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Department of Economics and Finance

THE IMPACT OF FINANCIAL INNOVATION ON THE OPERATIONAL EFFICIENCY OF BANKS: AN EMPIRICAL STUDY ON COMMERCIAL BANKS IN TURKEY

Master Thesis

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DECLARATION

I hereby declare that in the preparation of this thesis, scientific ethical rules have been followed, the works of other persons have been referenced in accordance with the scientific norms if used, there is no falsification in the used data, any part of the thesis has not been submitted to this university or any other university as another thesis.

Farah MAHMALJI

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SUMMARY

The overall objective of this research is to study the impact of financial innovation on the operational efficiency of commercial banks in Turkey. The study included employees of Kuveyttürk Bank and QNB Bank, where a sample of 370 respondents was taken, and questionnaires were then distributed to all permanent employees in the head offices and branches of the banks under study to explore their opinions on the impact of banking innovations on the performance of commercial banks. Demographic analyses of the respondents' age, gender, educational qualification, job experience, and place of work were applied, as well as Cronbach's alpha analysis, which proved that the study tool has a high degree of stability and therefore the questionnaire can be relied upon to conduct the necessary analyses.

In addition, descriptive analyses of the sample members' answers about the role of innovation through mobile banking, internet banking, and ATMs in enhancing operational efficiency showed that the majority of the sample members' answers fall within the scope of agreement, i.e. there is a role for financial innovation in enhancing the operational efficiency of banks, which is the focus of the study. An analysis of variance was also conducted, which proved the existence of statistically significant differences at the 5% level for the variables of gender and age with regard to financial innovation and its role in enhancing operational efficiency, in the event that the results did not show statistically significant differences between the individuals of the study sample with regard to the variable of academic qualification with regard to financial innovation and its relationship to operational efficiency.

Keywords: Financial innovation, operational efficiency, banking services**,** Mobile banking, ATM banking services.

ÖZET

Bu araştırmanın genel amacı, finansal inovasyonun Türkiye'deki ticari bankaların operasyonel verimliliği üzerindeki etkisini incelemektir. Çalışmaya Kuveyt Türk Bankası ve QNB Bank çalışanları dahil edilmiş, 370 kişilik bir örneklem alınmış ve daha sonra bankacılık yeniliklerinin ticari bankaların performansı üzerindeki etkisine ilişkin görüşlerini araştırmak üzere incelenen bankaların genel müdürlük ve şubelerindeki tüm kadrolu çalışanlara anketler dağıtılmıştır. Katılımcıların yaş, cinsiyet, eğitim durumu, iş deneyimi ve çalışma yerlerine ilişkin demografik analizlerin yanı sıra, çalışma aracının yüksek derecede kararlılığa sahip olduğunu ve bu nedenle gerekli analizleri yapmak için ankete güvenilebileceğini kanıtlayan Cronbach's alpha analizi uygulanmıştır.

Buna ek olarak, örneklem üyelerinin mobil bankacılık, internet bankacılığı ve ATM'ler aracılığıyla inovasyonun operasyonel verimliliği artırmadaki rolüne ilişkin cevaplarının tanımlayıcı analizleri, örneklem üyelerinin cevaplarının çoğunluğunun katılım kapsamında olduğunu, yani çalışmanın odak noktası olan bankaların operasyonel verimliliğini artırmada finansal inovasyonun bir rolü olduğunu göstermiştir. Finansal inovasyon ve operasyonel verimliliğin artırılmasındaki rolü ile ilgili olarak cinsiyet ve yaş değişkenleri için %5 düzeyinde istatistiksel olarak anlamlı farklılıkların varlığını kanıtlayan bir varyans analizi de yapılmıştır; ancak sonuçlar, finansal inovasyon ve operasyonel verimlilik ilişkisi ile ilgili olarak akademik nitelik değişkeni açısından çalışma örnekleminin bireyleri arasında istatistiksel olarak anlamlı farklılıklar göstermemiştir.

Anahtar Kelimeler: Finansal inovasyon, operasyonel verimlilik, bankacılık hizmetleri, mobil bankacılık, ATM bankacılığı hizmetleri.

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INTRODUCTION

Over the past two decades, classical financial systems, institutions, and banks have undergone significant transformations due to the advancement of financial technology systems and digitization. Banks that have embraced digitization as an opportunity, leveraging innovations to gain a competitive edge, have seen positive financial outcomes. Conversely, banks that have failed to keep pace with technological advancements and adapt to the changing landscape have struggled to maintain their value relative to their competitors (Zhang, 2022).

The widespread adoption of the internet and the continuous evolution of internet technologies have catalysed innovations within the finance sector. Both in Turkey and globally, the financial sector cannot afford to remain indifferent to the disruptive forces of technological progress across various domains. Market participants in the financial sector have introduced numerous innovations by aligning themselves with these transformative technological trends (Kou & Lu, 2025).

Financial innovation refers to the integration of finance and technology, and financial innovation in banks are organizations that aim to provide financial products and services in a faster and more convenient manner through innovative approaches and the utilization of technology. These banks offer solutions such as payment, money transfer, lending, and investment to their users. By effectively and innovatively incorporating financial innovation, commercial banks are paving the way for new developments in the finance sector and are recognized as leaders in the financial innovation industry. In addition to offering a wide range of financial products and services, these banks introduce innovative business and revenue models (Gündoğdu & Taşkın, 2017).

Banks that utilize financial innovation are becoming increasingly significant in the finance industry, leading to a rapid growth in investments each year. This sector is drawing the interest of numerous financial and technology institutions, establishing itself as a crucial area. The number of banks embracing financial innovation dedicated to offering such services is on the rise in Turkey and globally, playing a progressively vital role in finance. Consequently, this research aims to illuminate this sector and

contribute to existing studies by focusing on financial innovation banks, whose importance is escalating. (Hughes & Mester, 2008).

The primary objective of this study is to evaluate and analyse the performance and efficiency of operational banks that leverage financial innovation in Turkey. Performance is defined as the capacity to accomplish predetermined objectives, while operational efficiency stands as a key element and indicator of performance, denoting a unit's ability to maximize output with minimal resources. Efficiency is a very important performance indicator for financial innovation in banks trying to compete with major finance and technology companies, especially in a rapidly evolving and fiercely competitive industry.

For banks, the purpose of measuring operational efficiency is to determine the current situation, make plans for the future, and gain a competitive advantage by optimizing operational processes. The current status of financial innovation in banks can be determined by measuring and examining efficiency performance and can identify changes/improvements that need to be made in their operating processes (Rahman, 2023).

In this context, measuring the efficiency of financial innovation in banks will provide important guiding contributions to relevant commercial banks in Turkey and other countries in terms of demonstrating superior performance against their competitors and achieving sustainable competitive advantage (Zouari-Hadiji, 2021).

In this thesis, the concepts of financial innovation will first be examined and the evolution of financial innovation and the history of the use of technology in finance and banking will be discussed. Then, a focus will be placed on banks that use financial innovation and the financial innovation sector in Turkey. In the next section, the concepts of performance and operational efficiency will be discussed. Before starting the practical section, the methodology will be explained in terms of research design, research population and sample, and the analysis methods used. In the last section, a practical study will be applied through a questionnaire to examine the impact of financial innovation on the efficiency of some commercial banks in Turkey and present the results of the analysis, conclusions and recommendations.

CHAPTER ONE

GENERAL FRAMEWORK OF THE STUDY

1.1. The Importance of the Study

The utilization of financial technology by commercial banks in Turkey is fundamental in delivering services, as numerous studies have indicated that employing this technology not only boosts customer satisfaction but also enhances the overall performance of these banks. However, most of these studies have primarily focused on the financial aspect of bank performance, overlooking the non-financial aspects. Therefore, the researcher recognized the necessity to investigate the influence of financial technology on the operational efficiency of banks in Turkey, leading to the selection of this study's topic. This study also holds significance for commercial banks in Turkey, as it will shed light on the obstacles they face in integrating financial innovation into their operations. This knowledge can serve as a catalyst for institutions that are hesitant to embrace the technology, once they realize its advantages. Additionally, researchers interested in this field can benefit from conducting further studies, as it will enable them to generalize the findings.

1.2. Thesis Objectives

The overall objective of this research is to study the impact of financial innovation on the operational efficiency of commercial banks in Turkey.

The sub-objectives are:

To shed lights on the concept of financial innovation and operational efficiency of commercial banks.

To evaluate the impact of banking services based on financial technology on the performance of commercial banks.

To provide recommendations and findings that help enhance the performance of commercial banks in Turkey and the world and benefit researchers in the framework of implementing future research and generalizing the results.

1.3. Problem Statement

Financial innovation is portrayed as a new type of financial services business that integrates economic services such as payments, transfers, and asset management. Not only are financial innovations technologies that attempt to deal with traditional economic means of delivering financial services and controlling spending, but they also contribute significantly to expanding access to customers living outside the subdivision network and building opportunities for effective interaction with customers in commercial banks (Al Awadhi et al., 2023).

The development of financial sector in Turkey largely relies on the banking sector. Therefore, sound and healthy operation of financial sector in Turkey is important for all the other components of the economy. Banks are the heroes of financial sectors especially in emerging market economies and developing countries. Banks can have an impact on the economic growth directly or indirectly by increasing the savings, directing the funds to comparatively more productive investments and by their control roles after the financing. (Bayar, Gündüz, & Sezgin, 2019).

Asongu, & Nwachukwu, (2017), Conducted research on the relationship between ICT investments (Information and Communications Technology) and the success of small financial institutions, revealing that banks utilizing financial innovation outperform those that do not. Examined the impact of technological advancements on the banking sector, concluding that investing in technology leads to cost reduction and improved efficiency. The influence of mobile banking on the economic performance of commercial banks, establishing a significant correlation between mobile banking and the effectiveness of financial institutions in the country.

Through reviewing previous studies, it became clear that there is importance in studying the impact of financial innovation on the financial efficiency of commercial banks. Therefore, this study seeks to fill this gap by answering the following question: **What is the impact of financial technology on the performance of commercial banks in Turkey?**

1.4. Limitations of the Study

This study conducted in the year 2024 in some commercial banks in Turkey such as Kuveyttürk Bank and QNB Bank.

This study depends on the questionnaire to collect data from workers in commercial banks in Turkey. The results of this study limited in the opinions of workers in the banking sector in Turkey. Because of that it is necessary to conduct many studies in the same field to generalize the obtained results from this study.

There are difficulties related to time and explaining the importance of the research, its objectives, and the purpose of conducting the study to respondents, in addition to difficulties related to language and physical limitations.

To assess the influence of technical advancements in banking operations on operational efficiency, it is necessary to evaluate transaction speeds. However, banks disallow the measurement of transaction speed for any banking operations in the field due to operational security and to protect private data. Consequently, the assessment of transaction speed in the field, given the many technical advancements, is a limitation of this study; it was solely evaluated through the survey.

1.5. Methodology

The quantitative method utilized in responding to the research questions and achieving the objectives of this study. It is a structured and systematic process for collecting and examining data collected through the questionnaire and requires the use of statistical methods to arrive at conclusions.

A quantitative study seeks to measure the problem and understand its impact by looking for measurable results through the selection of a sample under investigation. This method, therefore, can be used in the current study, specifically because the study will use the questionnaire in a bid to obtain data. The study rely on a five-point Likert scale to evaluate the statements in the questionnaire where 1 is strongly agree and 5 strongly disagree, and employ SPSS 22 statistical package in analyzing the data.

CHAPTER TWO

FINANCIAL INNOVATION

2.1. The Concept and Definition of Innovation

The concept of innovation, which provides a competitive advantage in meeting the endless human needs and expectations, has become an important issue emphasized since the 1950s. Innovation has become a powerful force in the rapidly increasing global competition, leading companies to place importance on the innovative characteristics of individuals, even during the employee selection process. Products and services are constantly evolving to be faster, more effective, and more beneficial. The concept of innovation occupies a prominent position in literature, business, and technology. According to a literature review, the concept of innovation is defined in various ways because it is related to social, cultural, political, economic, and business performance (Kogabayev & Maziliauskas, 2017).

Gündoğdu and Taşkın (2017) highlight that innovation has become one of the most discussed topics in business and administration literature. They suggest that definitions of innovation often describe it as encompassing a series of operations, indicating that innovation is not just about developing an idea but also producing a tangible product. This distinction has sparked debates about whether innovation should be seen as a form of creativity. The entrepreneurship represents the creative personality, as entrepreneurs are constantly dealing with the unknown, shaping the future, creating possibilities, and turning chaos into order.

Błach (2011) defines creativity as the ability to develop new ideas and present new perspectives on problems or opportunities, while innovation refers to the ability to apply solutions in ways that improve people's lives.

Tamara et al. (2019) describe the concept of innovation through five key features. First, innovations render old products or services obsolete by offering significant cost and performance advantages. Second, innovations involve all processes aimed at developing new or improved products, services, or processes and making them commercially viable, highlighting the continuity of innovation. Third, innovations have a cumulative structure, laying the foundation for future innovations and guiding their direction. Fourth, innovations cover all company activities and

require a comprehensive approach. Lastly, innovations are often marked by uncertainty, risk, research, reevaluation, specialization, and testing (Tamara et al., 2019).

2.2. Types of Innovation

The classification of innovation types has led to various discussions in the literature. Although different types of innovations possess unique properties, adaptations are not uniform. Consequently, there is no clear consensus on the types of innovation, as the concept itself lacks a complete and universally accepted definition. Almost every study highlights different types of innovation, contributing to a certain level of confusion and fragmentation in the field. This lack of consensus means that a clear picture of the types of innovation has not yet fully emerged (Kogabayev & Maziliauskas, 2017).

2.2.1. Types of innovation according to the level

Innovations can be classified according to their levels into the following seven types, as innovations will differ depending on the institutions (Kylliäinen, 2019):

- **Financial and Economic Innovation**: These innovations impact the economy, financial sector, and operational processes in financial markets through the use of new information and technologies. They include financial or economic value in the product/service, process, and organizational dimensions.

- **Technological Innovations**: Technological innovation involves the development of new or improved technological products or services. It encompasses creating technological differences in products/services and processes, enhancing technological capabilities.

- **Organizational Innovation**: This type indicates an increase in a company's competitiveness by developing and/or adapting new business and commercial methods. Organizational innovations often lead to improved efficiency and performance.

- **Administrative Innovation**: Administrative innovation focuses on decision-making processes that aim to rationalize, improve, and develop all functions of an organization. It includes strategies and methods for better management and organizational effectiveness.

• **Development Innovation**: This involves increasing the competitiveness of a company by developing and/or adapting new marketing designs and methods. Essentially, it refers to the creation and implementation of ideas that add value.

Additionally, radical and disruptive innovations can be included.

• **Radical Innovation**: Radical innovations occur when established companies make significant technological advances that open completely new markets or significantly improve existing products/services or processes. They often result in major changes within the industry.

• **Disruptive Innovation**: Disruptive innovations are characterized by their ability to destroy or transform existing industry standards, leading to shifts in competitiveness. Such innovations can redefine performance standards and force other companies to adapt rapidly.

2.2.2. Types of innovation by size

The types of innovation can be evaluated according to their dimensions, typically categorized into the following five titles based on the information collected from the literature (Kylliäinen, 2019):

• **Product/Service Innovation**: Product innovation refers to changes in the characteristics or functionalities of a product, such as its design, use, or features. Service innovation involves a new or significantly improved approach to service provision and delivery. These innovations enable companies to showcase their technological and organizational capabilities and are particularly relevant in the service sectors.

• **Process Innovation**: This type of innovation involves changes or improvements in the methods used to produce a product or deliver a service. Process innovations aim to enhance product or service quality, reduce costs, or improve efficiency. These changes may not always be visible to consumers but can significantly impact the operational aspects of the business.

• **Marketing Innovation**: Marketing innovation refers to the application of new marketing methods to improve the reach and effectiveness of communication with consumers. This can include novel approaches in product design, advertising,

promotion, and pricing strategies. Effective marketing innovations enhance demand and communication processes, and creative ideas can lead to a redesign of the marketing mix.

- **Organizational Innovation**: Organizational innovation involves the creation or modification of organizational structures, practices, and business models. It can include changes in marketing operations and business model innovations. Organizational innovations generally occur within the organization's framework and impact its internal and external business practices.

- **Business Model Innovation**: Business model innovation focuses on redesigning the fundamental aspects of how a business creates and captures value. This includes activities such as sourcing raw materials, manufacturing processes, customer acquisition, sales, distribution, and service delivery. This innovation is crucial for adapting to changing market conditions and improving overall business performance.

2.2.3. Types of innovation according to the systematic situation

Types of innovations can be diversified according to their methodological conditions in studies. Several classifications highlight these distinctions(Sheu, & Lee, 2009):

- **Continuous and Intermittent Innovations**: Continuous innovations involve incremental improvements that ensure ongoing enhancement within an established framework. These innovations aim to refine and optimize existing products or processes while maintaining continuity. Conversely, intermittent or revolutionary innovations occur at distinct intervals and often introduce substantial changes that disrupt existing practices or create new paradigms

- **Exclusive and Open Innovations**: Exclusive innovations involve utilizing internal information and resources to develop new solutions without external input. In contrast, open innovations encompass the use of external ideas and information, combined with internal knowledge, to drive innovation. This approach facilitates collaboration and knowledge sharing beyond organizational boundaries.

- **Rapid and Slow Innovations**: Rapid innovations are characterized by their quick response to market demands and opportunities. These innovations focus on delivering new products, services, or business models swiftly to capitalize on

competitive advantages. Slow innovations, on the other hand, involve a more deliberate and gradual approach, allowing for careful consideration and adaptation over time (Sheu, & Lee, 2009).

2.2.4. Types of innovation according to the purpose

There are three types of innovation based on their purpose, each with specific objectives (Wójcik-Czerniawska, 2018):

- **Strategic Innovations**: Strategic innovations involve creating new markets from scratch and disrupting existing products, competition, and marketing systems within sectors. These innovations are often referred to as "disruptive innovations." For example, Sony's Walkman, introduced in the late 1970s, was a significant innovation for consumers seeking affordable and portable music devices, disrupting the market for large stereo systems.

- **Creating Experience**: Innovations focused on creating experience aim to make using products or services more engaging and enjoyable for customers. This type of innovation often involves adding unique features or experiences that differentiate the offering from competitors. For instance, the FAT Duck Restaurant in London provides an extraordinary dining experience with innovative Flavors and presentations, enhancing the enjoyment and uniqueness of the dining experience.

- **Social Innovation**: Social innovation refers to the development and implementation of solutions that benefit all segments of society. This includes innovations that address social issues such as employment, regional development, and income equality. Social innovations aim to create broader societal benefits and improve overall quality of life.

In addition to these types, the concept of innovation encompasses a range of other categories, including sector-specific innovations, performance enhancements, brand innovations, design innovations, production process innovations, packaging innovations, and reformulations of existing innovations.

2.3. Financial Innovation

The financial innovation waves that began in the early 1960s have significantly altered the financial landscape in advanced economies, such as the United States.

Following the collapse of the Bretton Woods system and until the early 1980s, monetary targeting strategies were pivotal in combating inflation. However, the advent of financial innovations began to challenge the efficacy of these strategies by shifting the demand for money and destabilizing established systems. While the concept of financial innovation is relatively recent, its roots can be traced back to the invention of money itself. (Arthur, 2017)

The concept of financial innovation gained prominence with the acceleration of financial markets in the 1970s. Factors such as increased competition, technological advancements, new investment opportunities, and evolving consumer expectations have played crucial roles in the development of financial innovations. These innovations impact various aspects of investment, production, and consumption decisions for both individuals and companies (Gündoğdu & Taşkın, 2017).

Wójcik-Czerniawska (2018) describes financial innovations as vital for creating rational and flexible capital markets and as foundational elements of the financial system. Research into financial innovation reveals various definitions and interpretations of the concept. Financial innovations aim to reduce costs associated with regulatory requirements and enhance investor characteristics through new financial products. This, in turn, provides economic advantages to producers, consumers, and national economies.

To understand the significance of financial innovation, three key elements can be emphasized (Kou & Lu, 2025):

1. Responding to Changes in Demand Conditions: Innovations like futures and options markets address evolving demand and price conditions.

2. Responding to Changes in Supply: Innovations such as credit cards and commercial papers facilitate increased market supply and international financial market integration.

3. Regulatory Adaptation: Innovations often involve changes in regulations and systems, such as repurchase agreements and joint investment funds, adapting to new financial practices.

The centralization of financing and its impact on economic growth underscores the importance of financial innovation in the modern economy. Developments in

financial practices can significantly influence economic activities and contribute to future economic advancements.

2.4. Historical Development of Financial Innovations

The initial conditions and foundations of the financial innovation process extend to the 1970s. In 1973, with the collapse of the Bretton Woods system, the fixed exchange rate system was introduced to the free exchange rate system; continuous changes in exchange rates have come up on the agenda, and the expectations and uncertainties of the future caused the reshaping of international financial markets. Thus, international financial markets with a rapidly developing, dynamic, and flexible structure have faced the concept of financial risk, especially in recent years. These financial risks include fluctuations in exchange rates, interest rates, stock markets, and inflation. To protect against risks caused by price fluctuations in exchange rates and interest rates in international markets, there has been a change in state policies to freely determine interest rates (Kou & Lu, 2025).

With the start of the free circulation of capital at the international level, capital transfer increased, new markets have been formed, and new products have emerged in accordance with market needs. One of the main objectives of financial innovations is to reduce the costs imposed on companies by legal regulations and changing investor profiles. The regulations and legal sanctions in the foreign exchange regimes of the countries have directed investors to new search efforts, where the effect of computer and communication technology is quite significant (Kou & Lu, 2025).

Communication technology, which began with the telegram in the 1840s, continued with the telephone, radio, and television broadcasts from the 1870s to the 1950s. The 1960s saw the advent of satellite communication and computer communication, while the 1970s to 1990s saw the introduction of the internet and mobile communication technologies. The turning point in telecommunications developments was the internet, which significantly impacted global communication and information exchange (Al Awadhi et al., 2023).

Significant advancements occurred with new technologies in information and communication. The introduction of the internet allowed for the easy exchange of information worldwide, enabling global capital to circulate freely among financial

markets. Consequently, while the costs of transfer and access to information decreased, information globalization accelerated, facilitating faster and less costly transactions. The globalization of knowledge has gradually increased technological development and triggered economic growth. Financial transactions began in the 19th century with the spread of the telegraph, railways, and advancements in ocean research (Ekanayake & Anjalika, 2022).

Following these developments, telephone and fax use became widespread, and visual and auditory transfer through wired and wireless communication systems accelerated the spread of mobile phones. With the spread of the internet, transactions have become possible in a virtual environment across various fields, with banking and stock market transactions conducted without time and space restrictions thanks to communication technologies. These developments in information and communication technology have enabled individuals to access a wealth of market information directly, reducing transaction costs (Ekanayake & Anjalika, 2022).

2.5. Types of Financial Innovation

Financial innovations can be categorized into two main areas: product innovation and operational innovation. Product innovations include new derivative contracts, securities, investment products, and similar financial instruments. In contrast, operational innovations involve new methods for pricing, operations, and overall business processes. Despite these distinctions, the differences between these two types of innovations can often be blurred in practice (Bouri et al., 2023)

Financial innovations are typically divided into two functional groups: strong innovation and defensive innovation. Strong innovation reshapes the market through new financial products and processes, affecting transaction costs and market dynamics. Defensive innovation, on the other hand, relates to the value that emerges from adapting to external changes and environmental factors. The financial sector has evolved through the development of new products, processes, markets, and regulations in response to technological advancements, changing demand, and public regulation. This evolution illustrates that financial innovation can manifest as new products, improvements in the supply or delivery of existing products, or changes in market regulations. Generally, financial innovations are assessed as either product innovations or process innovations. Product innovations occur in response to changes in inflation

and interest rates, while process innovations arise from technological advancements and development (Wójcik-Czerniawska, 2018).

2.5.1. Product innovation

Product innovations are generally considered as advancements in the range of financial products. These include derivatives such as futures, options, and exchanges. Derivative products are financial instruments whose values are derived from underlying assets like stocks, bonds, foreign currencies, or commodities, and are traded in derivative or futures markets. Such innovations often arise from the process of exploiting price discrepancies across different markets to generate profits. Consequently, product or service innovations must often cater to the objectives of investors, such as hedging and profit maximization (Trachuk, & Linder, 2019).

Service innovations are defined as improvements in payment methods that enhance consumer convenience, such as ATMs, online banking, and other bank services. Credit cards, which allow for the purchase of goods and services on credit, exemplify such innovations. They represent advancements in both products and services by providing loans and facilitating transactions without physical money. Other service innovations include financing options like leasing technologies. The primary goal of service innovations is to offer convenience, save time, and increase competitiveness for financial institutions. Effective advertising of these innovations can also enhance business popularity and expand customer bases (Mumin et al., 2014).

2.5.2. Process innovation

In the past twenty-five years, significant innovations have occurred in financial operations, with process innovation marking a comprehensive renewal of production processes for both new products and current services. Process innovation is frequently linked to technological advancements and aims to enhance efficiency. A prime example of this is online banking services, which have revolutionized how transactions are performed. The advent of technologies such as computers has been foundational for innovations like online banking, allowing transactions to be completed faster and more conveniently from a customer's location rather than requiring a physical visit to a bank (Al Awadhi et al., 2023).

Online banking services have become a preferred choice for various businesses, including small and medium-sized enterprises as well as larger institutions, across different sectors such as banking, flower cultivation, beauty salons, and libraries. These innovations contribute to reduced costs, improved speed, and enhanced quality of service. By streamlining access to products and services, process innovations like online banking can offer both cost benefits and increased efficiency, making them valuable to both businesses and consumers (Faraj, 2021).

2.5.3. Organizational innovation

Organizational innovation encompasses the introduction of new organizational structures and institutions, which can significantly influence the financial system and its intermediaries. Technological advancements play a crucial role in facilitating these innovations. For instance, online banking services represent an organizational innovation driven by technological progress. Changes in the range of services or products offered by financial institutions or other sectors illustrate system failures or expansions. Examples of organizational innovation include banks broadening their services to include private insurance and pension plans, and hotels expanding their offerings to include fitness and health resort services, in addition to traditional accommodation (Rahman, 2023).

2.6. Financial Innovation Characteristics

Financial innovations are characterized by their role in enhancing the financial system's functionality, facilitating risk transfer, and addressing market deficiencies. These innovations can mitigate risks faced by companies, investors, and governments in both national and international financial markets. Financial innovations are distinct from other types of innovations due to their specific characteristics. Although the concept is often linked to risks, capital, and technology, a common thread in the literature is its financial significance. Financial innovations share several common features (Faraj, 2021):

- Address market deficiencies
- Reduce costs
- Mitigate the impact of external factors such as tax and legal interventions on markets

- Contribute to overall economic stability
- Enhance the international dimension of financial assets by increasing liquidity
- Facilitate the distribution or elimination of risks associated with inflation, speculation, and other financial concerns

In summary, financial innovations aim to enhance liquidity, financial flexibility, and investment opportunities, often by reducing cash supply and introducing financial value

2.6.1. The positive effects of financial innovations

Positive features of financial innovation include (Rahman, 2023):

1. Financial innovations reduce economic fluctuations by making individuals and companies less likely to experience disruptions in cash flow.
2. They enable individuals and companies to spread their consumption and investments over time, enhancing financial flexibility
3. Financial innovations contribute to cost reduction.
4. They help provide economic balance and reduce macroeconomic volatility by mitigating crises in the real sector.
5. Innovations contribute to overall economic growth.
6. They increase the integration and efficiency of international markets.
7. Companies benefit from new and cheaper financing opportunities.
8. Increased liquidity allows for a broader range of products and services to be offered.
9. Innovations contribute to maintaining competitive markets.
10. They provide consumers with new alternatives for managing financial risks.

2.6.2. The negative aspects of financial innovation

Financial innovations, while offering numerous benefits, also present potential risks and negative effects, including: (Faraj, 2021):

1. They can have adverse effects on monetary policy.

2. The complexity of some financial innovations may render them difficult for individual investors and small companies to understand.

3. Certain financial products might harm the market and institutions.

4. Innovations in international financial markets can sometimes lead to significant structural changes.

5. Financial innovation may exploit gaps in laws and regulations.

6. Although financial innovations often offer cheaper alternatives compared to traditional financing tools, which can broaden financial access, they can also lead to money instability due to difficulties in predicting supply and cash demand behavior.

7. Innovations can provide rapid transaction implementation and alternative tools and products but can also bring risks related to transaction security.

8. The pursuit of competitive advantage through financial and technological innovations has sometimes led to higher growth rates for leading companies, but it can also create insecurity among consumers.

2.7. Financial innovations determinants

Financial innovations are not spontaneous or transverse innovations. On the contrary, there are a number of factors that reveal financial innovations. These factors can be summarized under three titles such as macroeconomic factors, partial economics and environmental factors (Arthur, 2017).

2.7.1. Macroeconomic factors

Effective macroeconomic factors contributing to the emergence of financial innovations can be categorized under five main titles:

1. Legal Regulations: Financial innovations have been driven by changes in legal regulations in two main ways: the removal of restrictions on capital movements and increased government regulations. During the 1970s, particularly in the United States, financial innovations emerged as a response to restrictive legal regulations on interest rates, which placed banks in difficult positions. High interest rates on loans and strict limits on deposit benefits led banks to seek innovations to attract deposits and overcome regulatory constraints (faraj,2021 ;Rahman ,2023)

2. Competition: Competition compels companies to innovate to maintain their market presence. Competitive conditions and evolving economic scenarios necessitate new approaches for companies to achieve their goals.

3. Technological Progress: Technological advancements are crucial drivers of financial innovation. Technological progress in information and communication technology accelerates financial innovation.

4. Financial Depth: Financial depth refers to the accessibility of financial services to individuals and institutions. The increase in financial institutions acting as intermediaries between the banking sector and capital markets enhances financial depth.

5. Risk of Uncertainty: Economic uncertainty can stimulate financial innovation. For example, the oil crises of the late 1970s led investors and financial institutions to develop new financial products to mitigate risks (Hughes and Mester ,2008).

2.7.2. Partial economic factors

Institutions and products may change as a result of financial innovations. The existing institutions may be subject to structural changes, new institutions may appear, while the demand for some products in the market decreases, and some products may take their place in the market (Sreenivasamurthy, 2018; Zouari-Hadiji, 2021).

2.7.3. Environmental factors

The acceleration of innovations affects the structure of the environment, and the change in the environment can also increase the demand for innovations. Environmental factors that play a decisive role in financial innovations can be examined in two groups: Castellanos-Redondo et al., 2020):

1. Social Factors: Changes in the age components of the population, education levels, and income distribution can lead to financial problems and increased use of financial tools.

2. Individual Factors: Increasing customer needs and expectations over time may drive financial institutions to provide new financial products and services.

2.8. Risks and Benefits of Financial Innovations

Several factors affect both the emergence and impact of financial innovations, including state economies, markets, companies, and institutions. Arthur (2017) highlighted the relationship between the financial sector and economic development, arguing that financing technological innovations is essential for economic growth.

According to Ekanayake and Anjalika (2022), financial innovations are expected to increase market efficiency by reducing transaction costs. They help enhance efficiency by improving risk sharing and addressing asymmetric information problems. Financial innovations are designed to reduce risks, but they can sometimes create greater risks if not properly evaluated. A variety of financial tools can reduce transaction costs and provide liquidity, allowing payments or liquidity at any time.

2.9. Financial Innovation in the Banking Sector

Financial innovations provide substantial benefits, particularly for early adopters. Investors who utilize financial innovations for the first time often gain a competitive advantage due to two key factors (Wójcik-Czerniawska, 2018):

1. They have a deeper understanding of market costs than ordinary investors.
2. They approach their investments with a unique perspective that can lead to strategic advantages over others.

However, it is important to recognize that merely adopting innovation is not always sufficient. Companies that introduce new financial innovations must also effectively leverage media and advertising to fully capitalize on their advantages.

2.10. Financial Innovations in Turkey

Since the implementation of liberal economic policies in Turkey during the 1980s, significant developments have occurred in the Turkish financial sector, including the establishment of primary and secondary markets that were previously non-existent (Gündoğdu & Taşkın, 2017). Below is a detailed overview of these innovations and their impacts:

1. Bond and Securities Market Establishment (1991)

The Turkish Treasury began issuing bonds in 1986 to address public deficits. Additionally, the Istanbul Stock Exchange (ISE) was launched to ensure a secure and

stable trading environment for securities. The Interbank Monetary Market (Interbank) was established within the Central Bank in the same year to facilitate transactions between banks experiencing liquidity congestion and surplus.

2. Central Bank Monetary Policy Tools (1987)

On February 4, 1987, the Central Bank started using new monetary policy instruments to control market liquidity. This move was part of a broader strategy to regulate the financial system more effectively, marking a shift toward more sophisticated monetary management.

3. Abolition of Capital Movement Restrictions (1989)

The removal of restrictions on capital movements in 1989 marked a significant shift toward a more open financial system. This period also saw the introduction of the Turkish Lira into international financial markets, enhancing Turkey's integration into global finance (Gündoğdu, & Taşkın, 2017).

4. Development of Bond and Repo Markets (1991-1993)

The operation of the ISE bonds and bond markets began in 1991, followed by the launch of the repo and reverse repo markets in 1993. These developments were crucial for enhancing liquidity management and financial stability) Gündoğdu, & Taşkın, 2017).

5. Electronic Trading Systems (1994)

In November 1994, Turkey adopted electronic trading for all stocks, and an international bonds and bills market was established. The Central Bank of the Republic of Turkey (CBRT) actively participated in the secondary market to manage short-term interest rates effectively. Intermediaries meeting specific criteria were permitted to join the API Directorate to further regulate liquidity

6. Electronic Fund Transfer (EFT) System (1992)

The EFT system, operational from April 1, 1992, allowed for real-time interbank Turkish Lira payments, providing electronic registration and transfer capabilities. The EFT system revolutionized banking transactions by reducing settlement times from days to minutes.

7. Electronic Securities Transfer (EMKT) System (2000)

Launched on October 30, 2000, the EMKT system facilitated real-time electronic transfers and agreements between banks. The EFT and EMKT systems are interconnected and often referred to collectively as the EFT-EMKT System. This integration significantly improved the efficiency of capital markets by enabling instantaneous securities settlements.

In the last decade, Türkiye has witnessed a real boom in financial innovations that changed the face of the banking and financial sector, and its most prominent effects were (Gündoğdu, & Taşkın, 2017):

1. Cost Reduction and Efficiency

Financial innovations, such as electronic payment systems, have enabled institutions to reduce operational costs and improve efficiency. Innovations like ATMs, internet banking, and telephone banking have minimized the need for physical bank visits., Digital banking adoption reduced operational costs by 30% between 2010 and 2020".

2. Increased Intermediary Function Effectiveness

Innovations have enhanced the role of banks as financial intermediaries. The introduction of sophisticated financial products and systems has allowed banks to manage liquidity and risk more efficiently.

3. Enhanced Market Access

The establishment of electronic trading systems and new financial markets has increased access to capital and investment opportunities.

4. Competitive Pressure and Complexity

The rise of financial innovations has intensified competition in the sector, leading to more complex financial products. While this has provided more options for consumers, it has also increased risks. The rapid growth of consumer credit products has raised concerns about over-indebtedness in Turkey".

5. Government-Driven Innovations

Many financial innovations in Turkey have been driven by government policies aimed at addressing economic challenges. For example, the introduction of the Asset Leasing Fund in 2001 helped stabilize banks during the financial crisis. Regulatory reforms post-2001 crisis were critical in modernizing Turkey's financial infrastructure.

CHAPTER THREE

BANKING AND OPERATIONAL EFFICIENCY IN BANKING

3.1. The Concept and Framework of Banking

Banks are a financial intermediary that transfers money from surplus individuals to deficit individuals. Apart from that, banks provide a wide range of services to individuals and companies. However, the information regarding borrowing and savings opportunities appears to be expensive and difficult to obtain. Thus, banks play a significant part in eradicating asymmetric information problems, thus conserving the costs involved. The role of this intermediation between investment and economic development cannot be exaggerated. Participants in the financial sector have witnessed an enormous increase not only in the number of organizations but also in the volume of money managed by the institutions and the range of activities offered (Rahman, 2023).

The banking industry has witnessed phenomenal transformation in its operating environment across the world. Profitability is required if a bank is to stay in business and provide satisfactory returns to its shareholders. It is particularly important to supervisors who consider it as making capital ratios more flexible, even during a risky economic situation. A country's payment system is put at risk when a bank collapses. A healthy and stable banking sector can better absorb adverse shocks and contribute to fostering stability in the financial system (Kamel et al., 2022).

As a result, all financial stakeholders, i.e., researchers, financial markets, bank management, and supervisors, are greatly interested in the determinants of bank performance. As expected, the 2008 financial crisis left an indelible imprint on the world's economy. Therefore, it is imperative for regulators to supply the required mechanism to minimize the occurrence of a crisis in the future. Apart from a few post-crisis regulatory requirements, all the forces of change in the banking industry, such as regulatory liberalization, financial innovation, globalization, competition from other financial intermediaries, and a risky market, have put pressure on banks (Afaq et al., 2019)

Its performance should be monitored at regular intervals. Apparently, the power of the economic system can be measured by looking at the performance of its banks. Many studies in the literature have tried to find the determinants that influence the performance of European banks and world banks (Bouri et al., 2023).

3.2. Banks' Performance

Banks are a financial intermediary that transfers funds from surplus to deficit individuals. In addition to that, banks provide a wide range of services to households and companies. However, information regarding borrowing and saving options appears to be difficult to obtain and expensive. Banks, therefore, serve a basic function in resolving asymmetric information problems, thereby reducing the costs involved. The importance of such intermediation in investment and economic development cannot be overemphasized and has been stressed by many researchers. In recent years, financial participants have witnessed an incredible expansion not only in the quantity of institutions, but also in the volume of money dealt with by these institutions and the variety of activities offered. The banking industry has undergone phenomenal transformation in its operating environment all over the world in the last two decades. Its structure and performance are determined by internal and external factors. (Gündoğdu & Taşkın, 2017).

Despite the growing trend in bank disintermediation and mounting competition from non-financial institutions, banks are at the center of the economy for several reasons. Firstly, profitability is a requirement if a bank is to remain in business and provide acceptable returns to its shareholders, and this is particularly crucial to supervisors who see it as rendering capital ratios more flexible, even in a risky economic setting. Second, when a bank collapses, a nation's payment system as a whole is endangered. Lastly, a healthy and thriving banking sector can better absorb adverse shocks and fulfill its part in adding financial system stability. Hence, all the stakeholders of finance, i.e., academic researchers, financial markets, bank management, and supervisors, are concerned with the determinants of bank performance (Afaq et al., 2019).

As expected, the 2008 financial crisis left an indelible impact on the world's economy. As a result, the financial position of financial institutions and banks in general has increased in importance. Therefore, it is paramount that governments and

regulators as well avail necessary mechanisms for mitigating the risk of a future crisis. Apart from some post-crisis regulatory imperatives, all the forces of change in the banking industry, such as regulatory liberalization, financial innovation, globalization, competition from other financial intermediaries, and a volatile market, have put the banks under pressure. These factors have a direct impact on the profitability of a bank. Therefore, it is important to understand the determinants of the financial health of a bank, the extent to which they do, and how each of these determinants can be measured (Jote, 2023).

A bank's healthy financial position is beneficial to its depositors, its shareholders, its employees, and the overall economy. A review of the bank's financial position should therefore be conducted from time to time. It would appear that an economic system's strength could be gauged by looking at the performance of its banks. There are several studies in the literature that have sought to establish the determinants of bank performance in Europe and the world. Previous studies have considered both internal and external determinants of bank profitability, focusing their investigation on banking systems within given countries, as well as cross-country comparisons (Jote, 2023).

3.3. Theories of Financial Innovation and Banking Performance

Relevant theories to apply in examining the interaction between banks and fintech are as follows: (1) consumer theory, where services can be provided more efficiently; (2) Information theory, given that the primary role of retail banks is financial intermediation; and (3) innovation diffusion theory to establish how new technologies spread (Kou & Lu, 2025).

3.3.1. Consumer theory

Individual taste is the subject of consumer theory, and is a complex variable to measure, in the sense that we can only make inferences about individuals' tastes from their decisions. Consumer theory attempts to evaluate the relative importance of alternative hypotheses regarding consumers' objectives, legislation, and constraints in deciding their demand for goods. Old services may be replaced with new services when the demand and supply of the consumer are brought into equilibrium according to consumer theory. Financial technology provides a case for comparison between the

new services created and the former services that were equivalent to traditional banking practices (Rahman, 2023).

To attract customers to new technology or innovation in general, they must be educated about the product so that they can see the advantages (or lack thereof). Finally, consumers must have faith in the recommended innovation. During the onboarding of a new product, privacy and data protection are core concerns to customers. Therefore, companies must provide data protection and transparency while creating a new fintech product (Castellanos-Redorno et al., 2020).

3.3.2. Information production theory

Asymmetric information is based on the idea that different economic agents possess different types of information and try to profit economically from it. Asymmetric information can subsequently lead to two issues: adverse selection and moral hazard. Adverse selection is a difficulty that is faced earlier within the transaction where one of the parties possesses more specific information. The second concern is that of moral hazard, after the agreement, when one party benefits from information at the expense of the other party (Stiglitz, 2010).

Financial entities such as commercial banks possess better information with which to process borrowers' information. They are therefore in a better position in terms of information and can allocate their funds more efficiently to their clients, thereby addressing the issue of information asymmetry. Information asymmetry is particularly important in lending and borrowing agreements, where the lender would want to possess better information than the borrower. This problem can be resolved by redundancy in large databases provided by FinTech solutions. For example, on peer-to-peer lending platforms, large databases can reduce search costs for buyers and reduce signaling costs from the perspective of the sellers. Thus, by reducing these costs, information asymmetry issue can be resolved (Faraj, 2021).

3.3.3. The Theory of diffusion of innovation

Rogers pioneered the theory of diffusion of innovation in 1962 to establish "how, why, and at what speed" technological innovations diffuse in a society. The desired result is that the members of the described society adopt the new product or idea. For it to become successful, it must be that people consider the idea or product as an

innovation. Diffusion of innovation may be conceived as the emergence of new products and services into the marketplace due to social pressures. It considers two types of social influences: network externalities and social signals. Network externalities consider the possibility that an individual will receive greater utility as more people consume that particular product. Social cues initiate any stimulus that is transformed into information regarding social facts such as social interaction, social conditions, social relationships, and social emotions (Reshid, 2020).

Globalization can be regarded as one of the prime drivers of the dissemination of innovations such as financial technology. For example, globalization has been a vital factor in the development of financial technology outside the banking industry, through facilitating small businesses to combine the financial industry with a popular innovation, information technology. Social media is among the fastest modes of dissemination of information and formation of trust. But such diffusion should take place in line with the stage and goal of the process of innovation. There are new companies popping up on the market every single day with a promise to present innovative products, especially inexpensive ones (Arthur, 2017).

3.4. Operational Efficiency in Banking

Operational efficiency in banking involves streamlining processes and systems to enhance productivity and revenues while reducing costs and errors. This includes channel optimization, customer interactions, staffing, and technology integration. Focusing on efficiency is critical to delivering a positive customer experience that enhances customer loyalty, which ultimately impacts a bank's financial performance significantly. A well-managed bank can speed up transactions, reduce errors, and provide customers with a seamless experience across various services. Moreover, operational efficiency enables banks to allocate resources efficiently, facilitate investments in technology modernization, enhance customer service, and comply with security protocols (Afaq et al., 2019).

3.4.1. The importance of operational efficiency for banks

Focusing on improving operational efficiency in banks is directly linked to customer satisfaction, employee satisfaction, and overall revenue results as follows:

3.4.1.1. Customer satisfaction

Customers today expect financial institutions to provide more than just basic services such as opening an account and accepting deposits. They want their banks to be actively involved as collaborators in enhancing all aspects of their financial well-being. Personalization, control, and convenience are key factors that customers seek. It is worth noting that one study revealed that 79% of financial consumers are willing to invest more in services that prioritize convenience (Al Awadhi et al., 2023).

3.4.1.2. Employee satisfaction

When employees are asked to work with outdated software and navigate flawed and inefficient procedures, they feel overwhelmed and lose motivation (Sreenivasamurthy, 2018). With only half of bank employees highly engaged and 35% at risk of quitting, financial institutions must prioritize enhancing employee engagement and commitment. Content leadership is a huge challenge without content employees, which makes investing in employee satisfaction even more important (Jote, 2023).

3.4.1.3. Revenue results

Happy customers and satisfied employees are the main drivers of financial institutions' profitability. Recent research indicates that 92% of customers prioritize high-quality customer service when choosing a bank. Additionally, 63% of consumers tend to remain loyal to a bank that provides exceptional customer service, while 78% express their intention to return for future services. These satisfied customers are more likely to schedule appointments, avail additional services, and stay with the bank for the long term, which positively impacts revenue generation. Ultimately, operational efficiency enables banks to meet the changing requirements of customers and employees, facilitating organizational growth (Gündoğdu & Taşkın, 2017).

3.4.2. Operational Efficiency Scope in Banking

Banks are increasingly viewing digital transformation as the key to achieving operational efficiency. While taking advantage of new technologies can enhance overall performance, it is not the only solution. In some cases, the adoption of technology may bring new challenges, especially if it results in a decrease in the availability of human representatives. As a result, customer experience and trust have

suffered a decline as the adoption of digital banking has spread Improving the bank's operational efficiency requires the following (Jote, 2023):

3.4.2.1. Channel optimization

Digital banking experiences have proven effective in streamlining various customer activities; however, there are instances where direct interaction with advisors is still necessary. Banking industry surveys consistently show that hybrid experiences, which combine digital and in-person interactions, tend to outperform digital-only or in-person-only experiences. A recent survey revealed that consumers generally prefer to use digital channels for transactional activities, but they still value visiting a physical branch for what they call "high-touch interactions." These interactions include inquiring about new products, applying for loans, opening new checking accounts, and receiving financial advice (Trachuk, & Linder, 2019).

In essence, customers are looking for a mix of in-person and digital experiences, which is driving banks to optimize their channels to strike the right balance. Many financial institutions are adopting a strategy in which their branches act as "advice centers", offering clients the opportunity to engage with financial advisors for expert guidance. At the same time, investment is being made in video banking to enable customers to connect with advisors remotely, eliminating the need to physically visit branches. Given that 36% of financial customers express a preference for video interactions over in-person meetings, this balance between digital and in-person interactions is critical in enhancing customer satisfaction (Rahman, 2023).

3.4.2.2. Improving employee efficiency

Customers tend to remember their emotional experience during an interaction more than the actual outcome, underscoring the importance of prioritizing employee well-being alongside customer satisfaction. A satisfied employee is more likely to provide positive customer experiences, while exhausted and dissatisfied employees can have a detrimental impact on customer interactions. Therefore, major financial institutions are focusing not only on reducing customer friction but also on enhancing employee experience. Financial institutions that emphasize efficient staffing are more likely to achieve high customer satisfaction rates, have a positive outlook for growth, and secure a greater share of the market. Banks can enhance employee efficiency by

leveraging technology that saves time, reduces errors, and helps employees better prepare for customer appointments. For example, banking appointment software can enhance visibility throughout the organization; facilitate branch recruitment, post-hiring follow-up, and monitor operational effectiveness (Wójcik-Czerniawska, 2018)

3.4.2.3. Data optimization

Effective data management is critical to enhancing the banking experience for customers, employees, and the organization as a whole. A lack of accurate data can hinder banks from identifying areas for operational improvement and understanding customer preferences. Data tracking plays a vital role in this process, as the best-performing financial institutions closely monitor three key categories: customer experience, employee performance, and overall revenue results. By analyzing metrics such as branch traffic volume, appointment volume, and lead times, organizations can gain valuable insights that directly impact employee performance and routing efficiency (Ekanayake & Anjalika, 2022).

3.5. Financial Innovation and Operational Efficiency in the Banking Sector

Enhancing operational efficiency in the banking sector can be improved through fine-tuning. The dynamic nature of today's lending environment, which is influenced by market trends and regulatory requirements, requires the ability to adapt systems and processes quickly. This adaptability provides lenders with a competitive advantage. Unlike traditional lending systems that require specialized technical expertise to make modifications, contemporary lending systems provide browser-based configuration tools designed specifically for business users rather than IT professionals. These tools enable authorized users to quickly and securely make modifications such as changing drop-down menus, screens, data fields, and user permissions to align with specific roles and responsibilities. Additionally, it allows users to configure a set of loan rules and processes to automate underwriting tasks and create seamless integration with more than 30 data sources and fields. From a compliance perspective, these tools maintain a comprehensive history of modifications, ensuring transparency (Murinde, et al, 2022).

The adoption of new technologies by banks, beginning with ATMs several decades ago, has revolutionized common transactions, enabling customers to manage

account balances, make telephone deposits, and facilitate payments through electronic funds transfers. Leveraging these advances in technology can similarly enhance banking processes such as loan origination, pushing operational efficiency to new heights (Mumin et al., 2014).

Bankers and other lenders have the opportunity to enhance their operational efficiency by using cloud lending solutions. Adopting cloud technology has already proven its cost-reducing benefits for businesses across various industries. Through the use of web-based applications, digital documents, decision rules, data integration, mobile solutions, and customizable systems, these innovative technologies are becoming increasingly essential in the lending industry (Al Awadhi et al., 2023).

By leveraging these tools, lenders can eliminate the need for long-term system development projects, process a higher volume of applications without expanding their workforce, automatically approve qualified applicants in real-time, improve the accuracy of risk assessments, and reduce technology infrastructure management expenses. It is recommended that lenders evaluate their current loan origination systems to identify areas for improvement (Stiglitz, 2010).

From what mentioned above this hypothesis can be presented:
H1: There is statistically significant effect of financial innovation on the operational efficiency of banks.

3.5.1. Mobile banking and operational efficiency

The pace of innovation in Internet technologies and the pervasiveness of cell phones have made mobile banking a viable option for the effective delivery of financial services. The growth in telecommunications technology has made it possible to offer mobile banking as an additional delivery channel for banking services, where customers are able to access banking services using their cell phones. Mobile banking would be defined as any type of transaction, i.e., passing of ownership or rights over goods and services, initiated and/or completed through the use of mobile access to computer networks with the help of an electronic device It encompasses conducting banking transactions using a mobile device such as a mobile phone and providing bank-connected financial services with the help of mobile communication devices (Tiwari et al., 2006).

Mobile banking has the potential to enhance productivity, enhance business growth, and enhance the efficiency of operations of the bank by providing a more cost-effective and efficient system of financial services support that reduces dependency on cash transactions and the associated risks. Mobile banking enables individuals to access banking services such as saving and borrowing in a low-cost and safe manner. These services include activities such as opening an account, checking balances, transferring funds between accounts, and settling bills using a mobile device, thus contributing to achieving greater operational efficiency for the bank. (Tiwari et al., 2006). From what was mentioned above, the following hypothesis can be put forward:

H1a: Mobile banking services have a significant effect on the operational efficiency of commercial banks.

3.5.2. Online banking and operational efficiency

Internet banking or online banking allows bank customers to maintain their accounts on the website of the bank without the application of traditional means such as letters, faxes, or telephone confirmations. Telecommunications networks and the Internet are utilized to provide customers with a variety of services. The worldwide penetration of internet banking has been an efficient and cost-cutting way of providing bank services compared to other channels. Internet banking revolutionized distribution channels within banking by providing increased efficiency, managerial control, and cost savings through replacing manual processes with automated ones. This shift to digital banking channels offers an opportunity for banks to enhance efficiency and promote productivity (Garma, 2017).

From what was mentioned, the following hypothesis can be put forward: H1b: Online banking services have a significant effect on the operational efficiency of commercial banks.

3.5.3. Automated teller machine (ATM) and operational efficiency

Research suggests that the introduction of the automated teller machine (ATM) has revolutionized the way customer's access banking services. By allowing customers to conduct various banking transactions outside of traditional banking hours and locations, ATMs have become a popular channel for routine banking activities. The convenience and accessibility of ATMs have made them a preferred choice for

customers, ranking second only to branch banking in terms of popularity. In Turkey, ATMs have emerged as a dominant innovation channel for banks, providing customers with access to banking services around the clock (Mumin et al., 2014).

From what was mentioned, the following hypothesis can be put forward: H1c: ATM banking services have a significant effect on the operational efficiency of commercial banks.

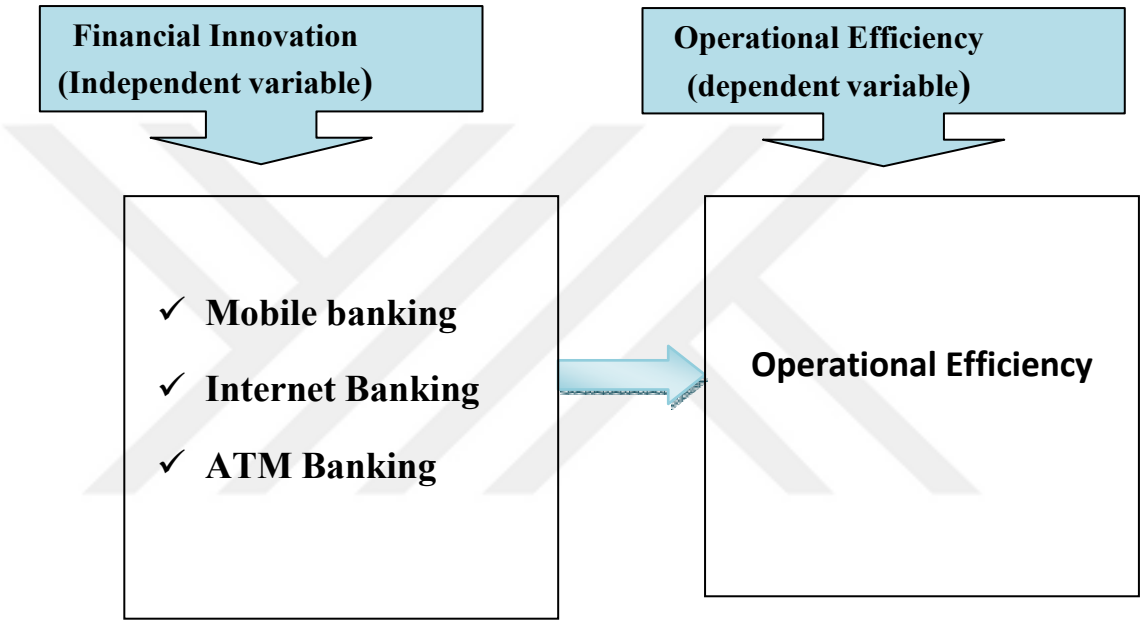


Figure 2.1: Conceptual Framework

CHAPTER FOUR

RESEARCH METHODOLOGY AND DESIGN

4.1. Research Design

According to Kothari, (2004), the plan of the research design assists in executing various research processes smoothly and helps the research to be conducted as efficiently as possible and to understand the maximum results with the least number of resources. The research design thus entails the shape or blueprint that directs the various procedures from the formulation of research questions and hypotheses to the reporting of findings, ultimately facilitating the study's objective.

Research methodology being employed is inevitably linked with goals which the researchers want to achieve. The main objective of the current research is to examine the effect of financial innovation on the operating efficiency of commercial banks in Turkey. In this regard, an analytical research method has been employed. Even though the research begins with defining the various forms of financial innovation and assessing commercial bank performance, it goes on primarily to examine if there exists any relationship and, through analysis, to what extent financial innovation has influenced the efficiency of commercial bank operations in Turkey. Hence, the analytic research design serves a very crucial purpose in fulfilling the objective of this study, which endeavors to determine the impact of financial innovation on the operational efficiency of banks in Turkey.

4.2. Study Population

The accessible population or study population includes the population that was derived from the target population of the research case study in the context of a specific survey study. This is the population from which the sample was taken, which includes employees of Kuveyttürk Bank and QNB Bank. To this end, the target population in this study was two units. The first unit targeted the institutional level where the study covered the head offices of Kuveyttürk Bank and QNB Bank. The head offices were selected in this study mainly due to the fact that they represent the important part that entails making decisions regarding innovation and operational efficiency. The financial innovation process is usually completed or implemented. Issues related to innovation products and services are usually directed from the head office of all banks.

The second unit of the study population targeted the management and employee levels of the branches of these banks in Istanbul, where the study targeted permanent employees of the banks who have ideas related to financial innovation policy and who understand how innovations affect the core operational activities of the banks with a higher appreciation than temporary workers. The main reason for their selection is that they have direct and adequate knowledge about financial innovation better than any other employees. They also work in a responsible role to ensure that the units' performance is maintained through departmental budgets and business plans.

4.3. Sample Size, Sampling Procedures, and Survey Scale

In survey research, a sample is described as selections of elements from a larger population. It goes without saying that such a sample should be identical and consistent with the population and thus provide an adequate representation of the population. Consequently, if the sample is incorrect and insufficient in terms of size and characteristics, it may fail to reject the null hypothesis, leading to unreliable results and a waste of institutional resources. Additionally, research based on significantly below-average data collection is considered a time-wasting study. Therefore, it is crucial to determine the sample size before commencing actual data collection.

According to the Turkish Banking Association in 2024, there are over 180,000 people in the workforce of the Turkish banking industry, including those employed by development banks. It will be fair to accept a total population of 150000 because of development banking personnel. We have a sample size of 370, which indicates roughly a 5% (0.052) confidence interval with Yamane's (1967) approach.

Foreign ownership, subjective willing, and internal control level

$n= N/1+ N (e)^2$

Where: n is the sample size,

N: represents the population size

e: represents the sampling error and its value is 5%

$N = 15000/ (1+ 15000(0.05)^2) = 390$

A total of 390 questionnaires were distributed as part of the study. After reviewing the responses, 20 questionnaires were excluded due to missing data. As a result, 370 valid questionnaires were used for statistical analysis and drawing conclusions.

The survey is designed by translating to Turkish (Nazaritehrani & Mashali, 2020) `s survey, which is similar to this study.

4.4. Data Collection Instrument

The data utilized in this research are primary and secondary. Primary data are information that have been recently collected and for the first time and therefore original information. Dawson, (2009) posits that secondary research data are information that are collected based on studies conducted by other researchers on a particular topic. Both sets of data were used in this research. Questionnaires were the primary tool for collecting primary data used in the research. Questionnaires were then administered to interview all permanent employees within the head offices and branches of banks being researched in a bid to draw out their views regarding the impacts of banking innovations on commercial banks' performance. Questions used in the research were closed-ended.

This is because, if one is conducting a survey, closed-ended questions are usually helpful in getting higher response rates. Second, closed-ended questions can easily be coded and analyzed; this is why they are particularly valuable when one is trying to determine the statistical importance of the results obtained from a survey. The questionnaire in this research starts with closed questions on the demographic information of the respondents, followed by the question on innovation and operational efficiency with a five-point Likert scale for which tick boxes have been provided to indicate the choice. The questionnaire was constructed and pre-tested among a small sample population to fine-tune further. They were selected carefully with the goal of acquiring data with a special emphasis on fulfilling the research aims and correspondence with the overall research problem. The questionnaire was split into two parts. Section A of the questionnaire dealt with the overall information of the respondents. Section B of the questionnaire measured the study-specific variables, i.e. financial innovation, i.e. mobile banking, internet banking, mobile ATMs and financial performance.

4.5. Data Collection Procedures

Primary data was collected by administering questionnaires to employees. Four (4) trained data collectors were engaged, one per bank to assist in administering and collecting the questionnaires. These field data collectors also acted as contact persons in case of problems.

The Information and Communication Technology department and the Human Resources department were our main sources of access to the banks. We sought permission both at the employee and the organizational level, and we did receive consent for these.

In the case of primary data, pilot testing was done before collecting the principal data to make the questionnaire reliable and valid, and the questions understandable and not vague. Pilot testing is a rehearsal of the tools and techniques one plans to use for research. This would leave space for feedback on how easy, clear, and appropriate the questions are for collecting the information they are meant to collect. A general rule is that a pilot test should use 5% to 10% of the intended sample. This is the reason why we sampled 20 administrative staff from the sampled banks in their headquarters for the pilot study. We took care to ensure that nobody who took part in the pilot study was used in the actual study. The total number of people in the pilot test was within the suggested range. The responses from the pilot administration of the questionnaire served to improve the questions in the main administration. Furthermore, the findings from the pilot questionnaires were utilized to test whether the questions were reliable and valid.

4.6. Reliability and Validity of the Instrument

Since any variable can always be measured more than once, the optimal measure or measures for each variable need to be developed. Accordingly, the initial analyses were conducted based on instrument quality. To quantify the measurement, the primary standards utilized were reliability and validity. Reliability is used as a warrant that ensures consistency in measuring data while validity is used to guarantee correctness or incorrectness of the process.

In addition, a reliability test was also conducted to determine the consistency of the instruments utilized at the main administration. Reliability is the degree of

consistency in measurement, i.e. the degree to which a measuring device will provide consistent values if used more than once on a single subject under the same conditions. The most basic test of reliability is repetition, or repeating the same questions to the same individuals two or more times and measuring the degree of correlation or repeating the same question but in alternative terms at different points in the questionnaire.

In the current study, Cronbach's alpha was utilized to test the reliability of the questionnaire. Internal consistency is best evaluated by Cronbach's alpha. The value of Cronbach's alpha ranges from 0 to 1. If the value of Cronbach's alpha is 0, then the instrument is erroneous. If the value of Cronbach's alpha is 1, then there is no error. Internal consistency is greater when the value of Cronbach's alpha is close to 1. It is 0.70 acceptable, credible and also advisable for the new questionnaire. The questionnaire was tested for reliability by using Cronbach's alpha test correlation coefficient with the help of SPSS. After conducting the test of Cronbach's alpha, the total alpha of 0.78 was obtained. The above results lead us to conclude that all the study variables in the questionnaire possess sufficient internal consistency and hence can be relied upon for the purposes of study, and its results can be generalized over population characteristics.

4.7. Data Processing and Analysis

This study collected its primary data using the questionnaire that was distributed. Questionnaires were collected, editing organization, coding, and searching for errors in data were carried out, and it was an issue of data processing. Data processing is a series of steps or operations performed on the data for the sake of verifying, organizing, transforming, combining, and extracting it in some form of output to be used in the future. With this in mind, facts gathered from a questionnaire were handled carefully. To this end, the large sets of data were condensed and expressed in terms of small groups.

Data collected and tabulated in the questionnaire were analyzed descriptively by descriptive statistics and multiple linear regression analysis. Some of the descriptive statistics that were calculated and used in describing the characteristics of interest include mean scores, percentages, frequency distribution, and standard deviation. Furthermore, through the method of the inferential statistic, correlation analysis was

carried out with the aim of looking for the absence or existence of a relationship between variables and multiple linear regression analyses for testing relationships hypothesized as well as determining each independent variable's relative importance for explaining commercial banks' operational efficiency operating in Turkey.

4.8. Hypotheses Of the Study

H1: There is statistically significant effect of financial innovation on the operational efficiency of banks.

H1a: Mobile banking services have a significant effect on the operational efficiency of commercial banks.

H1b: Online banking services have a significant effect on the operational efficiency of commercial banks.

H1c: ATM banking services have a significant effect on the operational efficiency of commercial banks.

H2: There are statistically significant differences regarding the role of financial innovation and its relationship to operational efficiency with regard to the age variable".

H3: There are statistically significant differences regarding the role of financial innovation in enhancing operational efficiency according to the educational qualification variable".

H4: There are statistically significant differences regarding the role of financial innovation in enhancing operational efficiency according to the educational qualification variable".

4.9. Findings of the Study

4.9.1. Demographic Analysis

Table 1: Demographic Analysis Table

Demographic Variable	Categories	Frequency (n)	Percentage (%)
Gender	Male	180	48.6%
	Female	190	51.4%

Age	15-25 years	90	24.3%
	26-40 years	140	37.8%
	41-55 years	100	27.0%
	Over 55 years	40	10.8%
Educational Qualification	Diploma	80	21.6%
	High school Degree	160	43.2%
	MA/MC	90	24.3%
	PhD	40	10.8%
Work Experience	Under 5 years	130	35.1%
	5-10 years	100	27.0%
	10-14 years	80	21.6%
	15-19 years	40	10.8%
	20 years and above	20	5.4%
Department	ICT	90	24.3%
	Operation	100	27.0%
	Finance	60	16.2%
	Marketing	70	18.9%
	Research & Development	50	13.5%

The data showed that the percentage of female participants (51.4%) slightly exceeded that of males (48.6%), indicating a good gender balance with a tendency towards greater female participation.

The most represented age group among the participants was 26-40 years old at 37.8%, followed by 41-55 years old at 27%. The least represented age group was those over 55 years old at 10.8%.

The data showed that the majority of participants held a bachelor's degree at 43.2%, followed by participants holding a master's or professional master's degree at 24.3%. The lowest percentage was for PhD holders at 10.8%.

The majority of participants had less than 5 years of professional experience at 35.1%, indicating that the sample includes a large segment of relatively new employees. The percentage of participants with experience between 5-10 years was 27%, while the percentage of those with long experience (20 years and more) was the lowest at 5.4%. The Operations Department was the most represented department with 27%, followed by the ICT Department with 24.3%. The lowest representation was in the R&D Department with 13.5%.

Table 2: Results of Cronbach's Alpha Test

Dimension	**Cronbach's Alpha**
Mobile Banking Services (MB)	0.832
ATM Banking Services (AB)	0.798
Online Banking Services (OB)	0.811
Overall Dimensions	**0.867**

Table 2 shows the results of the Cronbach's alpha test, which measures the level of internal consistency of the different dimensions used in the study. It is a statistical indicator that shows the reliability of the research tool and its ability to accurately and consistently measure the phenomenon.

For the mobile banking dimension, the Cronbach's alpha value was 0.832, indicating a high level of internal consistency, as the elements associated with this dimension work harmoniously in measuring customer experience.

With regard to ATM banking, the result showed a Cronbach's alpha value of 0.798, which is close to the minimum acceptable limit (0.798), indicating a good level of consistency that ensures the reliability of the elements associated with this dimension. As for the Online Banking Services (OB) dimension, the Cronbach's alpha value was 0.811, reflecting a high degree of reliability that highlights the quality of measuring this dimension.

As for the overall dimensions, the research tool as a whole achieved a Cronbach's alpha value of 0.867, which is the highest result among all dimensions, indicating a very high level of internal consistency, and showing that the research tool is carefully designed and suitable for achieving the study objectives. In general, all values exceeded the minimum statistically acceptable limit of 0.70, which shows that the research tool has a good too high level of reliability in all dimensions. These results enhance the credibility of the extracted data and enable reliance on them in analyzing and interpreting the results.

4.9.2. Descriptive analysis of questionnaire questions

In order to explore the impact of financial innovation on operational efficiency in some commercial banks in Turkey through the dimensions of financial innovation, which are banking services provided via mobile phone, internet and ATM, descriptive analyses were conducted to find out the opinions of the study sample members**.**

These variables were measured using a 5-point Likert scale, which is distributed between completely disagree = 1 and strongly agree = 5**.**

Table 3: Degree of approval according to the average values

Weighted Average	Approval Score
1 to 1.80	Strongly disagree
1.80 to 2.60	Disagree

2.60 to 3.40	Moderately agree
3.40 to 4.20	Agree
4.20 to 5	Strongly agree

Table 4: Results of the descriptive analysis of all dimensions

Dimension	Question	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)	Mean	Standard Deviation	Level of Agreement
Mobile Banking	Mobile banking solutions allow customers to manage banking operations efficiently and quickly.	35.6	42.3	12.5	6.7	2.9	4.056	0.875	Agree
	The use of mobile banking tools to manage financial transactions does not pose any security risks.	25.4	45.8	15.3	9.2	4.3	3.854	1.067	Agree
	Mobile banking systems enable clients to access and manage their accounts from a variety of locations.	40.5	38.2	10.9	7.1	3.3	4.102	0.912	Strongly Agree
	Mobile banking integration eliminates the requirement for physical client engagements which reduces banks personnel and operation cost.	30.7	40.8	14.3	9.6	4.6	3.875	1.014	Agree
	Mobile banking technology improves the quality of our banking services.	28.3	47.1	13.2	8.3	3.1	3.931	0.955	Agree
ATM Banking	ATMs simplify everyday banking activities for clients, such as depositing and withdrawing cash.	38.6	40.5	12.7	6.1	2.1	4.087	0.832	Agree
	In comparison to traditional banking, ATMs save clients time on their everyday banking operations.	30.7	44.2	15.3	7.4	2.4	3.946	0.958	Agree
	More ATMs in key locations decrease the need for physical client engagements, lowering bank personnel and operating costs.	35.5	38.6	14.1	8.3	3.5	3.956	1.015	Agree
	ATM usage reduces bank branch personnel and operational costs.	32.4	46.2	10.7	7.5	3.2	3.962	0.985	Agree
	Increasing ATM use by our customers improves the quality of our banking services while decreasing the number of human errors.	40.3	37.2	12.4	6.8	3.3	4.098	0.875	Agree
Online Banking	Online banking platforms offer flexibility in managing and processing bank transactions remotely.	42.5	39.8	11.3	4.7	1.7	4.182	0.785	Strongly Agree
	The use of online banking tools to manage financial	30.4	46.5	12.3	7.6	3.2	3.947	0.964	Agree

	transactions does not pose any security risks.								
	Online banking simplifies many banking activities, such as money transfers, loan applications, and payments for clients without the need for branch visits, reducing bank branch workload.	35.2	42.7	13.6	6.9	1.6	4.037	0.812	Agree
	Online banking provides a comprehensive and effective solution for managing bank operations.	37.4	40.5	13.5	5.8	2.8	4.067	0.875	Agree
	Digital marketing through online banking services boosts revenue while lowering costs.	29.3	43.6	15.8	8.2	3.1	3.842	0.985	Agree

Table 4 shows the descriptive analysis of the three dimensions of financial innovation services: mobile banking, ATM banking, and online banking, how they add to the bank's operational efficiency. It indicates that such services are directly and highly related with reaching an advanced level of operational efficiency since it enhances the cost of operations and quality of the services being offered thus increasing customer satisfaction. The explanation for each of these dimensions follows next.

For the mobile banking services Results showed that mobile banking services are a tool for the bank to enhance its operational efficiency. For example, 58.6% of the respondents strongly agreed that adopting such services resulted in enhancing the efficiency of operations and reducing costs. A sample of 48.6% also showed that the services of mobile banking contributed to decreasing transaction costs, while 40.3% agreed that these services enhanced the quality of the operations and reduced human errors. The role of mobile banking:

•Operational cost: The result from the survey has shown that mobile banking reduced the number of employees and the cost of manual operations. For example, 29.6% of participants strongly agreed that such services reduce the need for direct interaction with customers.

•Improving access: These services helped customers manage their accounts from anywhere, enhancing customer satisfaction and reducing the load on branches.

•Human errors minimized: More than an overwhelming proportion of respondents agreed that digital systems introduced in mobile banking services considerably reduced human error and operational errors.

It shows from the data that the ATM banking service plays a significant role in improving the bank's operational efficiency. 60.3% of the respondents stated that through an ATM, customers can have an easy and time-efficient way of performing daily transactions such as withdrawals and deposits.

As for the role of ATMs, the results indicate that ATMs have the following importance:

•Reduce operational pressure from branches: 55.7% of the sample agreed that spreading ATMs at strategic places helps relieve the pressure from the branches and reduces part of the operational costs.

•More customer satisfaction: 64% of participants indicated that with ATMs, customers save their time and simplify banking operations, thus increasing satisfaction.

•Cost reduction at operations: Through the ATMs, the bank reduced branch operation costs without compromising the provision of excellent banking services.

For online banking Services the results refer that the online banking services obtained the highest rating in acceptance due to their importance in promoting the efficiency of the operations of the bank. Thus, 68.2 percent agreed that online banking services are helpful in cost reduction at operations and promotion of efficiency.

For the role of online banking services, the results showed that online banking services •

Increase flexibility: 72% of respondents believed that the use of Online banking sites gives customers a high degree of flexibility in handling banking operations remotely and therefore have less need to visit branches.

•Reduces operational costs: It emerged that 66.4% of respondents agreed that such services decrease the bank's daily transaction costs.

• Improvement in the quality of operations: Through digital automation, human errors have been reduced, improving the overall customer experience of online banking services.

The results show that all dimensions of financial innovation (mobile, ATM, internet) contribute directly to enhancing the bank's operational efficiency through:

1. Reducing operational costs: These services helped reduce reliance on manual processes and human resources, which led to reducing operational costs. For example, 48.9% of participants agreed that mobile banking services significantly reduced costs.

2. Improvement of customer satisfaction: Digital services helped in improving customers' satisfaction due to the flexibility, speed, and security of the services. Thus, 55.7% of the sample emphasized that ATM services contributed to improving customer experience.

3. Productivity enhancement: Digital transformation has enabled customers to conduct their operations with ease and speed, hence increasing the productivity of the bank.

4. Human errors are reduced: With automation, human error rates have reduced, therefore enhancing efficiency and quality in service delivery.

The hypotheses put forward in the study relate to how financial innovation affects the operational efficiency of banks, considering that the different dimensions of such an effect were analysed by using mobile banking, Internet banking, and ATM services. The following hypotheses are tested:

H1: There is the significant effect of financial innovation in banks' operational efficiency.

The major hypothesis is, there is a statistically significant impact of financial innovation on the operating efficiency of banks. From the analysis, it is perceived that the results accepted this hypothesis since it has been noticed that financial innovation through applications, including mobile banking, the Internet, and ATMs, was considerably influential on raising operational efficiency. In general, all these services would be helpful for banks in minimizing operating costs and improving customer satisfaction by increasing the ability to improve productivity.

H1a: Mobile banking services will have a significant impact on the operational efficiency of commercial banks.

The sub-hypothesis H1a corresponds to the influence of mobile banking on commercial banks with regard to operational efficiency. From the results presented, this hypothesis was also accepted, as the study showed that, with mobile banking, the contribution to operational efficiency is significantly improved. From an account accessibility perspective and conducting transactions remotely, transaction costs could be reduced, branch dependencies minimized, and through this, the bank's operational efficiency thus improved.

H1b: E-banking services will have a profound impact on operational efficiency among commercial banks.

Regarding hypothesis H1b, online banking services had a significant positive impact on internal operational efficiency, as this saves efforts that had to be made toward transfers, bill payments, and account management without personally visiting the branch. This will help reduce operational costs, raise work efficiency, and thus enhance the overall efficiency of operations in the bank.

H1c: The utilization of the facility for ATM banking services in commercial banks positively influences their operational efficiencies.

Regarding hypothesis H1c, this pertains to the impact of the ATM services on the operational efficiency of the commercial banks. This hypothesis was also approved, as the availability of ATMs at strategic locations had relieved the pressure from the conventional branches, and as such contributed to the reduction in the bank's operational costs. Furthermore, the customers could transact business quicker and without hassles and increased their level of satisfaction that had led to the enhancement in the bank's operational efficiency.

It is based on the analysis that it can be said that all the hypotheses, that is, H1, H1a, H1b, and H1c, are accepted. The results proved that there is a significant effect of financial innovation on the operational efficiency of banks through various financial innovation services such as mobile, internet, and ATMs. These services reduced operating costs, enhanced customer satisfaction, and increased productivity, hence contributing to an improvement in the general operational efficiency of the bank.

4.9.3. Analysis of variance (ANOVA)

ANOVA was used to analyse the differences between males and females in the impact of financial innovation on the operational efficiency of banks.

Table 5: ANOVA results to study the differences between males (M) and females (F) in the role of financial innovation and its relationship to operational efficiency:

Dimension	Gender	Mean	Standard Deviation	Significance Level (Sig.)	F Value
Mobile Banking Services	M	3.3667	1.01237	0.000	0.045
	F	3.1491	.53648		
Online Banking Services	M	3.3818	1.37095	0.000	0.033
	F	3.2909	.64794		
ATM Banking Services	M	3.5636	1.11807	0.07	0.033
	F	2.9800	**58906.**		

From the table 5, it can be seen that the significance level value for both mobile banking services and online banking services is less than 0.05, and hence, males and females differ significantly in their opinion on the impact of these services with respect to enhancing the operational efficiency of the bank. In the case of the factor ATM service, the p-value is 0.07, which is greater than 0.05; therefore, it is not significant, and there are no differences between the genders in this dimension.

Based on these results, we will fail to reject the second hypothesis H2. We can say that there is a statistically significant difference in males' and females' opinions concerning the role of financial innovation to enhance the operational efficiency of banks when considering the services of mobile banking and online banking but fails to attain for ATM banking services.

Table 6: ANOVA results to study age differences in terms of the dimensions of financial innovation and its relationship to operational efficiency:

Dimension	Age	Mean	Standard Deviation	Significance Level (Sig.)	F Value
Mobile Banking Services	15-25	1.5917	.13805	0.000	0.067
	26-40	3.4815	.78404		
	41-55	2.5233	.25084		
	Over 55	3.2121	.46583		
Online Banking Services	15-25	1.0000	.00000	0.000	0.046
	26-40	3.6444	1.08068		

	41-55	3.0137	.82370		
	Over 55	3.0545	.55829		
ATM Banking Services	15-25	1.0000	.00000	0.000	0.265
	26-40	3.5111	.97802		
	41-55	3.2027	.16497		
	Over 55	2.9030	.22381		

From the table, one can observe the significance level values in all dimensions are less than 0.05 (for all dimensions the value is 0.000), which provides evidence of statistically significant differences existing between different age groups in influencing operational efficiency through either mobile banking, the Internet, or an ATM.

From these results, we have taken the third main hypothesis, H3. Therefore, we confirm that there is a statistically significant difference in the effect of financial innovation in respect of different age groups across different dimensions such as a mobile phone, Internet, and ATM, on the bank's operational efficiency.

Table 7: ANOVA results to study the variance according to educational qualification to study the relationship between financial innovation and operational efficiency

Dimension	education	Mean	Standard Deviation	Significance Level (Sig.)	F Value
Mobile Banking Services	Diploma	1.5917	.13805	0.45	0.023
	High school Degree	2.7852	.70426		
	MA/MC	3.3967	.57122		
	PhD	3.9750	.73075		
Online Banking Services	Diploma	1.0000	.00000	0.066	0.065
	High school Degree	3.9607	.85807		
	MA/MC	3.0182	.75474		
	PhD	3.9500	1.13174		
ATM Banking Services	Diploma	1.0000	.00000	0.085	0.024
	High school Degree	3.3984	.84521		
	MA/MC	3.1182	.69288		
	PhD	4.2000	.60315		

The p-values shown in the table for all dimensions, including mobile banking, internet banking, and ATM usage, are greater than 0.05 (0.45, 0.066, and 0.085

respectively). This suggests that there are no statistically significant differences due to academic qualifications among the respondents in the sample in terms of the impact of financial innovation on the bank's operational efficiency.Based on these results, the fourth hypothesis, H4, was rejected. It can be said that there are no statistically significant differences related to academic qualifications in terms of the impact of financial innovation on the bank's operational efficiency concerning the dimensions explored.

CONCLUSION AND RECOMMENDATIONS

This study aims to assess the impact of financial innovation on operational efficiency in commercial banks, studying a number of key dimensions of financial innovation, including mobile banking, the internet, and ATMs. This research was applied in two major banks in Turkey, namely Kuveyttürk Bank and QNB Bank, based on the consideration that these two banks represent innovative models in the Turkish banking sector. The study was applied to a sample of customers and employees in these two banks.

The findings of the research exposed a significant impact of financial innovation on the operational efficiency of banking institutions in which mobile banking, internet services, and ATMs contribute towards the improvement in the operational efficiency of banks. These findings are consistent with existing literature that documented financial innovation as an important tool, especially through digital platforms including mobile and internet banking, for reducing operational costs and improving the general performance efficiency in banks.

For instance, Faraj, (2021) demonstrated that innovations in mobile finance markedly accelerated transaction speed and diminished the necessity for banks to maintain physical branches, thereby lowering the costs linked with branch operations and staffing. Similarly, Ekanayake& Anjalika, (2022). verified the significance of online banking in bolstering the operational efficiency of financial institutions by offering customer-centric services at any time and from any location, which in turn lessens the requirement for a physical presence in conventional branches.

The present study also focused on the examination of the impact of singular variables such as gender, age, and education on the evaluation of financial innovation.

An ANOVA was conducted to analyse the differences between male and female respondents as well as between different age groups. The findings revealed statistically significant variances in the perspectives of males and females regarding mobile banking and online banking, suggesting that there are distinct disparities in the needs and preferences of each sex concerning these services. For instance, males might exhibit a greater inclination towards utilizing Internet and ATM services compared to females, or they may demonstrate a higher level of trust in mobile phone services than their female counterparts.

In relation to age demographics, it was established that different age groups (youth, adults, and seniors) showed diverse evaluations of banking innovations. For example, young people had a greater tendency to use mobile and online banking services, due to their increased ability to use modern technologies. In contrast, the older group had a stronger predisposition towards the use of traditional banking services, such as automatic teller machines (ATMs). No significant effect of educational qualification: On the other hand, it was found that there was no statistically significant effect of educational qualifications on the adoption of financial innovations in banking institutions. This implies that the use of mobile banking, internet services, and ATMs does not significantly depend on the educational level of a person. This phenomenon can be elucidated by the success of banks in streamlining their digital services, thereby ensuring accessibility for all social and educational demographics. As a result, the utilization of these services is rendered available to individuals irrespective of their educational attainment. Zouari-Hadiji, (2021) confirmed that financial innovation had a positive effect on increasing the speed of services and raising the level of customer satisfaction. In addition, the study emphasized that mobile banking was one of the essential factors in improving the operational effectiveness of banking institutions.

Nihad, (2013). Showed that online banking is important in improving operational efficiency by reducing costs and increasing access to banking transactions. In addition, her study emphasized the importance of focusing on digital services that reduce dependence on traditional branches.

Bouabdali, & Jaadi, S. (2016) have conducted a study to examine the impacts of mobile banking technology on the operational efficiency of financial institutions. Their

results indicated a positive direct relationship between the usage of such services and improvement in operational efficiency, mostly through cost reductions associated with conventional banking infrastructure.

The findings of this research demonstrate that financial innovation exerts a distinct and observable beneficial effect on the operational efficiency of commercial banks. Specifically, the results indicate that services such as mobile banking, the Internet, and ATMs play a crucial role in enhancing operational efficiency while simultaneously decreasing banking costs.

The impact of financial innovation is to reduce the need for traditional processes, for example, visiting the branches in person, thus increasing operational efficiency and enabling the bank to provide its services to customers faster and at a lower cost. Results The study shows that mobile and online banking services contribute to the reduction in the banks' operational costs by providing online alternatives for banking transactions that hitherto required customers to be present at the bank premises.

For example, customers can carry out banking activities or enquire about their accounts via mobile phones or the internet from anywhere and at any time. Such access eases the overload within the bank branches and eases pressure in the traditional banking processes. With such an outlook, financial institutions can reduce infrastructural costs such as rent of building space and recruitment of staff and decrease the occurrences of human-related errors which occur in a typical banking process. A fundamental factor contributing to the enhancement of operational efficiency is the expedited processes enabled by financial innovation services. The availability of mobile and online banking solutions permits customers to perform transactions swiftly and effectively, circumventing the need to wait in queues or engage with banking personnel. Consequently, this advancement improves the overall customer experience and fosters increased loyalty towards the banking institution.

Moreover, the research revealed significant variations in service preferences among males and females, as well as across various age demographics. The findings indicated that males exhibited a greater propensity for utilizing online banking and ATMs, whereas females demonstrated a stronger preference for mobile banking. Additionally, younger cohorts displayed a higher receptivity toward financial

innovation services in comparison to their older counterparts, which underscores the influence of contemporary technologies on consumer preferences.

The findings show that financial institutions need to adopt particular measures based on social and psychological trends in order to modify their services for the different needs of their clients. For example, a marketing campaign targeting a younger group may be more effective if it is focused on advertising online and mobile banking services while a campaign targeted towards an older group may be more focused on the improvement of access to ATMs and traditional services.

Notwithstanding the numerous advantages associated with financial innovation, certain challenges may impede banks from fully capitalizing on these services. Chief among these challenges are concerns related to security and the protection of customer data, necessitating that banks intensify their endeavours in the realm of cybersecurity to ensure a secure environment for conducting financial transactions. Furthermore, certain clients may encounter challenges when engaging with contemporary technology, thereby necessitating the establishment of training initiatives aimed at instructing them in the effective utilization of financial innovation services. In conclusion, this study shows that financial innovation can be a major driver for improving operational efficiency of the banks. Adoption of innovative strategies and exploitation of the benefits of digital technologies can enhance their services and customer base, which raises their competitiveness in the market.

RECOMMENDATIONS

1 .Enhancing digital offerings: Institutions should invest more to further develop and expand mobile, internet, and ATM banking channels to meet various needs of all customers, including efforts to increase speed and efficiency in transactions of banking.

2 .Improve the perception of diverse demographics: Financial institutions should create awareness programs that are specifically designed for the preferences and usage patterns of men and women, as well as by age in the use of these financial innovation tools.

3 .Improvement in customer experience through modern technologies: The ability of financial institutions to use artificial intelligence and data analytics in

enhancing customer experience by offering innovative and diverse banking solutions that more effectively meet the different needs of their customers.

4 .Continual investment in financial technology: the institutions should continue investing in financial technology and expand its scope in the long run. This also needs the continuous upgrade of digital infrastructure to keep it abreast with the needs of technology and the ever-growing demands of customers.

5. Further research into educational qualifications: Although this study does not find a conclusive effect of educational qualifications, further research in this regard could be conducted to ascertain the impact of educational attainment on consumer preferences for financial innovation services.

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APPENDIX 1

RESULTS OF ANALYSIS

Frequencies

[DataSet1] D:\files of thesis\spss\FARAH.sav

Frequency Table

gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	male	180	48.6	48.6	48.6
	female	190	51.4	51.4	100.0
	Total	370	100.0	100.0	

Education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Diploma	80	21.6	21.6	21
	Degree	160	43.2	43.2	64
	MA/MC	90	24.3	24.3	89
	PhD	40	10.8	10.8	100
	Total	370	100.0	100.0	

Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	15-25	90	24.3	24.3	24.3
	26- 40	140	37.8	37.8	62.1
	41 -55	100	27.1	27.1	89.1
	55-more	40	10.8	10.8	100.0
	Total	370	100.0	100.0	

```
RELIABILITY
  /VARIABLES=gender MB AB OB
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA.
```

Reliability

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	370	100.0
	Excluded[a]	0	.0
	Total	370	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.867	6

Reliability Statistics

Cronbach's Alpha	N of Items
.832	10

Reliability Statistics

Cronbach's Alpha	N of Items
.798	10

Reliability Statistics

Cronbach's Alpha	N of Items
.811	6

```
ONEWAY  gender
  /STATISTICS DESCRIPTIVES
  /MISSING ANALYSIS.
```

Oneway

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
MB	male	180	3.3667	1.01237	.06231	3.2440	3.4894	1.00	4.60
	female	190	3.1491	.53648	.03617	3.0778	3.1904	2.20	4.20
	Total	370	3.2678	.83685	.03804	3.1930	3.3425	1.00	4.60
AB	male	180	3.3818	1.37095	.08438	3.2157	3.5480	1.00	5.00
	female	190	3.2909	.64794	.04368	3.2048	3.3770	2.60	4.40
	Total	370	3.3405	1.10265	.05012	3.2420	3.4390	1.00	5.00
OB	male	180	3.5636	1.11807	.06933	3.4271	3.7001	1.00	4.80
	female	190	2.9800	.58906	.03971	2.9017	3.0583	1.60	3.80
	Total	370	3.2983	.96588	.04390	3.2121	3.3846	1.00	4.80

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
MB	Between Groups	5.681	1	5.681	0.045	.000
	Within Groups	332.576	369	.690		
	Total	338.257	370			
AB	Between Groups	.992	1	.992	0.033	.007
	Within Groups	586.255	369	1.216		
	Total	587.246	370			
IB	Between Groups	40.876	1	40.876	0.033	.000
	Within Groups	409.723	369	.850		
	Total	450.599	370			

```
ONEWAY MB AB OB Education
  /STATISTICS DESCRIPTIVES
  /MISSING ANALYSIS.
```

Oneway

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
MB	Diploma	80	1.5917	.13805	.02818	1.5334	1.6500	1.00	1.80
	Degree	160	2.7852	.70426	.06376	2.6590	2.9115	1.80	4.20
	MA/MC	90	3.3967	.57122	.03672	3.3244	3.4690	2.20	4.40
	PhD	40	3.9750	.73485	.07500	3.8261	4.1239	2.20	4.60
	Total	370	3.2678	.83685	.03804	3.1930	3.3425	1.00	4.60
AB	Diploma	80	1.0000	.00000	.00000	1.0000	1.0000	1.00	1.00
	Degree	160	3.9607	.85807	.07769	3.8069	4.1145	2.40	5.00
	MA/MC	90	3.0182	.75474	.04852	2.9226	3.1138	1.80	4.60
	PhD	40	3.9500	1.13174	.11551	3.7207	4.1793	2.00	4.60
	Total	370	3.3405	1.10265	.05012	3.2420	3.4390	1.00	5.00
IB	Diploma	80	1.0000	.00000	.00000	1.0000	1.0000	1.00	1.00
	Degree	160	3.3984	.84521	.07652	3.2469	3.5499	2.00	4.60
	MA/MC	90	3.1182	.69288	.04454	3.0304	3.2059	1.60	4.00
	PhD	40	4.2000	.60315	.06156	4.0778	4.3222	3.20	4.80
	Total	370	3.2983	.96588	.04390	3.2121	3.3846	1.00	4.80

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
MB	Between Groups	147.868	3	49.289	0.023	.045
	Within Groups	190.389	367	.397		
	Total	338.257	370			

```
ONEWAY MB AB OB  Age
  /STATISTICS DESCRIPTIVES
  /MISSING ANALYSIS.
```

Oneway

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
MB	15-25	90	1.5917	.13805	.02818	1.5334	1.6500	1.00	1.80
	26- 40	140	3.4815	.78404	.05335	3.3763	3.5866	1.80	4.40
	41 -55	100	2.5233	.25084	.02936	2.4648	2.5818	2.20	2.80
	55-more	40	3.2121	.46583	.04682	3.1192	3.3050	2.20	3.80
	Total	370	3.2678	.83685	.03804	3.1930	3.3425	1.00	4.60
AB	18-24	90	1.0000	.00000	.00000	1.0000	1.0000	1.00	1.00
	25- 34	140	3.6444	1.08068	.07353	3.4995	3.7894	1.80	5.00
	35 -44	100	3.0137	.82370	.09654	2.8212	3.2061	2.00	4.00
	45-54	40	3.0545	.55829	.05611	2.9432	3.1659	2.60	4.00
	Total	370	3.3405	1.10265	.05012	3.2420	3.4390	1.00	5.00
OB	18-24	90	1.0000	.00000	.00000	1.0000	1.0000	1.00	1.00
	25- 34	140	3.5111	.97802	.06655	3.3799	3.6423	1.60	4.60
	35 -44	100	3.2027	.16497	.01931	3.1642	3.2412	3.00	3.40
	45-54	40	2.9030	.22381	.02249	2.8584	2.9477	2.60	3.20
	Total	370	3.2983	.96588	.04390	3.2121	3.3846	1.00	4.80

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
MB	Between Groups	158.437	3	39.609	0.067	.000
	Within Groups	179.820	367	.375		
	Total	338.257	370			
AB	Between Groups	192.621	3	48.155	0.046	.000
	Within Groups	394.625	367	.824		
	Total	587.246	370			