	(Somewhat Disagree) (3)	(Neutral) (4)	(Somewhat Agree) (5)	(Agree) (6)	(Strongly Agree) (7)
1. Retain its current market share.	○	○	○	○	○	○	○
2. Increase its sales volume via increasing sales to current customers	○	○	○	○	○	○	○
3. Increase its sales volume by selling new products to current customers	○	○	○	○	○	○	○
4. Increase its sales volume by selling current products to new customers	○	○	○	○	○	○	○
5. Increase its sales volume by selling new products to new customers	○	○	○	○	○	○	○
6. Concentrate on profitable segments and give up other segments.	○	○	○	○	○	○	○

Q8 Please assess the level of the following statements in the partnerships between the Canadian banking industry and technology companies.

	(Strongly Disagree) (1)	(Disagree) (2)	(Somewhat Disagree) (3)	(Neutral) (4)	(Somewhat Agree) (5)	(Agree) (6)	(Strongly Agree) (7)
1. Promote a culture of cooperation and exchange.	○	○	○	○	○	○	○
2. Emphasize teamwork.	○	○	○	○	○	○	○
3. Partners believe that cooperation is more important than competition	○	○	○	○	○	○	○
4. Cooperation between partners enables them to resolve business problems more efficiently.	○	○	○	○	○	○	○
5. Partners care for each other, communicate openly and trust each other.	○	○	○	○	○	○	○
6. Partners dare to invest more money in joint research and development or learning.	○	○	○	○	○	○	○
7. Partners face sudden crises together.	○	○	○	○	○	○	○

Q9 Could you please assess the following statements in the Canadian banking Industry employees:

	(Strongly Disagree) (1)	(Disagree) (2)	(Somewhat Disagree) (3)	(Neutral) (4)	(Somewhat Agree) (5)	(Agree) (6)	(Strongly Agree) (7)
1. Are encouraged to learn new technologies	○	○	○	○	○	○	○
2. Closely follow the trends in current technologies	○	○	○	○	○	○	○
3. Understand the business environments they support.	○	○	○	○	○	○	○
4. Are encouraged to learn about business functions.	○	○	○	○	○	○	○
5. Are able to interpret business problems and develop appropriate technical solutions.	○	○	○	○	○	○	○
6. Are knowledgeable about business functions.	○	○	○	○	○	○	○
7. Are self-directed and proactive.	○	○	○	○	○	○	○
8. Are very capable of teaching others.	○	○	○	○	○	○	○
9. Have the ability to plan, organize, and lead projects.	○	○	○	○	○	○	○
10. Have the ability to plan and execute work in a collective environment	○	○	○	○	○	○	○

11. Have the ability to accomplish multiple assignments	○	○	○	○	○	○	○
12. Work well in cross-functional teams addressing business problems.	○	○	○	○	○	○	○
13. Have the ability to work cooperatively in a project team environment	○	○	○	○	○	○	○
14. Have the ability to work closely with clients and customers.	○	○	○	○	○	○	○
15. Have the ability to write clear, concise and effective memos, and reports.	○	○	○	○	○	○	○
16. Have the ability to develop and deliver persuasive presentations.	○	○	○	○	○	○	○
17. Are skilled in security and privacy technology.	○	○	○	○	○	○	○
18. Are skilled in digital engagement technologies	○	○	○	○	○	○	○
19. Are skilled in payment and transaction technologies	○	○	○	○	○	○	○

20. Are skilled in Artificial Intelligence and analytics,	○	○	○	○	○	○	○
21. Are skilled in infrastructure technologies	○	○	○	○	○	○	○
22. Are skilled in automation technologies	○	○	○	○	○	○	○

Q10 Please assess the level of the following measurements about the financial performance of the Canadian banking industry.

	(Very bad) (1)	(Bad) (2)	(Somewhat Bad) (3)	(Neutral) (4)	(Somewhat Good) (5)	(Good) (6)	Very good) (7)
1. Return on Assets (ROA).	○	○	○	○	○	○	○
2. Sales growth	○	○	○	○	○	○	○
3. Profitability.	○	○	○	○	○	○	○
4. Improvement in work productivity.	○	○	○	○	○	○	○
5. Return on Equity (ROE).	○	○	○	○	○	○	○
6. Earnings per Share (EPS).	○	○	○	○	○	○	○

Q11 Please assess the level of the following measurements about the non-financial performance in the Canadian banking industry.

	(Very bad) (1)	(Bad) (2)	(Somewhat Bad) (3)	(Neutral) (4)	(Somewhat Good) (5)	(Good) (6)	(Very good) (7)
1. Customers' satisfaction.	○	○	○	○	○	○	○
2. Growth of number of customers.	○	○	○	○	○	○	○
3. Employee satisfaction.	○	○	○	○	○	○	○
4. Quality in products and services.	○	○	○	○	○	○	○
5. Industry reputation.	○	○	○	○	○	○	○
6. Relations with suppliers and partners.	○	○	○	○	○	○	○
7. Managing service error	○	○	○	○	○	○	○

Q12 Please rate the effectiveness of the Canadian regulatory environment in digital banking across the following aspects:

	(Not Effective) (1)	(Slightly Effective) (2)	(Moderately Effective) (3)	(Somewhat Effective) (4)	(Effective) (5)	(Very Effective) (6)	(Highly Effective) (7)
1. Managing risks	○	○	○	○	○	○	○
2. Supporting cybersecurity	○	○	○	○	○	○	○
3. Protecting data	○	○	○	○	○	○	○
4. Protecting consumers	○	○	○	○	○	○	○
5. Safeguarding market dynamics and new players	○	○	○	○	○	○	○

Appendix4- Delphi study- Reliability: Cronbach's Alpha

Table 30- Cronbach's Alpha of the Delphi Study

Factors	Indicators	Canada	Iran
Resource-Non-financial	Average interitem covariance	0.136	0.620
	Number of items in the scale	7*	8
	Scale reliability coefficient	0.833	0.829
Capability-Non-financial	Average interitem covariance	4.475	1.811
	Number of items in the scale	25	25
	Scale reliability coefficient	0.908	0.877
Resource-Financial	Average interitem covariance	0.0446	0.367
	Number of items in the scale	8	8
	Scale reliability coefficient	0.181	0.793
Capability-Financial	Average interitem covariance	5.557	1.670
	Number of items in the scale	25	25
	Scale reliability coefficient	0.934	0.926
Digital Technologies-Financial	Average interitem covariance	0.204	0.173
	Number of items in the scale	27	27
	Scale reliability coefficient	0.817	0.552
Digital Technologies-Non-financial	Average interitem covariance	0.579	0.781
	Number of items in the scale	27	27
	Scale reliability coefficient	0.827	0.915
Digital Technologies-Strategic capabilities	Average interitem covariance	0.211	0.062
	Number of items in the scale	27	27
	Scale reliability coefficient	0.882	0.782
Digital Technologies-Functional capabilities	Average interitem covariance	0.224	0.084
	Number of items in the scale	27	27
	Scale reliability coefficient	0.882	0.811
Digital technologies Operational capabilities	Average interitem covariance	0.190	0.0503
	Number of items in the scale	27	27
	Scale reliability coefficient	0.863	0.758

*Information Technology expense - financial constant in analysis sample, dropped from the analysis
Average Interitem Covariance: Mean correlation between scale items.
Number of Items in the Scale: Total items within the measurement.
Scale Reliability Coefficient: Cronbach's alpha indicates internal consistency.

Appendix5-Delphi study- Consensus analysis

Table 31- Standard Deviation for Ranking Resource in terms of impact on Non-financial Performance

	Capital	Investment in Information Technology	Information Technology expense	Investment in data analytics	Deposits	Age of investment in data analytics	Non-Performing Loans	Physical branch
First phase in Canada	0.518	1.414	1.768	1.302	1.753	1.069	1.356	NA
Second phase in Canada	0.463	0.463	0.000	0.354	0.354	0.518	0.707	0.916
Difference between the two phases in Canada	-0.055	-0.951	-1.768	-0.949	-1.399	-0.551	-0.649	0.916
First phase in Iran	1.618	1.120	1.902	0.905	1.640	1.471	0.467	NA
Second phase in Iran	1.120	1.104	1.864	0.603	2.203	0.539	0.688	1.095
Difference between the two phases in Iran	-0.498	-0.016	-0.039	-0.302	0.563	-0.932	0.220	NA

Table 32- Strandard_Deviation for Ranking Capabilities in terms of impact on Non-financial Performance

	Customer-centric capabilities	Digital strategy	Marketing strategy	Innovation-driven capabilities	Fintech innovation	Dynamic capabilities	Organizational digital literacy	Marketing knowledge management	Managers' skills and experience	Employees' skills and experience	Digital servitization orientation	Effective resource and capability management	Organization culture	Partnerships with technology companies	Knowledge management functions	Income diversification	Digital Transactions-ATM/Mobile transaction	Marketing ethics	Social capital	Brand preference	Consistency in innovation	Strategic flexibility	Bank's process integration with customers'	Board members combination	Asset portfolio management
First phase in Canada	3.682	2.800	4.596	5.258	3.919	4.069	5.007	3.503	4.803	4.673	4.773	4.734	3.505	3.852	0.991	2.816	2.669	4.464	NA	NA	NA	NA	NA	NA	NA
Second phase in Canada	1.126	0.707	0.926	0.756	0.916	2.295	2.252	1.598	2.000	1.847	1.909	2.268	2.659	3.796	3.603	3.928	6.302	8.983	7.270	5.849	7.010	4.660	5.027	2.070	1.885
Difference between the two phases in Canada	-2.556	-2.093	-3.670	-4.502	-3.003	-1.773	-2.755	-1.905	-2.803	-2.826	-2.865	-2.466	-0.846	-0.056	2.612	1.112	3.633	4.519	NA	NA	NA	NA	NA	NA	NA
First phase in Iran	1.250	3.325	2.822	2.976	2.359	3.475	5.312	4.606	5.971	5.405	4.319	2.832	4.714	3.165	2.767	3.357	3.009	4.634	NA	NA	NA	NA	NA	NA	NA
Second phase in Iran	1.286	1.368	1.036	0.447	1.136	0.944	3.078	2.136	1.572	2.366	1.748	4.119	2.423	3.668	3.081	3.552	4.134	1.748	4.571	2.796	2.976	4.657	2.750	2.343	4.480
Difference between the two phases in Iran	0.036	-1.956	-1.786	-2.528	-1.223	-2.531	-2.234	-2.470	-4.399	-3.039	-2.571	1.287	-2.290	0.503	0.314	0.195	1.125	-2.886	NA	NA	NA	NA	NA	NA	NA

Table 33- Strandard_Deviation for Ranking Resource in terms of impact on Financial Performance

	Capital	Deposits	Investment in Information Technology	Non-Performing Loans	Information Technology expense	Investment in data analytics	Age of investment in data analytics	Physical branch
First phase in Canada	0.744	0.991	1.356	1.768	1.685	1.165	0.916	NA
Second phase in Canada	0.744	0.535	0.707	1.061	1.832	1.195	2.264	0.916
Difference between the two phases in Canada	0.000	-0.457	-0.649	-0.707	0.147	0.030	1.348	NA
First phase in Iran	1.272	1.916	1.508	2.166	1.537	1.888	1.489	NA
Second phase in Iran	0.302	1.214	0.539	1.514	0.924	0.632	0.751	1.758
Difference between the two phases in Iran	-0.971	-0.703	-0.968	-0.652	-0.613	-1.255	-0.739	NA

Table 34- Strandard_Deviation for Ranking Capabilities in terms of impact on Financial Performance

	Customer-centric capabilities	Digital strategy	Marketing strategy	Innovation-driven capabilities	Fintech innovation	Dynamic capabilities	Organizational digital literacy	Marketing knowledge management	Managers' skills and experience	Employees' skills and experience	Digital servitization orientation	Effective resource and capability management	Organization culture	Partnerships with technology companies	Knowledge management functions	Income diversification	Marketing ethics	Marketing ethics	Social capital	Brand preference	Consistency in innovation	Strategic flexibility	Bank's process integration with customers' businesses	Board members combination	Asset portfolio management
First phase in Canada	2.973	2.134	4.559	5.365	4.824	4.536	4.941	3.583	5.007	1.282	2.375	4.291	4.502	4.324	5.757	4.340	3.643	3.454	NA	NA	NA	NA	NA	NA	NA
Second phase in Canada	0.744	0.641	0.641	0.835	1.061	1.069	1.389	1.690	1.488	1.982	2.560	2.387	2.560	5.423	3.357	3.105	3.454	4.334	3.335	2.866	3.998	6.392	0.354	9.149	10.351
Difference between the two phases in Canada	-2.229	-1.493	-3.918	-4.531	-3.763	-3.467	-3.552	-1.893	-3.519	0.700	0.185	-1.904	-1.942	1.099	-2.400	-1.235	-0.189	0.880	NA	NA	NA	NA	NA	NA	NA
First phase in Iran	3.208	3.908	3.668	2.879	4.585	4.052	2.663	3.075	5.293	2.838	5.610	5.081	3.443	5.456	4.905	2.832	2.136	2.005	NA	NA	NA	NA	NA	NA	NA
Second phase in Iran	0.751	1.044	0.924	2.618	3.982	1.963	1.921	0.924	1.732	1.601	2.423	1.737	1.814	1.401	2.014	1.804	1.440	1.834	1.537	3.012	4.478	3.379	0.751	1.758	3.524
Difference between the two phases in Iran	-2.457	-2.864	-2.744	-0.261	-0.603	-2.089	-0.742	-2.150	-3.561	-1.237	-3.187	-3.344	-1.629	-4.054	-2.891	-1.028	-0.697	-0.171	NA	NA	NA	NA	NA	NA	NA

Table 35- Strandard_Deviation for Ranking Digital technologies in terms of impact on Non-financial Performance.

	AI technology infrastructure	Banking APIs and Platform	Banking Application Marketplaces	Blockchain Asset Tokenization	Digital Banking Platform	Digital Personal Financial Assistant	Embedded Finance and Payments	Financial industry Super Apps	Hyperautomation tools in Bankingmation tools in Banking
First phase in Canada	6.392	3.271	2.000	1.188	0.463	2.053	4.809	2.550	6.105
Second phase in Canada	2.232	2.446	1.195	2.000	0.744	1.188	0.926	1.061	1.414
Difference between the two phases in Canada	-4.160	-0.825	-0.805	0.812	0.281	-0.865	-3.883	-1.489	-4.691
First phase in Iran	5.641	2.292	2.442	2.284	1.814	2.256	3.532	5.119	2.873
Second phase in Iran	1.221	1.601	1.095	2.071	0.405	0.924	1.286	1.963	3.371
Difference between the two phases in Iran	-4.420	-0.691	-1.347	-0.213	-1.410	-1.332	-2.245	-3.155	0.498

	IoT in Banking	Low-Code/No-Code in Banking	Machine Customers	Nonfungible Tokens	Open Banking	Roboadvisor 2.0	Social Messaging Payment Apps	Autoadapting and Autocomposing Products	CBDC
First phase in Canada	5.423	6.022	1.512	7.010	3.808	4.998	3.682	5.249	1.165
Second phase in Canada	1.885	1.302	0.991	1.126	4.870	4.892	0.991	0.886	0.707
Difference between the two phases in Canada	-3.538	-4.720	-0.521	-5.884	1.062	-0.107	-2.690	-4.363	-0.458
First phase in Iran	5.486	6.096	3.618	3.113	2.427	7.097	5.002	5.419	2.252
Second phase in Iran	1.864	0.982	0.809	1.722	1.722	1.036	1.471	1.128	1.272
Difference between the two phases in Iran	-3.622	-5.115	-2.809	-1.392	-0.706	-6.061	-3.531	-4.291	-0.980

	Cloud Banking Technology	Conversational User Interfaces(Chatbots)	Data analytics	Data Monetization	Decentralized Finance technologies	Homomorphic Encryption	Natural Language Processing	Omni-channel	Real-Time Payments
First phase in Canada	3.071	2.053	1.727	0.991	1.246	1.832	4.243	0.756	3.370
Second phase in Canada	2.315	0.707	1.188	2.326	1.061	2.435	1.165	1.061	1.188
Difference between the two phases in Canada	-0.756	-1.346	-0.539	1.335	-0.186	0.603	-3.078	0.305	-2.182
First phase in Iran	4.819	3.045	3.464	1.221	4.020	6.024	3.986	4.174	5.387
Second phase in Iran	1.578	1.888	1.679	1.368	1.214	2.618	0.924	1.844	2.464
Difference between the two phases in Iran	-3.240	-1.157	-1.785	0.147	-2.807	-3.406	-3.062	-2.330	-2.923

Table 36- Strandard_Deviation for Ranking digital technologies in terms of impact on Financial Performance

	Banking Application Marketplaces	Data analytics	Decentralized Finance technologies	Digital Banking Platform	IoT in Banking	Low-Code/No-Code in Banking	Nonfungible Tokens	Open Banking	Real-Time Payments	Social Messaging Payment Apps	AI technology infrastructure	Autoadapting and Autocomposing Products	Banking APIs and Platforms	Blockchain Asset Tokenization	CBDC	Cloud Banking Technology	Conversational User Interfaces (Chatbots)	Data Monetization	Digital Personal Financial Assistant	Embedded Finance and Payments	Financial industry Super Apps	Homomorphic Encryption	Hyperautomation tools in Bankingmation tools in Banking	Machine Customers	Natural Language Processing	Omni-channel	Roboadvisor 2.0
First phase in Canada	3.739	5.153	2.828	3.777	1.246	3.159	2.387	2.900	6.845	6.413	7.279	5.902	7.568	2.964	2.550	4.941	1.458	2.000	3.891	4.979	4.400	1.389	10.412	2.605	4.596	4.069	7.426
Second phase in Canada	0.518	0.641	1.165	0.886	1.069	1.069	1.512	0.641	0.707	0.835	0.886	1.246	0.463	0.886	0.916	3.891	1.309	1.282	1.195	1.488	0.463	0.641	0.463	0.535	1.246	0.354	0.835
Difference between the two phases in Canada	-3.222	-4.512	-1.663	-2.891	-0.177	-2.090	-0.875	-2.259	-6.138	-5.578	-6.392	-4.656	-7.105	-2.078	-1.633	-1.049	-0.148	-0.718	-2.696	-3.490	-3.937	-0.748	-9.949	-2.070	-3.350	-3.715	-6.591
First phase in Iran	4.132	7.632	3.328	4.513	3.613	6.882	3.414	4.108	3.908	4.094	7.408	5.278	8.063	4.813	2.071	4.519	4.070	2.562	3.349	5.957	3.802	2.700	9.611	3.015	5.002	4.714	7.390
Second phase in Iran	1.286	2.700	1.375	0.505	4.336	1.567	1.120	0.874	1.921	1.348	0.924	1.136	1.027	2.873	1.168	1.293	0.934	3.727	0.905	3.868	1.214	1.348	1.342	1.136	1.368	2.730	2.618
Difference between the two phases in Iran	-5.418	-10.33	-4.703	-5.017	-7.949	-8.449	-4.534	-4.982	-5.829	-5.443	-8.332	-6.414	-9.090	-7.686	-3.239	-5.812	-5.004	-6.289	-4.254	-9.826	-5.015	-4.049	-10.95	-4.151	-6.370	-7.444	-10.0[illegible]

Table37 - Strandard_Deviation forcapabiltit readiness to implement digital technologies

			First phase in Canada	Second phase in Canada	Difference between the two phases in Canada	First phase in Iran	Second phase in Iran	Difference between the two phases in Iran
Security and Privacy technologies	Banking APIs and Platforms	Strategic capability	0.463	0.535	0.072	0.522	0.831	0.309
		Functional capability	0.518	0.518	0.000	0.924	0.831	-0.093
		Operational capability	0.744	0.744	0.000	0.751	0.751	0.000
Infrastructure technologies	Cloud Banking Technology	Strategic capability	0.886	0.744	-0.142	0.539	0.632	0.093
		Functional capability	1.035	0.518	-0.518	0.539	0.522	-0.017
		Operational capability	0.518	0.463	-0.055	0.522	0.522	0.000
Automation technologies	IoT in Banking	Strategic capability	0.926	0.518	-0.408	0.789	0.751	-0.038
		Functional capability	0.926	0.886	-0.039	0.789	0.539	-0.249
		Operational capability	0.926	0.886	-0.039	0.789	0.751	-0.038
	Hyperautomation tools in Banking	Strategic capability	0.756	0.744	-0.012	0.831	0.632	-0.199
		Functional capability	0.756	1.035	0.279	0.831	0.539	-0.292
		Operational capability	0.756	1.035	0.279	0.831	0.539	-0.292
	Autoadapting and Autocomposing Products	Strategic capability	0.535	0.518	-0.017	0.505	0.522	0.018
		Functional capability	0.535	0.518	-0.017	0.522	0.522	0.000
		Operational capability	0.535	0.518	-0.017	0.302	0.522	0.221
	Roboadvisor 2.0	Strategic capability	0.756	0.463	-0.293	0.831	0.522	-0.309
		Functional capability	0.756	0.744	-0.012	0.701	0.522	-0.178
		Operational capability	0.756	0.744	-0.012	0.751	0.522	-0.229
Artificial Intelligence and Analysis	Homomorphic Encryption	Strategic capability	0.518	0.463	-0.055	0.302	0.302	0.000
		Functional capability	0.518	0.463	-0.055	0.302	0.467	0.166
		Operational capability	0.518	0.463	-0.055	0.302	0.405	0.103
	Natural Language Processing	Strategic capability	0.916	0.463	-0.453	0.688	0.405	-0.283
		Functional capability	1.282	0.707	-0.575	0.751	0.786	0.035
		Operational capability	0.707	0.916	0.209	0.809	0.467	-0.342
	Data Analytics	Strategic capability	0.463	0.354	-0.109	0.674	0.701	0.026
		Functional capability	0.835	0.354	-0.481	0.944	0.831	-0.113
		Operational capability	0.991	1.061	0.070	0.775	0.831	0.057
	AI technology infrastructure	Strategic capability	0.707	0.535	-0.173	0.505	0.751	0.246
		Functional capability	0.463	0.535	0.072	1.000	0.831	-0.169
		Operational capability	0.707	0.707	0.000	0.522	0.405	-0.118
Digital Engagement technologies	Digital Banking Platform	Strategic capability	0.916	0.744	-0.172	0.688	0.688	0.000
		Functional capability	0.707	0.744	0.037	0.707	0.505	-0.203

		Operational capability	0.756	1.808	1.052	1.506	0.467	-1.038
	Digital Personal Financial Assistant	Strategic capability	0.744	1.035	0.291	0.707	0.924	0.217
		Functional capability	1.061	0.916	-0.145	1.033	0.831	-0.202
		Operational capability	1.549	1.604	0.054	0.699	0.603	-0.096
	Conversational User Interfaces (Chatbots)	Strategic capability	1.035	1.035	0.000	0.527	0.809	0.282
		Functional capability	0.886	0.535	-0.352	0.820	0.905	0.084
		Operational capability	1.188	1.309	0.122	1.350	0.751	-0.599
	Social Messaging Payment Apps	Strategic capability	0.835	1.246	0.412	0.924	0.934	0.010
		Functional capability	1.035	1.581	0.546	1.136	0.775	-0.362
		Operational capability	1.506	1.389	-0.117	0.972	0.701	-0.271
	Banking Application Marketplaces	Strategic capability	0.756	0.991	0.235	1.000	0.820	-0.180
		Functional capability	1.302	1.282	-0.021	1.506	0.809	-0.697
		Operational capability	1.195	1.512	0.317	1.424	1.009	-0.415
	Low-Code/No-Code in Banking	Strategic capability	0.756	0.835	0.079	0.982	0.809	-0.173
		Functional capability	1.061	1.408	0.347	0.674	0.688	0.013
		Operational capability	1.598	1.847	0.249	0.738	0.701	-0.037
	Financial industry Super Apps	Strategic capability	0.835	0.886	0.052	1.481	0.831	-0.650
		Functional capability	1.553	1.727	0.174	1.398	0.701	-0.698
		Operational capability	0.744	1.847	1.103	0.738	1.009	0.271
	Open Banking	Strategic capability	1.727	0.354	-1.373	0.522	1.104	0.581
		Functional capability	1.188	1.408	0.220	0.505	0.302	-0.203
		Operational capability	1.581	1.773	0.192	0.568	0.522	-0.045
	Omni-channel	Strategic capability	1.188	0.518	-0.670	0.924	1.036	0.111
		Functional capability	1.553	1.690	0.138	1.036	0.522	-0.513
		Operational capability	1.574	0.835	-0.739	0.816	0.701	-0.116
	Machine Customers	Strategic capability	0.463	0.354	-0.109	0.302	0.302	0.000
		Functional capability	0.463	0.354	-0.109	0.302	0.302	0.000
		Operational capability	0.354	0.354	0.000	0.316	0.302	-0.015
Payment and Transaction technologies	Nonfungible Tokens	Strategic capability	0.690	0.744	0.054	0.894	0.905	0.010
		Functional capability	0.690	0.991	0.301	1.009	0.820	-0.189
		Operational capability	0.690	0.886	0.196	0.667	0.751	0.084
	Embedded Finance and Payments	Strategic capability	1.126	1.414	0.288	0.820	0.944	0.124
		Functional capability	1.126	1.126	0.000	0.505	0.405	-0.100

		Operational capability	1.126	1.126	0.000	0.674	0.674	0.000
	Decentralized Finance technologies	Strategic capability	0.690	0.518	-0.173	0.894	0.874	-0.021
		Functional capability	0.690	0.756	0.066	0.601	0.632	0.032
		Operational capability	0.690	0.707	0.017	0.422	1.044	0.623
	CBDC	Strategic capability	0.756	0.707	-0.049	0.874	0.982	0.108
		Functional capability	0.756	0.926	0.170	1.036	0.775	-0.261
		Operational capability	0.756	0.707	-0.049	0.789	0.751	-0.038
	Blockchain Asset Tokenization	Strategic capability	0.690	0.707	0.017	0.934	0.809	-0.125
		Functional capability	0.690	0.991	0.301	0.422	0.647	0.225
		Operational capability	0.690	0.991	0.301	0.522	0.688	0.165
	Real-Time Payments	Strategic capability	1.126	0.835	-0.291	0.707	0.775	0.067
		Functional capability	1.126	1.165	0.039	0.674	0.820	0.146
		Operational capability	1.126	1.302	0.176	1.206	0.905	-0.302
	Data Monetization	Strategic capability	0.641	0.354	-0.287	1.104	0.944	-0.160
		Functional capability	0.641	0.463	-0.178	1.009	1.000	-0.009
		Operational capability	0.641	0.463	-0.178	1.430	0.701	-0.729

Appendix6- Group Statistics

Table 38- Group Statistics-resource non-financial performance

	Country	N	Mean	Std. Deviation	Std. Error Mean
Capital	Canada	8	1.25	0.463	0.164
	Iran	11	1.64	1.120	0.338
Investment in Information Technology	Canada	8	1.75	0.463	0.164
	Iran	11	3.27	1.104	0.333
Information Technology expense	Canada	8	3.00	0.000	0.000
	Iran	11	3.45	1.864	0.562
Investment in data analytics	Canada	8	4.13	0.354	0.125
	Iran	11	3.82	0.603	0.182
Banks Deposits	Canada	8	4.88	0.354	0.125
	Iran	11	3.36	2.203	0.664
Age of investment in data analytics	Canada	8	6.38	0.518	0.183
	Iran	11	5.91	0.539	0.163
Non-Performing Loans	Canada	8	7.25	0.707	0.250
	Iran	11	7.55	0.688	0.207
Physical branch	Canada	8	7.38	0.916	0.324
	Iran	11	7.00	1.095	0.330

Table 39- Group Statistics-capability non-financial performance

	Country	N	Mean	Std. Deviation	Std. Error Mean
Customer-centric capabilities	Canada	8	2.13	1.126	0.398
	Iran	11	1.64	1.286	0.388
Digital strategy	Canada	8	2.25	0.707	0.250
	Iran	11	3.45	1.368	0.413
Marketing strategy	Canada	8	2.00	0.926	0.327
	Iran	11	3.55	1.036	0.312
Innovation-driven capabilities	Canada	8	4.50	0.756	0.267
	Iran	11	2.00	0.447	0.135
Fintech innovation	Canada	8	6.38	0.916	0.324
	Iran	11	5.09	1.136	0.343
Dynamic capabilities	Canada	8	8.13	2.295	0.811
	Iran	11	6.91	0.944	0.285
Organizational digital literacy	Canada	8	9.25	2.252	0.796
	Iran	11	17.55	3.078	0.928
Marketing knowledge management	Canada	8	10.63	1.598	0.565
	Iran	11	7.82	2.136	0.644
	Canada	8	11.50	2.000	0.707

Managers' skills and experience	Iran	11	6.55	1.572	0.474
Employees' skills and experience	Canada	8	12.38	1.847	0.653
	Iran	11	11.00	2.366	0.714
Digital servitization orientation_	Canada	8	13.75	1.909	0.675
	Iran	11	9.36	1.748	0.527
Effective resource and capability management_	Canada	8	15.50	2.268	0.802
	Iran	11	21.82	4.119	1.242
Organization culture	Canada	8	16.75	2.659	0.940
	Iran	11	21.45	2.423	0.731
Partnership with technology companies	Canada	8	17.88	3.796	1.342
	Iran	11	11.36	3.668	1.106
Knowledge management functions	Canada	8	20.13	3.603	1.274
	Iran	11	20.91	3.081	0.929
Income diversification	Canada	8	21.00	3.928	1.389
	Iran	11	17.73	3.552	1.071
Digital Transactions-ATM/Mobile transaction	Canada	8	19.50	6.302	2.228
	Iran	11	21.91	4.134	1.246
Marketing ethics	Canada	8	16.13	8.983	3.176
	Iran	11	13.36	1.748	0.527
Social capital	Canada	8	11.00	7.270	2.570
	Iran	11	13.91	4.571	1.378
Brand preference	Canada	8	13.25	5.849	2.068
	Iran	11	17.27	2.796	0.843
Consistency in innovation	Canada	8	13.50	7.010	2.478
	Iran	11	13.36	2.976	0.897
Strategic flexibility	Canada	8	18.50	4.660	1.648
	Iran	11	17.09	4.657	1.404
Bank's process integration with customers' businesses	Canada	8	17.88	5.027	1.777
	Iran	11	16.18	2.750	0.829
Board members combination	Canada	8	22.00	2.070	0.732
	Iran	11	20.91	2.343	0.707
Asset portfolio management	Canada	8	22.13	1.885	0.666
	Iran	11	22.55	4.480	1.351

Table 40- Group Statistics-digital technologies- Non-financial performance

	Country	N	Mean	Std. Deviation	Std. Error Mean
AI technology infrastructure	Canada	8	5.13	2.232	0.789
	Iran	11	5.91	1.221	0.368
Banking APIs and Platform	Canada	8	16.38	2.446	0.865
	Iran	11	9.18	1.601	0.483
Banking Application Marketplaces	Canada	8	11.00	1.195	0.423
	Iran	11	14.00	1.095	0.330
Blockchain Asset Tokenization	Canada	8	21.50	2.000	0.707
	Iran	11	20.91	2.071	0.625
Digital Banking Platform	Canada	8	1.38	0.744	0.263
	Iran	11	1.18	0.405	0.122
Digital Personal Financial Assistant	Canada	8	5.63	1.188	0.420
	Iran	11	3.64	0.924	0.279
Embedded Finance and Payments	Canada	8	18.00	0.926	0.327
	Iran	11	16.36	1.286	0.388
Financial industry Super Apps	Canada	8	14.38	1.061	0.375
	Iran	11	10.64	1.963	0.592
Hyperautomation tools in Banking	Canada	8	25.00	1.414	0.500
	Iran	11	19.18	3.371	1.016
IoT in Banking	Canada	8	15.88	1.885	0.666
	Iran	11	19.55	1.864	0.562
Low-Code/No-Code in Banking	Canada	8	12.63	1.302	0.460
	Iran	11	15.18	0.982	0.296
Machine Customers	Canada	8	25.88	0.991	0.350
	Iran	11	26.64	0.809	0.244
Nonfungible Tokens	Canada	8	22.88	1.126	0.398
	Iran	11	22.82	1.722	0.519
Open Banking	Canada	8	4.50	4.870	1.722
	Iran	11	2.18	1.722	0.519
Roboadvisor 2.0	Canada	8	21.25	4.892	1.729
	Iran	11	25.55	1.036	0.312
Social Messaging Payment Apps	Canada	8	12.13	0.991	0.350
	Iran	11	7.18	1.471	0.444
Autoadapting and Autocomposing Products	Canada	8	25.25	0.886	0.313
	Iran	11	25.55	1.128	0.340
CBDC	Canada	8	20.25	0.707	0.250
	Iran	11	20.73	1.272	0.384
Cloud Banking Technology	Canada	8	4.75	2.315	0.818
	Iran	11	6.91	1.578	0.476

Conversational User Interfaces(Chatbots)	Canada	8	2.75	0.707	0.250
	Iran	11	3.82	1.888	0.569
Data analytics	Canada	8	9.63	1.188	0.420
	Iran	11	10.73	1.679	0.506
Data Monetization	Canada	8	23.38	2.326	0.822
	Iran	11	23.55	1.368	0.413
Decentralized Finance technologies	Canada	8	20.38	1.061	0.375
	Iran	11	18.55	1.214	0.366
Homomorphic Encryption	Canada	8	7.75	2.435	0.861
	Iran	11	14.64	2.618	0.789
Natural Language Processing	Canada	8	8.25	1.165	0.412
	Iran	11	10.36	0.924	0.279
Omni-channel	Canada	8	6.38	1.061	0.375
	Iran	11	6.00	1.844	0.556
Real-Time Payments	Canada	8	15.63	1.188	0.420
	Iran	11	17.55	2.464	0.743

Table 41- Group Statistics-resource- financial performance

	Country	N	Mean	Std. Deviation	Std. Error Mean
Capital	Canada	8	1.63	0.744	0.263
	Iran	11	1.09	0.302	0.091
Banks Deposits	Canada	8	1.50	0.535	0.189
	Iran	11	2.55	1.214	0.366
Investment in Information Technology	Canada	8	3.25	0.707	0.250
	Iran	11	2.91	0.539	0.163
Non-Performing Loans	Canada	8	6.38	1.061	0.375
	Iran	11	6.91	1.514	0.456
Information Technology expense	Canada	8	5.25	1.832	0.648
	Iran	11	4.36	0.924	0.279
Investment in data analytics	Canada	8	6.00	1.195	0.423
	Iran	11	6.00	0.632	0.191
Age of investment in data analytics	Canada	8	5.38	2.264	0.800
	Iran	11	5.18	0.751	0.226
Physical branch	Canada	8	6.63	0.916	0.324
	Iran	11	7.09	1.758	0.530

Table 42- Group Statistics-capabilities- financial performance

	Country	N	Mean	Std. Deviation	Std. Error Mean
Customer-centric capabilities	Canada	8	1.38	.744	.263
	Iran	11	2.18	.751	.226
Marketing strategy	Canada	8	1.88	.641	.227
	Iran	11	5.09	1.044	.315
Partnership with technology companies	Canada	8	2.88	.641	.227
	Iran	11	1.36	.924	.279
Income diversification	Canada	8	4.13	.835	.295
	Iran	11	5.36	2.618	.789
Employees’ skills and experience	Canada	8	6.63	1.061	.375
	Iran	11	4.36	3.982	1.201
Digital strategy	Canada	8	7.50	1.069	.378
	Iran	11	16.36	1.963	.592
Managers’ skills and experience	Canada	8	9.25	1.389	.491
	Iran	11	15.09	1.921	.579
Dynamic capabilities	Canada	8	10.00	1.690	.598
	Iran	11	7.64	.924	.279
Effective resource and capability management	Canada	8	11.25	1.488	.526
	Iran	11	10.00	1.732	.522
Innovation-driven capabilities	Canada	8	12.75	1.982	.701
	Iran	11	4.82	1.601	.483
Digital servitization orientation	Canada	8	14.38	2.560	.905
	Iran	11	11.45	2.423	.731
Marketing knowledge management	Canada	8	15.63	2.387	.844
	Iran	11	6.73	1.737	.524
Knowledge management functions	Canada	8	16.38	2.560	.905
	Iran	11	18.91	1.814	.547
Fintech innovation	Canada	8	16.38	5.423	1.917
	Iran	11	11.82	1.401	.423
Marketing ethics	Canada	8	18.88	3.357	1.187
	Iran	11	10.36	2.014	.607
Digital Transactions-ATM/Mobile transaction	Canada	8	20.25	3.105	1.098
	Iran	11	20.36	1.804	.544
Organization culture	Canada	8	21.75	3.454	1.221
	Iran	11	18.45	1.440	.434
Organizational digital literacy	Canada	8	21.25	4.334	1.532
	Iran	11	20.82	1.834	.553
Social capital	Canada	8	16.38	3.335	1.179
	Iran	11	15.18	1.537	.464

Brand preference	Canada	8	17.25	2.866	1.013
	Iran	11	14.55	3.012	.908
Consistency in innovation	Canada	8	18.63	3.998	1.413
	Iran	11	13.36	4.478	1.350
Strategic flexibility	Canada	8	12.00	6.392	2.260
	Iran	11	20.73	3.379	1.019
Bank's process integration with customers' businesses	Canada	8	23.13	.354	.125
	Iran	11	22.82	.751	.226
Board members combination	Canada	8	12.63	9.149	3.235
	Iran	11	23.91	1.758	.530
Asset portfolio management	Canada	8	12.50	10.351	3.660
	Iran	11	23.27	3.524	1.063

Table 43- Group Statistics-digital technologies- Financial performance

	Country	N	Mean	Std. Deviation	Std. Error Mean
Banking Application Marketplaces	Canada	8	11.63	0.518	0.183
	Iran	11	9.64	1.286	0.388
Data Analytics	Canada	8	17.13	0.641	0.227
	Iran	11	14.91	2.700	0.814
Decentralized Finance technologies	Canada	8	20.75	1.165	0.412
	Iran	11	19.09	1.375	0.415
Digital Banking Platform	Canada	8	2.75	0.886	0.313
	Iran	11	1.64	0.505	0.152
IoT in Banking	Canada	8	26.00	1.069	0.378
	Iran	11	22.00	4.336	1.307
Low-Code/No-Code in Banking	Canada	8	2.00	1.069	0.378
	Iran	11	8.64	1.567	0.472
Nonfungible Tokens	Canada	8	18.00	1.512	0.535
	Iran	11	19.36	1.120	0.338
Open Banking	Canada	8	7.13	0.641	0.227
	Iran	11	5.82	0.874	0.263
Real-Time Payments	Canada	8	19.25	0.707	0.250
	Iran	11	20.91	1.921	0.579
Social Messaging Payment Apps	Canada	8	8.88	0.835	0.295
	Iran	11	7.73	1.348	0.407
AI technology infrastructure	Canada	8	5.25	0.886	0.313
	Iran	11	3.64	0.924	0.279
Autoadapting and Autocomposing Products	Canada	8	20.13	1.246	0.441
	Iran	11	20.91	1.136	0.343
Banking APIs and Platform	Canada	8	13.75	0.463	0.164

	Iran	11	8.36	1.027	0.310
Blockchain Asset Tokenization	Canada	8	22.75	0.886	0.313
	Iran	11	20.36	2.873	0.866
CBDC	Canada	8	22.38	0.916	0.324
	Iran	11	23.82	1.168	0.352
Cloud Banking Technology	Canada	8	3.00	3.891	1.376
	Iran	11	5.45	1.293	0.390
Conversational User Interfaces(Chatbots)	Canada	8	4.00	1.309	0.463
	Iran	11	1.55	0.934	0.282
Data Monetization	Canada	8	25.25	1.282	0.453
	Iran	11	22.91	3.727	1.124
Digital Personal Financial Assistant	Canada	8	4.50	1.195	0.423
	Iran	11	3.73	0.905	0.273
Embedded Finance and Payments	Canada	8	24.25	1.488	0.526
	Iran	11	23.18	3.868	1.166
Financial industry Super Apps	Canada	8	13.25	0.463	0.164
	Iran	11	12.45	1.214	0.366
Homomorphic Encryption	Canada	8	7.88	0.641	0.227
	Iran	11	13.73	1.348	0.407
Hyperautomation Tools in Banking	Canada	8	15.25	0.463	0.164
	Iran	11	15.00	1.342	0.405
Machine Customers	Canada	8	26.50	0.535	0.189
	Iran	11	25.91	1.136	0.343
Natural Language Processing	Canada	8	10.88	1.246	0.441
	Iran	11	13.55	1.368	0.413
Omni-channel	Canada	8	9.88	0.354	0.125
	Iran	11	10.64	2.730	0.823
Roboadvisor 2.0	Canada	8	16.13	0.835	0.295
	Iran	11	24.36	2.618	0.789

Appendix7- Outloading of SEM model

Table 44- Outerloading of SEM model

Construct	Items	Canada Outer Loadings	Iran Outer Loadings
Customer-centric capability	C1: Objectives are primarily driven by customer satisfaction.	0.606	0.348
	C2: Constantly monitors the level of commitment and orientation to serving customers' needs.	0.887	0.543
	C3: The strategy for competitive advantage is based on the understanding of customers' needs.	0.367	0.753
	C4: Strategies are driven by beliefs about how they can create greater value for customers.	0.303	0.922
	C5: Measures customer satisfaction systematically and frequently.	0.876	0.832
	C6: Gives close attention to repeated customer service.	0.229	-0.505
	C7: Promptly responds to newly identified customer needs and addresses customer complaints in a timely manner.	0.099	0.22
	C8: When it discovers customer dissatisfaction with a product or service, it takes immediate corrective action.	0.115	-0.469
	C9: Adopts a proactive approach to shape market demand rather than a reactive one.	0.906	0.475
	C10: Demonstrates the ability to easily satisfy new customer needs.	-0.327	0.878
	C11: Compared to global banking industries, the Canadian banking industry excels in satisfying customers' needs, and they have built a reputation for effectively meeting customer demands.	0.213	0.872
Digital strategy	D1: Digitalization is among the top three most important elements of its business strategy.	0.867	0.845

	D2: Investigates the newest trends and future scenarios in digitalization to stay competitive.	0.756	0.796
	D3: Digital projects have high priority within this business.	0.633	0.538
	D4: Constantly updates and refines its digital strategy.	0.646	0.782
	D5: Is considered a leader in digital innovation in the world.	0.817	0.73
Innovation capability	I1: The development of new products.	0.73	0.73
	I2: The modification or improvement of existing products.	0.549	0.797
	I3: The introduction of new or improved products over the last three years.	0.754	0.759
	I4: Introducing more new or improved products in the last three years compared to earlier years.	-0.383	0.786
	I5: New methods and process development.	0.552	0.87
	I6: Improved methods and process development.	0.652	0.831
	I7: The introduction of new or improved processes in the last three years.	0.831	0.738
	I8: The introduction of more new or improved processes in the last three years compared to earlier years.	0.752	0.425
	I9: The implementation of new processes that have shortened the cycle or improved service flexibility.	0.49	0.72
	I10: The implementation of new processes that have reduced costs.	0.456	-0.156
Marketing strategy	M1: Retain its current market share.	0.901	0.924
	M2: Increase its sales volume via increasing sales to current customers.	0.787	0.843
	M3: Increase its sales volume by selling new products to current customers.	0.846	0.898
	M4: Increase its sales volume by selling current products to new customers.	0.869	0.874

	M5: Increase its sales volume by selling new products to new customers.	0.927	0.817
	M6: Concentrate on profitable segments and give up other segments.	0.958	0.917
Partnership	P1: Promote a culture of cooperation and exchange.	0.924	0.802
	P2: Emphasize teamwork.	0.579	0.753
	P3: Partners believe that cooperation is more important than competition.	0.843	0.769
	P4: Cooperation between partners enables them to resolve business problems more efficiently.	0.839	0.608
	P5: Partners care for each other, communicate openly and trust each other.	0.366	0.786
	P6: Partners dare to invest more money in joint research and development or learning.	0.564	0.571
	P7: Partners face sudden crises together.	0.828	0.788
Employees' knowledge and skills	E1: Are encouraged to learn new technologies.	0.887	0.853
	E2: Closely follow the trends in current technologies.	0.163	0.609
	E3: Understand the business environments they support.	0.83	0.772
	E4: Are encouraged to learn about business functions.	0.814	0.697
	E5: Are able to interpret business problems and develop appropriate technical solutions.	-0.057	0.855
	E6: Are knowledgeable about business functions.	0.612	0.799
	E7: Banking industry employees are self-directed and proactive.	0.245	0.632
	E8: Are self-directed and proactive.	0.682	0.716
	E9: Are very capable of teaching others.	0.619	0.794
	E10: Have the ability to plan, organize, and lead projects.	0.153	0.749
	E11: Have the ability to plan and execute work in a collective environment.	0.043	0.294

	E12: Have the ability to accomplish multiple assignments.	0.182	0.461
	E13: Work well in cross-functional teams addressing business problems.	0.073	0.775
	E14: Have the ability to work cooperatively in a project team environment.	0.755	0.509
	E15: Have the ability to work closely with clients and customers.	0.736	0.844
	E16: Have the ability to write clear, concise and effective memos, and reports.	0.786	0.873
	E17: Are skilled in Security and Privacy Technology.	0.315	0.032
	E18: Are skilled in digital Engagement technologies.	0.749	0.707
	E19: Are skilled in Payment and Transaction technology.	0.721	0.622
	E20: Are skilled in Artificial Intelligence and Analytics.	0.704	0.305
	E21: Are skilled in infrastructure technologies.	-0.072	0.102
	E22: Are skilled in Automation technologies.	0.164	0.393
Financial performance	FP1: Return on assets.	0.89	0.822
	FP2: Sales growth.	0.903	0.71
	FP3: Profitability.	0.928	0.889
	FP4: Improvement in work productivity.	0.892	0.874
	FP5: Return on Equity (ROE).	0.924	0.687
	FP6: Earnings per Share (EPS).	0.887	0.799
Non-financial performance	NFP1: Customers' satisfaction.	0.761	0.805
	NFP2: Growth of the number of customers.	0.818	0.772
	NFP3: Employee satisfaction.	0.773	0.888
	NFP4: Quality in products and services.	0.774	0.896
	NFP5: Industry reputation.	0.812	0.828
	NFP6: Relations with suppliers and partners.	0.793	0.808
	NFP7: Service error level.	0.778	0.641
Regulatory scope of focus in digital banking	R1: Managing risks.	0.898	0.931

	R2: Supporting cybersecurity.	0.907	0.929
	R3: Protecting data.	0.737	0.963
	R4: Protecting consumers.	0.879	0.961
	R5: Safeguarding market dynamics and new players.	0.914	0.779

Glossary

1. **Strategic Capabilities**

Customer-centric capabilities

According to Al-dmour et al. (2021), customer-centric capability is defined as "an approach to doing business that focuses on meeting customer needs and wants while maintaining a profitable business model". This approach involves putting the customer at the centre of the business, understanding their needs, and aligning the business's offerings to meet those needs.

In another study by Al-dmour et al. (2022), customer-centric capability is defined as "a marketing approach where the bank takes the customer's perspective in all aspects of its operations to create superior customer value and satisfaction." This approach involves understanding the customer's preferences, needs, and behaviours and developing products and services that align with them.

Both definitions highlight the importance of putting the customer at the center of the bank's operations, understanding their needs, and aligning the bank's offerings to meet those needs. This aligns with Hooley et al. (1998)'s model, which emphasizes the importance of customer orientation as a strategic capability for banks.

In Hooley's model, customer-centric capability is considered a strategic capability. This is because it enables a bank to develop and maintain strong relationships with its customers, leading to increased customer loyalty, retention, and revenue. As stated by Al-dmour et al. (2021), a customer-centric capability is necessary for banks to keep up with the evolving customer expectations and demands in the digital age. Additionally, a customer-centric capability can aid banks in identifying opportunities for innovation and developing new digital products and services that meet customer needs. Therefore, having a customer-centric capability is essential for banks to succeed in the competitive digital banking industry.

Marketing strategy

Setia (2013) define marketing strategy as "a set of activities that firms employ to align their resources with customer needs and preferences to achieve a competitive advantage in the market." According to Al-dmour et al. (2022), marketing strategy involves the identification of target customers, the development of a value proposition, and the implementation of marketing mix tactics to reach customers and achieve marketing objectives.

In Hooley et al. (1998)'s model, marketing strategy is considered a strategic capability because it enables a company to differentiate its offerings from competitors, create and deliver value to customers, and achieve long-term growth and profitability. By having a strong marketing strategy, a company can identify and satisfy customer needs and preferences, which leads to increased customer loyalty and retention. Additionally, marketing strategy can help a company enter new markets, develop new products or services, and build a strong brand image, all of which are essential for sustainable growth in the digital age.

Income Diversification

Income diversification refers to the process of businesses generating income from multiple sources rather than relying on a single source of income (Abdulai &

CroleRees, 2001; Barrett et al., 2001; Chiorazzo et al., 2008; Reardon et al., 1992). In the banking sector, income diversification refers to the ability of a bank to generate income from a variety of sources, including interest income, fee income, and trading income (Chiorazzo et al., 2008).

In Hooley et al. (1998)’s model, income diversification is considered a strategic capability because it can help banks mitigate risk and reduce dependence on a single revenue source. This can lead to greater financial stability and long-term profitability, particularly in uncertain economic conditions (Cao et al., 2022).

Digital strategy

Ross et al. (2017) describe digital strategy as a way to "blend digital technologies and business strategy to create new value and experiences for customers, employees, and stakeholders." Blackburn et al. (2020) explain that digital strategy involves identifying and prioritizing digital initiatives that align with an organization's overall goals, while Gobble (2018) emphasizes the importance of a digital strategy in enabling a company to stay competitive and adapt to the rapidly evolving digital landscape.

In Hooley et al. (1998)’s model, digital strategy is considered a strategic capability because it enables a company to effectively harness digital technologies to achieve its business objectives and maintain competitiveness.

Dynamic capabilities

Dynamic capability is the organization's ability to integrate, build and reformulate internal and external capabilities to cope with rapidly changing environments. Because today's competitive environment is changing drastically and the type of changes has become very diverse, there is a need for capabilities that can create a competitive advantage for companies (Helfat et al., 2007). Other researchers also suggest this definition: the capacity of any organization to create, develop or modify basic resources in a targeted manner. These definitions show that dynamic capabilities are in the general concept of organizational processes and their role is to change the basic resources of the organization (Wójcik, 2015).

In the conditions of changing the external environment, in order to stabilize the competitive advantage, the organization must renew its valuable resources. Dynamic capabilities enable organizations to respond to these ongoing changes. Dynamic capabilities control the rate of change of the organization's resources, including resources. These sources of some capabilities, such as the ability to identify threats and opportunities, understand changing customer needs, etc., are not dynamic capabilities in themselves but are considered important elements in dynamic capabilities. That is, the basic resources of the organization enable it to achieve sustainable competitive advantages. In its broadest sense, resources are activities, capabilities, abilities, etc., that allow organizations to create benefits (Barreto, 2010).

Dynamic capabilities are strategic capabilities in Hooley’s model because they refer to a firm's ability to adapt and respond to changing market conditions and environments. They involve a firm's capacity to integrate, build, and reconfigure its resources and capabilities in response to dynamic and uncertain market conditions. These capabilities allow firms to learn from experience, innovate, and improve over time, thus providing a competitive advantage. By continually improving their dynamic capabilities, firms can better anticipate and respond to changes in the market and create new opportunities for growth and success. Therefore, dynamic capabilities are considered a critical aspect of strategic management and are essential for firms seeking to remain competitive in dynamic and rapidly changing markets.

Innovation-driven capabilities

Bell (2009) defines innovation capabilities as the ability to recognize and respond to new opportunities and challenges by developing new products, processes, and business models. Vu (2020) adds that innovation capabilities include a firm's ability to create, acquire, and transfer knowledge, as well as its ability to manage and integrate different types of knowledge.

In Hooley et al. (1998)’s model, innovation-driven capabilities are considered strategic because they enable a firm to stay ahead of the competition by continuously developing and implementing new ideas and technologies.

Digital servitization orientation

According to Manser Payne et al. (2021), digital servitization orientation refers to a bank's ability to incorporate digital technologies and services into its business model to enhance customer experiences, create new revenue streams, and improve operational efficiency. It involves leveraging technologies such as artificial intelligence, data analytics, and cloud computing to develop innovative service offerings and deliver them to customers through digital channels.

In Hooley et al. (1998)’s model, digital servitization orientation is considered a strategic capability because it enables banks to differentiate themselves from competitors, enhance customer value proposition, and create new revenue streams through the development of innovative digital services.

Marketing ethics

Marketing ethics can be defined as a set of principles, values, and standards that guide the behaviour of individuals and organizations in their marketing practices, and emphasize the importance of fairness, responsibility, honesty, and respect for customers and other stakeholders (Suandi et al., 2022). In Hooley et al. (1998)'s model, marketing ethics is considered a strategic capability because it plays a crucial role in enhancing the reputation and credibility of financial institutions.

2. **Operational Capabilities**

Partnerships with technology companies

Partnership with technology companies is a operational capability for banks in the digital age as it allows them to leverage external expertise and resources in the development and implementation of technology solutions. Cao et al. (2022) define partnership as "collaborations between banks and external technology companies that involve the exchange of knowledge, skills, and resources to develop and implement technology solutions for banking operations." Partnerships with technology companies are operational because they directly influence the day-to-day functioning of banks by integrating technology solutions into their operational frameworks. These collaborations lead to the implementation of software and systems that optimize processes, automate tasks, and improve efficiency within the bank's operations.

Fintech innovation

According to Al-dmour et al. (2020), fintech innovation refers to the use of technology to create new and innovative financial services and products, as well as to improve the efficiency and effectiveness of existing financial services. Fintech innovation is classified as an operational capability primarily due to its focus on enhancing the operational aspects of financial services through the utilization of technology. This capability involves leveraging technological advancements to create novel financial products and services or to enhance the efficiency and effectiveness of existing financial services. The operational aspect lies in its direct impact on the day-to-day operations and processes within the financial sector.

Digital Transactions-ATM/Mobile transaction

Digital transactions refer to the use of electronic devices and platforms for conducting financial transactions such as payments, transfers, and purchases, without the need for physical currency or face-to-face interaction (Vijayalakshmi, 2019). Digital transactions are considered an operational capability because they pertain to the execution and management of day-to-day financial activities using electronic devices and platforms. This capability is focused on the efficient and effective implementation of transactions, such as payments, transfers, and purchases, through digital means. It involves the integration of technology into the routine processes of financial transactions, enabling individuals and businesses to conduct their financial activities without the constraints of physical currency or direct in-person interactions.

Organizational culture

Organizational culture can be defined as the shared values, beliefs, norms, and behaviours that shape the way people in an organization interact and work together (Klimas, 2016; Manser Payne et al., 2021; Ouchi & Wilkins, 1985). In the context of Hooley et al. (1998)'s model, organizational culture is considered an operational capability because it is related to the day-to-day functioning of the organization.

Organizational digital literacy

Organizational digital literacy refers to an organization's ability to effectively use digital technologies and tools for business operations and decision-making (Cetindamar Kozanoglu & Abedin, 2021; Zhao et al., 2023). This capability is operational in Hooley et al. (1998)'s model because it involves the knowledge, skills, and competencies of employees in using digital technologies, which can directly impact the organization's ability to perform its day-to-day activities and achieve its operational goals. Organizational digital literacy also enables organizations to identify new opportunities for innovation and growth through the use of digital technologies, making it a crucial capability for maintaining competitiveness in today's digital landscape.

3. Functional Capabilities

Employee's skills and experience

This capability refers to the competencies, knowledge, and expertise of an organization's workforce (Heyes & Stuart, 1996; Ramlall, 2004). The skills and experience of employees are critical to the organization's performance, productivity, and efficiency (Heyes & Stuart, 1996). Employees' skills and knowledge are considered functional capabilities because they directly contribute to the effective execution of specific tasks and functions within an organization. Functional capabilities encompass the expertise and competencies that individuals bring to their roles to ensure the smooth operation of various organizational functions.

Managers’ skills and experience

Managers’ skills and experience refer to the knowledge, expertise, and competencies possessed by individuals in managerial positions within an organization (Al-dmour et al., 2021; Shehu & Egbu, 2007; Waters, 1980). Managers' skills and experience are considered functional capabilities because they are directly related to the specific functions and responsibilities within an organization. Functional capabilities encompass the expertise, knowledge, and competencies that individuals or teams possess to carry out specific tasks and functions effectively. In the case of managers' skills and experience, they contribute to the smooth functioning of various operational and strategic aspects of an organization.

Effective resource and capability management

Effective resource and capability management refers to the ability of an organization to efficiently and effectively allocate and utilize its resources and capabilities to achieve its strategic objectives (Liu et al., 2011). In Hooley’s model, this capability is considered functional because it relates to the operational and day-to-day activities of the organization, such as managing the workforce, technology, and other resources, to ensure that they are aligned with the strategic goals of the organization (Huselid et al., 1997). By effectively managing its resources and capabilities, an organization can optimize its performance and increase its competitiveness in the marketplace.

Marketing knowledge management

Marketing knowledge management refers to the processes, systems, and strategies that organizations use to capture, create, store, share, and apply marketing knowledge and information to improve their performance and competitiveness (Al-dmour et al., 2022; Setia, 2013). It involves integrating knowledge from various sources, including internal and external data, customer feedback, competitor intelligence, and market trends, and using this knowledge to inform marketing decisions, develop new products and services, and create value for customers (Al-dmour et al., 2020; Manser Payne et al., 2021).

Marketing knowledge management is classified as a functional capability due to its integral role in facilitating specific organizational functions. It encompasses a range of processes, systems, and strategies aimed at effectively capturing, creating, storing, sharing, and applying marketing-related knowledge and information. By integrating insights from diverse sources, both internal and external, such as customer feedback, competitive analysis, and market trends, marketing knowledge management informs critical marketing decisions, guides the development of innovative products and services, and ultimately adds value to customers' experiences.

Knowledge management functions (acquisition, integration, utilization)

Knowledge management functions, including knowledge acquisition, integration, and utilization, refer to the processes and activities involved in identifying, capturing, sharing, and utilizing knowledge within an organization (Al-dmour et al., 2021; Al-dmour et al., 2022). These functions are considered a capability as they enable organizations to effectively manage their knowledge resources, identify and address gaps in their knowledge, and use knowledge to drive innovation and competitive advantage (Al-dmour et al., 2021). Knowledge management capability is considered functional in Hooley's model because it supports the day-to-day operational activities of an organization.

4. **Resources**

Capital

Capital refers to anything that provides value or advantage to its owners, which could include physical assets like a factory and its equipment, intangible assets like patents or copyrights, or financial assets held by individuals or businesses (Hargrave, 2022).

Bank deposits

Bank deposits refer to the money held in a bank account by an individual or an organization, which can be withdrawn or used for transactions or investments (Gul et al., 2021). Banks use these deposits to fund their operations and provide loans to borrowers, earning interest on the difference between the interest they pay to depositors and the interest they receive from borrowers (Kahn et al., 1999).

Investment in information technology

Investment in information technology (IT) refers to the allocation of financial resources by an organization for the acquisition, implementation, and maintenance of IT systems, hardware, software, and other related technologies (Weill & Olson, 1989).

Non-Performing Loans

Non-performing loans (NPLs) refer to loans that are in default or have not been paid back according to the loan agreement. They represent a significant risk to the financial stability of banks and financial institutions as they can result in financial losses (Gul et al., 2021). NPLs can arise due to various reasons such as economic downturns, poor credit risk management, and inadequate collateral for loans (Khairi et al., 2021). Effective management of NPLs is critical for the financial health and sustainability of banks and financial institutions.

Investment in data analytics

Investment in data analytics refers to the allocation of resources by organizations to acquire, manage and analyze large volumes of data in order to identify patterns, insights, and opportunities for decision-making and strategic planning (Raguseo & Vitari, 2018). This capability involves the use of specialized technologies, tools, and techniques to collect, store, process, and analyze data in a way that generates meaningful insights for the organization. In the context of organizational performance, investment in data analytics has been shown to have a positive impact on firm performance, both directly and indirectly, through its effects on operational efficiency, innovation, and customer satisfaction (Raguseo & Vitari, 2018; Sena & Ozdemir, 2020).

Age of investment in data analytics

The age of investment in data analytics can be defined as the period in which companies are investing heavily in technology and tools to collect, process, and analyze large amounts of data in order to gain insights and make data-driven decisions. This resource involves utilizing big data analytics, machine learning, and other digital technologies to extract valuable information from data and leverage it to improve business operations, enhance customer experiences, and gain a competitive advantage (Gul et al., 2021; Holmlund et al., 2020)

Information technology expenses

Information technology expenses refer to the costs incurred by an organization related to its technological infrastructure and digital tools. According to Gul et al. (2021), information technology expenses have a positive correlation with productivity.

5. **Infrasuture technologies**

Infrastructure in digital technologies refers to the physical and virtual components that support the development and use of digital systems and applications (Wang & Yin, 2022). This includes the hardware, software, networks, databases, and other tools and resources needed to store, process, and transmit digital information.

Cloud Banking Technology

According to Shatalova and Huseynov (2021), Cloud banking technology refers to the provision of banking services and infrastructure through the use of cloud computing, allowing for remote access to data and services on demand. Cloud banking technology enables banks to store, process, and manage data on third-party servers, rather than their own physical hardware. This technology is categorized as an infrastructure technology in Skinner (2018)'s model because it serves as the foundation for the delivery of banking services and supports other digital banking technologies such as mobile banking and online banking (Shatalova & Huseynov, 2021). This technology is categorized as an infrastructure technology in Chriss Skinner's model because it serves as the foundation for the delivery of banking services and supports other digital banking technologies such as mobile banking and online banking (Shatalova & Huseynov, 2021).

6. Artificial Intelligence and Analytics technologies

Artificial Intelligence (AI) and Analytics technologies are categorized as "enabling technologies" in Skinner (2018) 's model. These technologies are used to enhance the capabilities of other infrastructure technologies in the digital banking ecosystem. AI refers to the use of algorithms and computational methods to simulate human intelligence and decision-making processes. Analytics technologies, on the other hand, refer to the use of data analysis tools and techniques to identify patterns, trends, and insights from large datasets. Both AI and analytics technologies are critical for digital banks to gain competitive advantages through data-driven decision-making, personalized customer experiences, and risk management.

Homomorphic Encryption

Homomorphic Encryption is a cryptographic technique that allows computation on encrypted data without requiring decryption, thereby ensuring data privacy and security. Tebaa et al. (2015) describe it as a method of protecting the privacy of banking data in the cloud. Iezzi (2020) provides an overview of homomorphic encryption as a practical privacy-preserving data science technique. Homomorphic encryption is categorized as an Artificial Intelligence and Analytics technology in Chris Skinner's model because it has the potential to enable secure computation on sensitive data, which is essential for machine learning and advanced analytics applications.

Natural Language Processing

According to Chowdhary and Chowdhary (2020), NLP is a "branch of computer science that deals with the ability of computers to understand, interpret, and generate human language." It involves the development of algorithms and techniques that enable computers to analyze and process natural language data, such as text and speech, to extract insights and meaning. NLP has applications in various fields, including language translation, sentiment analysis, chatbots, and voice assistants. In Chriss Skinner's model, NLP is categorized as an Artificial Intelligence and Analytics technology due to its focus on analyzing and interpreting human language data to extract insights and drive decision-making processes (Zahner, 2021).

Data Analytics

According to Srivastava and Gopalkrishnan (2015), it involves the use of statistical and computational techniques to extract meaningful information from data. Gupta et al. (2019) highlight that data analytics allows for better risk assessment, fraud detection, customer segmentation, and personalized marketing in the banking sector. It is categorized as an Artificial Intelligence and Analytics technology in Chris

Skinner's model as it involves the use of machine learning algorithms and statistical models to analyze and derive insights from data.

AI technology infrastructure

According to Ustenko and Ostapovych (2020), AI infrastructure in the banking sector includes machine learning models, natural language processing systems, and neural networks, among others. These technologies require high-performance computing systems, cloud computing platforms, and data management tools to support large-scale data processing and analysis. Rahman et al. (2021a) note that AI infrastructure also includes data governance frameworks, security protocols, and ethical guidelines to ensure the responsible use of AI in banking services. The AI technology infrastructure is categorized as an Artificial Intelligence and Analytics technology in Chris Skinner's model because it provides the foundation for developing and implementing AI-based applications and systems that can improve business operations and decision-making processes.

7. **Security and Privacy Technologies**

In Skinner's model, Security and Privacy technologies refer to the tools and technologies used to ensure the security and privacy of digital transactions and data. This includes authentication methods, encryption techniques, firewalls, anti-virus software, and other security measures that protect against cyber threats and unauthorized access to sensitive information.

Banking APIs

According to De Visser (2021) APIs are computer programs that are used to create other software applications that interact with existing technology from other companies. When banks use APIs, they can provide their customers with a more streamlined and efficient experience. This can lead to the development of creative solutions that address specific issues within the banking industry.

Banking APIs can be categorized as Security and Privacy technologies in Skinner's model because they involve the secure transfer of sensitive financial data between different parties. APIs are used by banks to securely share information with third-party developers, fintech companies, and other financial institutions.

8. Automation technologies

According to Skinner's model, automation technologies are those that "automate and optimize internal processes, increase efficiency and reduce costs”

IoT in Banking

According to Shiklo (2020), the Internet of Things (IoT) is a technology that connects devices such as sensors, cameras, and smart gadgets in a network, allowing for the real-time collection of data. The collected data is then transferred to the cloud for analysis and used to react to events in real-time. IoT has significant applications in the banking and finance industry, where it enables efficient data collection, processing, and automation of key processes. By leveraging IoT, financial institutions can optimize their services and operations, improve the security of transactions, and provide customers with advanced experiences. The Internet of Things (IoT) in the banking industry can be categorized as Automation technologies in Skinner's model as it involves the automation of key processes by collecting real-time data through a network of connected devices (sensors, cameras, smart gadgets) and transferring it to the cloud for analysis and processing.

Hyper-automation tools in Banking

Hyper-automation is a method of digital transformation that focuses on automating a maximum number of business processes, while also digitally enhancing those processes that require human intervention (Dilmegani, 2023). Hyper-automation tools in banking are categorized as automation technologies in Skinner's model because they are designed to automate and streamline various business processes in banking, such as account opening, loan processing, and customer service.

Autoadapting and autocomposing products

Autoadapting and autocomposing products are financial products that utilize emerging technology and data capabilities to meet rising customer digital expectations by dynamically adjusting and evolving in response to changing customer needs and preferences (Gartner, 2021c). Autoadapting and autocomposing products are categorized as automation technologies in Skinner's model because they involve the use of emerging technologies and data capabilities to automate the process of product adaptation and composition

Roboadvisor 2.0

Roboadvisors 2.0 are digital financial tools that are automated, collaborative, and employ algorithms to carry out advanced investment management and financial planning tasks, according to the definition provided by (Gartner, 2021a). Roboadvisors 2.0 are categorized as automation technologies in Skinner's model because they are collaborative, automated, digital financial tools that use algorithms to perform advanced investment management and financial planning functions.

9. Digital engagement technology

Digital Banking Platform

According to (Gartner) a digital banking platform (DBP) is a tool that allows a bank to commence the process of becoming a fully digital bank that is centred around ecosystems. It also enables banks to attain business optimization. Nonetheless, this is not the ultimate goal. Banks that aim to achieve only business optimization through their digital banking strategy can fulfill their requirements with a digital banking multichannel solution. A digital banking platform is categorized as Digital Engagement technology in Skinner's model because it allows banks to engage with customers through various digital channels such as mobile apps, online banking portals, and social media platforms. The platform provides customers with a seamless and personalized banking experience, enabling them to access banking services at their convenience, make transactions, and communicate with the bank. Therefore, a digital banking platform is an essential tool for banks to enhance customer engagement and improve customer experience in the digital age.

Digital Personal Financial Assistant

A digital personal financial assistant is an intelligent software agent that helps users manage their finances. It uses natural language processing and machine learning algorithms to understand user needs and preferences, providing personalized financial advice and recommendations (Balathas et al., 2021). It is categorized as a Digital Engagement technology in Chris Skinner's model because it enables banks to engage with customers in a more personalized and interactive way, enhancing the overall customer experience.

Conversational User Interfaces

According to Baier et al. (2018), Conversational User Interfaces (CUIs) are a type of technology that allows users to interact with computer systems through natural language conversations. CUIs can be implemented through chatbots, voice assistants, or other similar technologies (Fahn & Riener, 2021). They are categorized as Digital Engagement technologies in Chriss Skinne's model because they enable more natural and intuitive interactions between users and digital systems, leading to a more engaging and personalized experience (Brüggemeier & Lalone, 2022).

Social Messaging Payment Apps

According to Yuen (2020), social messaging payment apps refer to mobile payment extensions offered by multinational mobile messaging applications. These apps allow users to send and receive payments directly through the messaging platform, eliminating the need to switch between multiple apps. Social messaging payment apps have gained popularity due to their convenience, speed, and user-friendly interfaces. They offer a seamless and integrated user experience, with the added benefit of enhanced security measures. Social Messaging Payment Apps are categorized as Digital Engagement technologies in Skinner's model because they facilitate engagement between customers and the banking institution through a digital platform.

Banking Application Marketplaces

According to Vallee and Zeng (2019), banking application marketplaces represent a new banking paradigm that shifts the focus from in-house product development to collaboration with external partners, while also providing customers with more choice and convenience. Banking application marketplaces are categorized as digital engagement technologies in Skinner's model because they provide customers with a platform to discover and access a wide range of financial products and services from different providers, all in one place. This allows customers to engage more deeply with their finances and make informed decisions, enhancing their overall digital banking experience.

Low-Code/No-Code in Banking

Low-Code/No-Code (LCNC) refers to the use of platforms and tools that allow developers to create software applications with minimal coding effort or knowledge. These platforms provide pre-built application components, visual drag-and-drop interfaces, and pre-configured templates that can be used to rapidly develop and deploy custom applications (Nair, 2022). LCNC are categorized as digital engagement technologies in Skinner's model because they enable banks to rapidly create and deploy digital solutions to engage customers and improve their experiences.

Financial industry Super Apps

Financial Industry Super Apps are digital platforms that integrate multiple financial services and non-financial services into a single mobile application (Deloitte, 2022). These apps aim to offer customers a comprehensive suite of services, including banking, insurance, wealth management, payments, and more, on a single platform.

Financial Industry Super Apps are categorized as digital engagement technologies in Skinner's model because they are digital platforms that offer multiple financial services, such as banking, insurance, and investing, within a single app.

Open Banking

According to Brodsky and Oakes (2017), open banking is an emerging, customer-centric approach that enables third-party developers to build applications and services around the customer, and through collaboration with banks, provide a range of financial services to users that they can access and manage via their mobile devices and computers. Open banking is categorized as a digital engagement technology in Skinner's model because it leverages digital technology to enable customers to access and share their financial data securely with third-party providers and to initiate transactions and make payments.

Omni-channel

According to McKinsey & Company, omni-channel is "an effort to build a fully integrated and consistent customer experience across all channels, with the goal of allowing customers to use the channel of their choice at any given moment." This means that customers can interact with the bank in the same way across multiple channels and that all channels are connected and work together. The goal is to provide a convenient and personalized customer experience, regardless of the channel used (Rizzi, 2019). Omni-channel is categorized as digital engagement technologies in Skinner's model because it enables customers to interact with banks and financial institutions seamlessly across multiple channels, including mobile, web, ATM, and branch.

Machine Customers

A machine customer is an economic actor that is not a human and acquires goods or services by providing payment (Law, 2023). Machine customer is categorized as Payment and Transaction technologies in Skinner's model because it involves the exchange of goods and services for payment, which falls under the payment and transaction category.

10. Payment and Transaction Technologies

Nonfungible Tokens

According to financestrategists.com, a non-fungible token (NFT) is a unique digital asset that is stored on a blockchain, a decentralized digital ledger that allows for secure and transparent recording of transactions. Unlike cryptocurrencies, which are interchangeable with other units of the same cryptocurrency, NFTs are unique and cannot be exchanged for other tokens or assets on a one-to-one basis. NFTs are often used to represent digital art, music, videos, and other collectables, and their ownership and authenticity can be verified through the blockchain (Tamplin, 2023). Nonfungible Tokens (NFTs) can be categorized as Payment and Transaction technologies in Skinner's model because they enable the exchange of value and ownership of unique digital assets on blockchain networks.

Embedded Finance and Payments

According to McKinsey & Company embedded finance refers to the integration of financial products into a non-financial platform or experience that is aimed at customers (Dresner, 2022). Embedded Finance and Payments are categorized as Payment and Transaction technologies in Skinner's model because they involve integrating financial services and products within non-financial platforms and experiences to enable seamless and convenient transactions.

Decentralized finance technologies

Decentralized finance, commonly referred to as DeFi, leverages blockchain technology and digital currency to facilitate financial transactions. The objective of DeFi is to democratize finance by substituting traditional centralized financial systems with decentralized, peer-to-peer relationships that can offer a comprehensive range of financial services, including standard banking services, loans, mortgages, and complex financial instruments (Neapolitan, 2022). Decentralized finance technologies are categorized as payment and transaction technologies in Skinner's model because they aim to revolutionize the way financial transactions are conducted by leveraging the capabilities of blockchain technology and cryptocurrencies.

CBDC (Central bank digital currencies)

Central bank digital currencies (CBDCs) are a digital version of a currency that is issued by the government and not tied to any physical commodity (McKinsey, 2023). Central banks are responsible for issuing these digital currencies, as they play a crucial role in supporting financial services for the government and commercial banking system of a country, establishing monetary policy, and regulating currency. CBDCs are categorized as Payment and Transaction technologies in Skinner's model because they are digital forms of government-issued currency that are intended to support financial services for a nation's government and commercial banking system.

Blockchain Asset Tokenization

According to BNYMELLON (2019), asset tokenization refers to the conversion of asset ownership or rights into a digital token on a blockchain. Tokenization can be applied to a wide range of assets, including regulated financial instruments like equities and bonds, real estate, precious metals, and even intellectual property such as music copyrights. Blockchain asset tokenization is categorized as Payment and Transaction technologies in Skinner's model because it involves the creation of digital tokens on a blockchain or distributed ledger, which represent either digital or physical assets.

Real-Time Payments

According to (Payments Journal, 2021) real-time payments (RTP) refer to payments that are initiated and settled almost immediately. A real-time payments rail is a digital platform that enables real-time payments. The aim is to ensure that real-time payment networks offer uninterrupted access 24/7/365, which means that transfers can be processed even on weekends and holidays.

Data Monetization

According to Gartner Glossary, Data monetization involves utilizing data to achieve measurable financial gains. This can be done through internal means, such as using data to make informed business decisions and improve overall performance. As Data Monetization involves the process of generating revenue or economic benefits from data, it can be considered a type of Payment and Transaction technology in Skinner's model. Data Monetization involves creating value from data by exchanging it for financial benefits, which aligns with the definition of Payment and Transaction technology.

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