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IMPLEMENTATIONS AND TRANSFORMATION ACTIVITIES IN THE FIELD OF DIGITAL BANKING: A COMPARATIVE ANALYSIS OF THE UNITED STATES OF AMERICA, GERMANY, AND TÜRKİYE

Yüksek Lisans Tezi

ÜMİTCAN ÜNAL

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İstanbul, 2025

ACKNOWLEDGEMENTS

I hereby express my sincere gratitude to my thesis advisor, Assoc. Prof. Dr. Mehtap ÖNER, for her exemplary guidance, insightful feedback, and steadfast support throughout my research. Her academic rigor and profound expertise have been instrumental in shaping both the theoretical framework and methodological approach of this study. I am also deeply appreciative of Prof. Dr. Emin AVCI, with whom I initiated this research endeavour, for his early mentorship and encouragement.

I am also grateful to the faculty members of Business Administration for their encouragement and support, and for providing me with a challenging and stimulating academic environment.

I owe particular gratitude to my former and actual managers for their support in my business life. Finally, I would also thank my beloved family, for their endless support and patience.

I dedicate this thesis to my mother, Sabiha ÜNAL, who continues to provide me with her love and spiritual support.

ÜMİTCAN ÜNAL

İstanbul, 2025

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Tez Türü ve Tarihi : Yüksek Lisans, 2025

Anahtar Kelimeler : Dijital Bankacılık, Finansal Teknoloji, İnovasyon

ÖZET

DİJİTAL BANKACILIK ALANINDAKİ UYGULAMALAR VE DÖNÜŞÜM FAALİYETLERİ: AMERİKA BİRLEŞİK DEVLETLERİ, ALMANYA VE TÜRKİYE'NİN KARŞILAŞTIRMALI ANALİZİ

Tezin amacı, dijital bankacılığın yasal durumu ve yapısı hakkında genel bir çerçeve çizmek, uluslararası (Almanya, Amerika Birleşik Devletleri (ABD)) dijital bankacılık düzenlemeleri ile karşılaştırmalı analiz ve değerlendirmeler yapmak ve Türkiye'deki dijital bankalara ve bu sektörde düzenleyici konumunda olan kamu kurum ve kuruluşlarına önerilerde bulunmaktır.

Tez çalışmasının piyasa oyuncuları ve düzenleyiciler için bir öngörü oluşturacağı düşünülmektedir. Düzenlemelerin yeni olması nedeniyle düzenleyici kurum ve kuruluşlar tarafından yayınlanacak ek tebliğler gibi mevzuatın hazırlanma sürecinde de kaynak olması amaçlanmaktadır.

Ayrıca, para alışverişinin yoğun olarak gerçekleştirildiği ana kuruluşlar olarak dijital bankacılık faaliyetleri, son dönemde popüler bir konu olan CBDC (Merkez Bankası Dijital Parası) ile ilgili literatürde yer alan akademik çalışmalar ve merkez bankaları tarafından yayınlanan raporlar incelenmiştir. Bu doğrultuda, entegrasyon süreçleri değerlendirilmiş olup tez kapsamında öneriler sunulmuştur. Bu kapsamda, yöntem olarak ilgili taraflar belirlenerek anket çalışmaları gerçekleştirilmiştir. Anket sonuçlarına ilişkin analizler ile birlikte, tezden

yararlanacak taraflara piyasa yapısı ve uygulama alanları hakkında genel bilgiler verilmesi beklenmektedir.

Bilimsel olarak literatüre kazandırılan bu çalışma gelecekte ilgili alanda çalışmak isteyen araştırmacılara da kaynak olacaktır. Kültürel açıdan bakıldığında, uluslararası toplumlara sunulan hizmetlerde ne gibi değişimlerin olduğu, hizmetlerin farklılaştırılarak nasıl sunulması gerektiği gibi karşılaştırmalı analizler ile birlikte ilgili ekosistem unsurlarına fayda sağlayacağı düşünülmektedir.

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Degree Awarded and Date : Master, 2025

Keywords : Digital Banking, Financial Technology, Innovation

ABSTRACT

IMPLEMENTATIONS AND TRANSFORMATION ACTIVITIES IN THE FIELD OF DIGITAL BANKING: A COMPARATIVE ANALYSIS OF THE UNITED STATES OF AMERICA, GERMANY, AND TÜRKİYE

The aim of the thesis is to draw a general framework about the legal situation and structure of digital banking, to make comparative analyses and evaluations with international (Germany, and the United States (USA)) digital banking regulations, and to make suggestions to digital banks in Türkiye and public institutions and organizations that are in the regulatory position in this sector.

It is thought that with the thesis study, a foresight will be created for market players and regulators. Since the regulations are new, it is aimed to be a source in the preparation process of the legislation, as well as the additional communiqués to be published by regulatory institutions and organizations.

Additionally, as digital banking activities are the main establishments where monetary transactions are heavily conducted, the literature on CBDC (Central Bank Digital Currency/Digital Money/e-currency) has been reviewed, including academic studies and reports published by central banks. The integration processes have also been evaluated, and suggestions have been presented within the scope of the thesis. In this context, relevant parties have been identified as the method, and surveys have been conducted. Along with the analysis

of the survey results, it is expected that the thesis will provide general information about the market to the parties who will benefit from it.

This study, which has been brought to the literature scientifically, will also be a source for researchers who want to work in the related field in the future. From a cultural point of view, it is thought that it will benefit the relevant ecosystem elements together with comparative analyses such as what kind of changes are in the services offered to international societies and how the services should be presented by differentiating them.

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ABBREVIATIONS

ACH	Automated Clearing House
AI	Artificial Intelligence
API	Application Programming Interface
ATM	Automated Teller Machine
B2B	Business-to-Business
BaFin	Finanzdienstleistungsaufsicht (Federal Financial Services Supervisory Authority (Germany))
BAT	Baidu, Ant Financial, Tencent
BigTech	Big Technology Companies
BKM	Interbank Card Center (Türkiye)
BNPL	Buy Now, Pay Later
BRSA	Banking Regulation and Supervision Agency (Türkiye)
CBDC	Central Bank Digital Currency
CBRT	Central Bank of the Republic of Türkiye
CFPB	Consumer Financial Protection Bureau (USA)
CFTC	Commodity Futures Trading Commission (USA)
CI	Credit Institutions
CMB	Capital Markets Board (Türkiye)
COVID-19	Coronavirus Disease 2019
CRS	Cash Register System
DeFi	Decentralized Finance
DLT	Distributed Ledger Technology
EBA	European Banking Authority
ECB	European Central Bank
ESCB	European System of Central Banks
ESG	Environmental, Social, and Governance
ETF	Exchange-Traded Fund
EU	European Union
FAMGA	Facebook, Amazon, Microsoft, Google, Apple
FDIC	Federal Deposit Insurance Corporation (USA)

FED	US Federal Reserve
FIN-FSA	Financial Supervisory Authority of Finland
FINRA	Financial Industry Regulatory Authority (USA)
FinCEN	Financial Crimes Enforcement Network (USA)
Fintech	Financial Technology
FSA	Federal Savings Association (USA)
FTC	Federal Trade Commission (USA)
GDP	Gross Domestic Product
IBAN	International Bank Account Number
ICC	Interbank Card Center
ICO	Initial Coin Offering
IFC	Istanbul Finance Center
IT	Information Technology
KWG	Kreditwesengesetz (German Banking Act)
MFI	Monetary Financial Institution
NASDAQ	National Association of Securities Dealers Automated Quotations (USA)
NFT	Non-Fungible Token
OCC	Office of the Comptroller of the Currency (USA)
P2P	Peer-to-Peer
POS	Point of Sale
RPA	Robotic Process Automation
SaaS	Software as a Service
SEC	Securities and Exchange Commission (USA)
SIPC	Securities Investor Protection Corporation (USA)
SME	Small and Medium-sized Enterprises
SSL	Secure Sockets Layer
SWIFT	Society for Worldwide Interbank Financial Telecommunication
TGNA	Turkish Grand National Assembly
TL	Turkish Lira
TRY	Turkish Lira
UK	United Kingdom

ULC	Uniform Law Commission (USA)
URVCBA	Uniform Regulation of Virtual-Currency Businesses Act (USA)
US	United States
USA	United States of America

INTRODUCTION

The rapid evolution of technology has profoundly reshaped the financial services industry, giving rise to new platforms and methods for conducting monetary transactions. At the forefront of this shift is digital banking, which enables customers to access financial services with greater ease, efficiency, and flexibility. As financial technology (fintech) continues to expand, regulatory institutions and financial organizations are faced with the challenge of adapting existing legal structures to meet the demands of a digital ecosystem. In this changing environment, it becomes essential to examine how different regions implement and regulate digital banking practices.

This thesis investigates the implementations and transformation activities in the field of digital banking through a comparative analysis of the United States of America, the European Union (specifically Germany), and Türkiye. Germany was chosen as the representative of the European Union due to its position as the largest economy in the EU, its highly regulated and stable banking sector, and its significant role in shaping European financial regulations. The study aims to provide a broad legal and structural overview of digital banking and to compare the regulatory approaches of these regions. In doing so, it offers recommendations to digital banks operating in Türkiye, as well as to public regulatory institutions shaping the future of the sector. Due to the relatively recent emergence of many digital banking regulations, the findings of this study are expected to serve as a useful reference for future legislation and policy development.

The methodology of this thesis includes both a literature review and an empirical component based on survey results. A special focus is also given to Central Bank Digital Currencies (CBDCs), whose development and integration are becoming increasingly relevant in digital banking discussions. Reports and publications by central banks have been examined to understand the broader context in which digital banking operates. By analyzing responses from relevant stakeholders, the study aims to offer insights into current market conditions and user expectations in the three regions.

The findings show that there are noticeable differences among the three regions in terms of digital banking adoption and regulatory approaches. While all regions emphasize cost-

efficiency, ease of use, and secure infrastructures, cultural and regulatory factors shape the way digital banking is implemented in each context.

Overall, this study contributes to the growing academic literature on digital banking by providing both theoretical and practical perspectives. It is expected to support researchers, policy-makers, and financial institutions in understanding how digital transformation can be successfully implemented. Through its comparative analysis and recommendations, the thesis aims to guide future innovation in digital finance while respecting local market dynamics and regulatory needs.

1. OVERVIEW OF BANKING

According to the Financial Literacy Skills Activity Book published by the Ministry of National Education in 2023, the concept of a bank is defined as follows: "A bank is a financial institution that conducts activities related to utilizing funds obtained from depositors or through other means, lending or discounting them for its own account, and is established in accordance with the requirements of the legislation."

According to Article 3 of the Banking Law No. 5411, there are three main types of institutions serving as banks in Türkiye: deposit banks, participation banks, development and participation banks. The following definitions regarding relevant organizations are used in the law.

Deposit bank: In accordance with this Law, it defines the institutions operating primarily to accept deposits and provide loans in their own name and account, and the branches of such institutions established abroad in Türkiye.

Participation bank: In accordance with this Law, it defines the institutions operating primarily to collect funds and provide loans through special current and participation accounts, and the branches of such institutions established abroad in Türkiye.

Development and investment bank: Except for accepting deposits or participation funds in accordance with this Law; It defines the organizations that operate primarily to provide loans and/or fulfil the duties assigned to them by special laws, and the branches of such organizations established abroad in Türkiye.

Banks, as one of the most influential components of financial markets, experience growth and transformation in their areas of operation. This is due to numerous factors, such as globalizing world, evolving economic conditions, intensifying competition, increased telecommunication opportunities, shifting customer expectations, and rapid changes in external factors affecting businesses. Today, a highly dynamic banking approach, which evolves daily, is dominant. As stated in Banking Law No. 5411, banks offer an extensive range of services as listed below:

- Accepting deposits,
- Receiving participation funds,
- Providing cash and non-cash loans in various types and forms,

- Conducting all payment and collection transactions, including cashless and dematerialized payments and fund transfers, utilizing correspondent banking or checking accounts,
- Negotiating checks and other negotiable instruments,
- Offering storage services,
- Issuing payment instruments such as credit cards, debit cards, and travellers' checks and carrying out related operations,
- Conducting foreign exchange transactions, including spot transactions; buying and selling money market instruments; engaging in purchasing, selling, or escrow transactions involving precious metals and stones,
- Purchasing, selling, and intermediating futures contracts, option contracts, and simple or complex financial instruments containing multiple derivatives, based on economic and financial indicators, capital market instruments, commodities, precious metals, and foreign currencies,
- Buying and selling capital market instruments and engaging in repurchase or resale commitment transactions,
- Intermediating in the sale of capital market instruments through issuance or public offering,
- Facilitating the trading of previously issued capital market instruments for intermediation purposes,
- Providing guarantee services, such as offering guarantees, assurances, and other commitments on behalf of others,
- Carrying out investment advisory transactions,
- Managing portfolios and overseeing their administration,
- Market making for purchase and sale transactions under the obligations assumed within the scope of a contract established with the Undersecretariat of Treasury and/or the Central Bank and institution associations,
- Executing factoring and forfaiting transactions,
- Intermediating in money trading transactions in the interbank market,
- Conducting financial leasing transactions,
- Offering insurance agency and private pension intermediation services, and performing other activities as determined by the Board.

Assessing the performance of banks is crucial, given their significant role in the finance sector and their numerous contributions to the economy. Evaluating a bank's performance fosters its growth and stability. In a competitive financial market, understanding a bank's performance can provide investors with insights to guide their decisions to invest or withdraw deposits. Likewise, the bank's standing can help managers identify areas for service improvement (Öztürk et al., 2020).

Banks are financial institutions that accept deposits, accumulate funds, and distribute these funds as short-term and long-term loans to individuals, businesses, and the government in need of financing. Banks' functions extend beyond monetary transactions; they also play a vital role in a country's economy. A robust financial framework within a nation can be attributed to its banks, which contribute to long-term macroeconomic stability. The banking sector, being a fundamental part of the financial system, must effectively demonstrate its interplay with the economic system and operate within a sound structure. The banking sector is considered a crucial instrument in achieving rapid economic growth and development (Yetiz, 2016).

In conventional banking, deposits gathered from clients at preset interest rates are allocated as loans to parties requiring funds based on the bank-determined interest rates (Tabaş, 2022).

Banks contribute a portion of the accumulated funds to the real economy, while another part can be used outside the real economic system, such as investing in the rent-seeking economy. This includes instruments like treasury bills, government bonds, and repos.

In the conventional banking system, securities are treated like commercial products, as they are bought and sold at specific prices. Consequently, the role of money differs significantly from that in participation banks. Traditional banks are known to engage in currency trading alongside banking services.

Banks generate revenue primarily through two channels: interest-based income and non-interest-based income. While interest forms a significant portion of a bank's revenue, during times of economic instability when central interest rates soar, it can become a substantial liability. This increase in costs reduces the attractiveness of interest-earning products to both individual and corporate clients, resulting in a decline in the market and consequently, the

bank's earnings. On the other hand, non-interest income encompasses revenues from foreign exchange, service fees, commissions, and capital market operations (Dinçer, 2019).

International trade involves risks and uncertainties, particularly when parties are unfamiliar with the global market. Banks play a critical role in mitigating these risks by providing guarantees to parties involved in transactions, ensuring timely delivery for imports, and secure payment mechanisms for exports. Exporters aim to receive payment for the goods they sell, while importers seek timely delivery for utilization. Banks intervene by providing export incentives such as pre-export financing, working capital loans, foreign currency loans, and facilitating trade through letters of credit and export drafts. The involvement of banks in international trade is crucial to ensure the global market's stability and growth. By providing guarantees, incentives, and secure payment mechanisms, banks can mitigate risks and uncertainties and facilitate global trade, promoting economic development and growth.

A fundamental principle of economic development involves redirecting inactive funds, which are removed from the economy for various reasons, back into the real sector through different channels. The larger the number of idle resources, the more the country's economic development is negatively impacted. Many of the world's largest banks (such as Citibank, HSBC, Commerce Bank, Deutsche Bank, Union Bank of Switzerland, Goldman Sachs), which became aware of this economic reality in the 1970s, established units conducting banking activities based on a profit-and-loss-sharing principle. This system is implemented in two distinct ways worldwide: the "specialized banking" model, which offers only credit banking services, and the "model banking" approach, which provides both traditional and contemporary banking services (Özulucan et al., 2009).

With global and regional advancements in the financial sector, the scope of competition has extended beyond national borders. The technological progress of countries has transformed the cyclical investment process. Nowadays, banks invest in digital channels, aim to minimize branch and personnel costs, and adopt a centralized management approach (Dinçer , 2019).

It's important to understand the diverse developments in banking systems worldwide due to various factors. The growth of banking systems in each country is influenced by their economic structures and cultural factors. This diversity in banking practices shapes economic strategies

and outcomes in unique ways. This analysis examines how banking systems in different countries have taken distinct paths. Such an examination is crucial for understanding the role of banking in the global economy and assessing the impacts of different banking models on economic growth.

1.1.US Banking System

The American banking regulatory framework is characterized by a dual system of oversight involving both federal and state-level authorities, with the primary regulator depending on the bank's charter type. This complex structure differentiates the U.S. banking system from those in other developed countries such as Japan, Germany, France, and Canada, where the sector is more centralized around a few large national institutions. In contrast, the United States maintains a more segmented yet diverse banking landscape, consisting of both large commercial banks and a significantly higher number of smaller, community-oriented banks. The American banking sector plays a vital role in the broader economy by offering secure deposit services and serving as a primary source of credit through instruments like mortgages, credit cards, auto loans, and small business financing. Moreover, the sector is deeply integrated with capital markets, contributing to economic growth and financial intermediation. Regulatory oversight in the U.S. covers a wide array of concerns, including consumer privacy, disclosure obligations, fraud prevention, anti-money laundering, anti-terrorism financing, and equitable lending practices aimed at underserved populations. Despite this extensive framework, the 2008 financial crisis revealed critical weaknesses in both the design and enforcement of banking regulations, prompting a wave of reforms intended to strengthen oversight. However, since 2016, there has been a noticeable shift toward deregulation under the federal administration, raising concerns about the long-term resilience of the system and leading to speculation that state-level regulatory agencies may need to play a more prominent role in safeguarding financial stability (Lessambo, 2020).

1.1.1. Federal Reserve

As the central bank of the United States, the Federal Reserve System, commonly known as the FED, is the primary institution responsible for managing the country's monetary policy and ensuring the stability of its financial system. This institutional role and its core responsibilities are demonstrated in Table 1 below.

The Board of Governors of the Federal Reserve System, commonly known as the Federal Reserve Board, is the main governing body of the Federal Reserve System. As shown in Table 1, it is charged with overseeing the Federal Reserve Banks and with helping implement the monetary policy of the United States. Governors are appointed by the president of the United States and confirmed by the Senate for 14-year terms. (FED, 2021).

There are 12 Federal Reserve Banks, each of which is responsible for member banks located in its district. These regional banks, whose locations include Boston, New York, Philadelphia, Cleveland, Richmond, Atlanta, Chicago, St. Louis, Minneapolis, Kansas City, Dallas, and San Francisco, are illustrated in Table 1. (FED of St. Louis, 2021).

The Federal Open Market Committee (FOMC) is a committee within the Federal Reserve System (the Fed) that is charged under United States law with overseeing the nation's open market operations (e.g., the Fed's buying and selling of United States Treasury securities). Table 1 highlights this committee's key role in making decisions about interest rates and the growth of the United States money supply. (FED, 2024).

The key responsibilities of the FED, which functions as the U.S. Federal Reserve, include:

- Implementing the nation's monetary policy with the aim of achieving full employment and maintaining price stability (Yılmaz, et al., 2014).
- Ensuring the stability and security of the financial system.
- Regulating, overseeing, and supervising the banking sector in order to protect consumer credit rights and guarantee the safety of the banking system.
- Managing potential systemic risks that may emerge in financial markets.
- Delivering financial services to the U.S. government, the public, financial institutions, and foreign government agencies.

Table 1. The Structure and Functions of the Federal Reserve System

U.S. Central Bank	The Federal Reserve System				
Key Entities	Federal Reserve Board of Governors	Federal Reserve Banks	Federal Open Market Committee		
Key Functions	Conducting the nation's monetary policy	Helping maintains the stability of the financial system	Supervising and regulating financial institutions	Fostering payment and settlement system safety and efficiency	Promoting consumer protection and community development

Source: FED, 2022

Moving from the Federal Reserve's structure and functions, it's important to look at the Office of the Comptroller of the Currency (OCC). Part of the U.S. Department of the Treasury, the OCC supervises national banks and federal savings associations, focusing on their safe operation and adherence to laws. This gives a glimpse into the OCC's key role in U.S. financial regulation.

1.1.2. Office of The Comptroller of the Currency (OCC)

The OCC is responsible for chartering, regulating, and overseeing national banks and federal savings associations (FSAs), as well as licensing, regulating, and supervising federal branches and agencies of foreign banking organizations. Additionally, the agency examines services offered by selected third parties. By enforcing federal banking laws, the OCC manages the organization and structure of the federal banking system. It maintains a regulatory and supervisory framework that guarantees the stability and security of the federal banking system, while promoting innovation and adaptation to address the ever-changing financial needs of consumers, businesses, and communities across the country. The OCC employs a risk-based supervisory approach that evaluates banks' risk management, identifies significant and emerging issues, and mandates corrective actions when necessary (OCC, 2023).

1.1.3. US Banking Sector at Glance

As of September 30, 2023, the federal banking system consists of 1,062 banks and federal branches operating within the United States. These banks vary in size, from small community banks to the largest, internationally active U.S. banks. Among them, 753 banks hold less than $1 billion in assets, while 55 possess over $10 billion (OCC, 2023).

In the United States, the way banks are regulated mainly depends on their size, with more attention given to monitoring larger institutions. Big banks, because of their significant role in both the national and international financial scenes, face more thorough examination. This includes strict capital needs and thorough testing to ensure stability and adherence to financial rules. On the other hand, small-scale banks, which usually serve local areas, are subject to more forgiving regulations. This allows them to operate with fewer capital reserves and a simpler risk management approach. However, these smaller banks must still follow the basic banking rules and laws that protect consumers. This dual-level regulatory system aims to reduce systemic risks while supporting local economic growth by backing smaller, locally-oriented banking institutions.

Table 2 displays a ranking of the ten major banks in the U.S. based on their total assets for 2022. JPMorgan Chase leads the list with assets surpassing three trillion dollars. Following closely are Bank of America and Citigroup, securing the second and third spots with assets of 2.4 and 1.7 trillion dollars, respectively. The chart highlights the substantial economic clout held by these premier banks, with a remarkable drop in assets observed as the list goes from fourth place Wells Fargo & Co. to U.S. Bancorp in fifth, underscoring the substantial differences in the asset accumulation of these top banking entities.

Table 2. Top 10 Banks in the US by Assets (30.09.2024)

Bank Name	Consolidated Assets (Mil $)
JPMorgan Chase	3,584,105
Bank of America	2,565,878
Citigroup	1,733,111
Wells Fargo & Co.	1,698,675
U.S. Bancorp	670,008
Goldman Sachs	564,359
PNC Bank	559,700
Truist Financial Corporation	515,224

Capital One	483,857
TD Bank	399,881

Source: FED, 2024

According to Insider Intelligence (2023), leading U.S. banks have increasingly embraced digital transformation and artificial intelligence (AI) as central elements of their long-term strategies to remain competitive in a rapidly evolving financial landscape. JPMorgan Chase has placed significant emphasis on targeting digital-native consumers, particularly millennials, by expanding its digital service channels and integrating AI into its product offerings. This approach is designed not only to engage younger users but also to cultivate them into high-value clients over time. To support this initiative, JPMorgan allocated the largest technology budget among global banks in 2019—amounting to $11.4 billion—with a major focus on identifying effective use cases for AI technologies in banking processes. Similarly, Bank of America has responded to shifting customer expectations by launching digitally enhanced branches that feature contactless ATMs and video-conferencing tools, enabling efficient service delivery while reducing costs. These branches demonstrated promising results shortly after their 2017 launch, with significantly lower foot traffic compared to nearby conventional branches, indicating a growing preference for digital interaction among consumers.

PNC Financial Services has adopted a hybrid approach by introducing "solution centers," which combine self-service tools such as ATMs, video teller machines, and mobile workstations with on-site staff who assist with more complex inquiries. This dual model aligns with the increasing demand for flexibility and convenience in banking services. Capital One, another major player in digital innovation, significantly increased its technology workforce from 2,500 in 2011 to 9,000 in 2019, enabling it to launch "Eno," an AI-powered chatbot aimed at improving customer engagement and operational efficiency. Despite experiencing a major data breach in 2019, Capital One ranked first in the Banking Digital Trust Report by excelling in six critical areas: security, privacy, reputation, reliability, ease of use, and breadth of features. This high level of trust is largely attributed to the bank's early and extensive adoption of cloud computing, which has enhanced its ability to scale services, perform seamless updates, and strengthen cybersecurity measures. Overall, these cases illustrate how major U.S. banks are redefining traditional service models by integrating digital technologies and AI, thereby responding

effectively to changing consumer expectations and maintaining competitive positioning in the digital age (Insider Intelligence, 2023).

1.2.EU Banking System

In the European Union, numerous banking model approaches exist, one of which is the prevalent universal banking system. This approach allows credit institutions to conduct both commercial and investment banking activities while also offering additional services such as capital market transactions and insurance, in conjunction with traditional banking operations. In the context of the EU, banking activities can be broadly classified into retail and wholesale banking. Retail banking encompasses deposit banking, branch banking, and commercial banking, providing a diverse array of services including time and demand accounts, check clearance, letters of credit, short-term loans, consumer loans, credit cards, foreign exchange transactions, money orders, and securities trading on behalf of clients. Notably, retail banking within the EU primarily operates at the national level. In contrast, wholesale banks specialize in obtaining substantial funds from international money and capital markets using high tech, typically through a limited number of branches. These banks facilitate international trade financing by employing innovative techniques such as factoring and forfaiting and primarily operate within specific financial centers. The competitive nature of these international markets further characterizes wholesale banking (Tiftikcioğlu, 2011).

1.2.1. European Central Bank

The European Central Bank (ECB), an institution within the European Union, is founded upon the principles of economic integration and serves as the appointed monetary authority for member states (Yazgan, 2003).

The ECB has been established in 1998 with the aim of achieving the Economic and Monetary Union, the ECB does not independently conduct monetary policies. Instead, it operates within the framework of the European System of Central Banks (ESCB), as specified by the Maastricht Treaty, collaboratively implementing the community's monetary policy alongside the National Central Banks of member states. The ECB has two main goals: to maintain price stability and to promote financial stability in the region. The ECB places great emphasis on ensuring that

prices remain stable, but it also works to ensure that the financial system remains stable within the region.

The ESCB, established within the context of the European Union's monetary policies, primarily serves three objectives: (European Central Bank, 2022)

1. Maintaining price stability in the euro area, which is the fundamental goal of central banking,
2. Developing a geographically extensive Eurozone and fostering long-term relationships between National Central Banks and national banking institutions,
3. Facilitating the integration of multiple nationalities, languages, and cultures within the Eurozone.

National Central Banks are expected to fulfill the third objective more effectively than the international ECB. Consequently, a collective system incorporating National Central Banks was established, rather than a single international Central Bank for the union. The ESCB is responsible for formulating and executing a unified monetary policy, conducting foreign exchange transactions, managing and maintaining the foreign exchange reserves of the countries participating in the monetary union, and ensuring the smooth operation of payment systems. These responsibilities are jointly carried out by the ECB and the National Central Banks within the system (Erdinç, 2021).

The ECB is responsible for a range of key tasks within the Eurozone. This includes setting interest rates that dictate the amount of money in circulation and impact inflation levels. The ECB also manages foreign currency reserves and regulates the buying and selling of currencies to ensure exchange rate stability. In addition, the ECB supervises financial markets and institutions, working in collaboration with national authorities to ensure their safe and secure functioning. The ECB also monitors the production of euro banknotes by Eurozone countries and continually monitors price trends while assessing risks to price stability. Overall, the ECB plays a crucial role in ensuring the health and stability of the European banking system (ECB, 2020).

1.2.2. European Banking Authority (EBA)

The European Banking Authority (EBA) is responsible for a broad range of activities aimed at ensuring financial stability, promoting transparency in the banking sector, and safeguarding investor interests. Among its various duties and powers, the EBA coordinates international banking audits, oversees market functioning in alignment with corporate and financial management principles, and provides advisory support for the development of regulations pertaining to banking, payment systems, and electronic money applications. The EBA also contributes to legislative improvements and developmental initiatives at the EU level, including those related to savings deposits and bank liquidation. In summary, the EBA plays a crucial role in promoting effective banking regulation and maintaining the soundness of the European financial system (Ministry for EU Affairs, 2011).

The primary objective of the EBA is to play a crucial role in the development of a unified market within the EU for the banking sector. It is responsible for creating and implementing a consistent regulatory framework that applies equally to all banks and investment companies operating within the EU. The EBA works towards establishing a single rulebook on banking, which will serve as the standard for all financial institutions in the EU. The regulatory framework for the EU's single market in banking is established through a set of rules put in place by the EBA. These rules are derived from the legislative proposals of the European Commission and are further developed by the EBA through the creation of technical standards, guidelines, and recommendations aimed at both financial institutions and EU supervisors. The resulting single rulebook provides a consistent framework for the banking sector across the entire EU (EBA, 2016).

The EBA relies on data from credit institutions (CIs) and Monetary Financial Institutions (MFIs) in its reporting process. Despite the fact that the ECB does not have access to pure bank data, the EBA considers it necessary to analyse the banking sector through CI and MFI data as banks account for a significant portion (75-80%) of the EU's financial system (Stehnei et al., 2020).

In the financial world, CIs and MFIs are two different types. CIs are mainly banks that take deposits and give out loans and credit. MFIs include a wider group. This group has CIs but also

has other financial players like investment funds and insurance companies. CIs focus more on banking and lending money, while MFIs deal with a variety of financial services and investments. So, all CIs are part of MFIs, but not all MFIs are CIs.

A credit institution is defined as a business entity that accepts deposits or funds from individuals with terms of repayment and provides loans, or any other legal entity, excluding those that meet the first definition, that issues electronic money as a means of payment. Monetary financial institutions, on the other hand, are financial institutions that make up the sector responsible for issuing money within the Eurozone. This sector includes the Eurosystem, resident credit institutions defined by EU legislation, and other financial institutions that primarily attract deposits and/or closed substitutes for deposits, engage in lending and/or investing in securities, mainly money market funds (Stehnei et al., 2020).

1.2.3. European Banking Sector at Glance

Europe's banking industry is currently robust and well-equipped to handle a potential downturn in economic growth and an increase in loan defaults. In the medium term, banks are expected to maintain profitability, aided by rising interest rates. However, it's crucial for these institutions to persist in implementing structural changes. These include digitizing business operations, adapting their branch networks, and promoting further consolidation within the sector. Additionally, focusing on sustainable and responsible banking practices will become increasingly important in this evolving financial landscape. This approach ensures that banks remain resilient and adaptable in the face of future economic challenges.

Within the context of the European Union's single banking market, the EBA has established a foundational regulatory framework. This framework emphasizes the importance of data from both CIs and MFIs in assessing the contours of Europe's financial landscape. As of 2023, the significance of this framework is underscored by the dominant position of HSBC, recognized as Europe's leading bank with assets totalling €2,680 billion. Supporting this, S&P Global Market Intelligence reports that two of Europe's ten largest banks are headquartered in the UK, with HSBC at the forefront. BNP Paribas and Crédit Agricole also stand out in the European context, holding large volumes of assets and playing key roles in line with EBA guidelines and broader EU banking regulations, as demonstrated in Table 3.

Table 3. Top 10 European Banks by Consolidated Assets (2022)

Bank Name	Consolidated Assets (Mil €)
HSBC Holdings PLC, UK	2,680,720
BNP Paribas SA, France	2,666,380
Crédit Agricole Group, France	2,379,120
Banco Santander SA, Spain	1,734,660
Barclays PLC, UK	1,706,570
UBS Group AG, Switzerland	1,571,050
Groupe BPCE, France	1,531,130
Société Générale SA, France	1,486,820
Deutsche Bank AG, Germany	1,336,790
Crédit Mutuel Group, France	1,105,100

Source: S&P Global, 2023

In 2021, HSBC invested $6 billion in technology as part of its broader strategy to transform its technological infrastructure and enhance the overall customer experience. These investments encompassed the implementation of contextual monitoring within trade finance, improvements in fraud detection and market surveillance systems, and the application of machine learning to boost both the accuracy and speed of risk detection processes. Such initiatives reflect HSBC's determination to remain at the forefront of technological innovation in the financial sector. However, advances in digital technologies and evolving regulatory environments are simultaneously opening the door for new market entrants, intensifying competition. In response, HSBC must continue to innovate, leverage emerging digital tools, and tailor its products and services to meet changing customer expectations. To maintain its competitive position, the bank is required to remain agile and responsive to ongoing developments within the financial industry (HSBC Holdings plc, 2022).

As a bank for a rapidly changing world, BNP Paribas must stay ahead of the changes that impact its customers and society. Innovation is at the core of its strategy, providing the bank with the ability to offer a seamless, efficient, and secure customer experience, particularly in the realm of payment methods. BNP has taken a unified approach to retail banking, making payments the focal point of customer relationships, with the goal of making life easier for consumers and improving vendor performance. Innovation is not limited to technology, as it also allows BNP to differentiate itself by offering responsible investment opportunities that align with customer expectations. The bank recently completed a successful transformation program that

emphasized the use of technology and the industrialization of its business operations (BNP Paribas, 2022).

In 2021, Crédit Agricole CIB initiated a comprehensive digital transformation program with the goal of making digital technology a competitive advantage for the bank. This three-year program will encompass all aspects of the bank's operations, including support functions, front-offices, and back-offices. The objective of this program is to enhance client interactions by providing a seamless and cohesive user experience, to offer new products and services utilizing digital and data analysis technologies, to transform the bank's internal operations, and to foster collaboration with partners. The ultimate aim is to improve operational efficiency, increase agility, and be better equipped to adapt to a changing market through the acquisition of the necessary IT and digital assets (Crédit Agricole Corporate and Investment Bank, 2022).

Against this background, Germany, possessing the European Union's largest economy, presents a compelling case study. The economic prominence of Germany implies that understanding its banking trends and innovations is instrumental for a holistic view of Europe's banking landscape. This is further emphasized by Germany's notable digital banking innovations, many of which are led by fintech start-ups and Challenger banks based in the country.

Regulatory and legal frameworks in Germany, specifically tailored for the digital banking sector, have also garnered attention. Such regulations, potentially serving as a model for other nations, offer insights into the effective and secure management of digital banking. The adoption rate and manner in which Germany has embraced the digital transformation in banking have been significantly influenced by its unique cultural factors, reflecting how digital banking practices respond to cultural nuances.

Moreover, as a key member of the European Union, Germany's path in digital banking offers valuable lessons for fellow EU member states. Analyzing the impact of the EU's overarching policies and regulations on a leading member like Germany provides crucial insights into the EU's broader influence on the realm of digital banking. Through the lens of Germany, one can perceive the collaborative interplay between individual country dynamics, EU policies, and the strategic initiatives of major European banks.

Moving from the broader European context to a more focused examination, Germany emerges as a key case in the digital banking landscape. The selection of Germany is driven by its unique financial market and innovative banking infrastructure, setting it apart within the EU. As the EU's largest economy, Germany leads in digital banking, characterized by rapid technological adoption, customer-focused solutions, and a strict regulatory framework. These factors make Germany an ideal subject for studying digital banking innovations and transformations. Additionally, comparing Germany's digital banking strategies with those of the United States and Türkiye highlights diverse market structures and regulatory approaches, enriching our understanding of global trends in digital banking. This comparison is crucial for a comprehensive analysis of the varied dynamics that shape the sector in different economic contexts.

1.3.German Banking System

As a member of the EU, Germany's regulatory framework for banking is based on EU directives and regulations. The central regulatory element for the German banking sector is the Banking Act (Kreditwesengesetz; “KWG”). This law governs licensing requirements, property control, and supervision.

For specialized financial institutions such as mortgage banks (Pfandbriefbanken), building societies (Bausparkassen), payment institutions, and investment fund management companies, the Directive 2015/2366 (PSD2) on payment services within the internal market also applies (Akbulak, 2022).

1.3.1. BaFin

The Federal Financial Services Supervisory Authority (Bundesanstalt für Finanzdienstleistungsaufsicht; "BaFin") is the designated national regulatory body in Germany. BaFin is responsible for overseeing the banking, insurance, and securities markets.

The legal regulatory framework in Germany, as part of the Continental European legal system, relies on principles of caution rather than strict rules. This gives the BaFin considerable flexibility in handling issues in the German banking sector. The typical model for a German bank is a universal bank that integrates retail banking, corporate finance, and investment

banking. Germany has a substantial banking sector, consisting mainly of public banks, which are either directly or indirectly owned by the state (Akbulak, 2022).

1.3.2. German Banking Sector at Glance

By the end of 2023, Germany had 1,403 banks, including 1,330 reporting credit institutions, with total combined assets of €10.72 trillion. Key banking types included 242 commercial banks, 354 savings banks (Sparkassen), 696 credit cooperatives, and 7 mortgage banks. As of September 2024, the total assets of these banking categories were distributed as follows: commercial banks managed €4.77 trillion, savings banks accounted for €1.56 trillion, credit cooperatives held €1.19 trillion, and mortgage banks controlled €220 billion. (Deutsche Bundesbank , 2024) These data reflect the balanced and diverse structure of Germany's banking sector, where various institution types collectively contribute to the nation's financial resilience. Observed fluctuations in asset distribution, particularly within commercial banks, may signify adjustments in market strategy or responses to evolving economic conditions. This adaptability reinforces Germany's role as a cornerstone of stability in the European and global financial systems.

Germany has three major banks: (Mones, 2024)

1. Deutsche Bank, which is publicly traded and not under the control of any private entity.
2. DZ Bank,
3. Commerzbank, which is also publicly traded and has a significant stake held by the German Federal Government's bailout fund after its recapitalization during the financial crisis.

Deutsche Bank

Deutsche Bank has been actively leveraging technology and innovation to improve transaction lifecycle processes, increase automation, and ensure regulatory compliance. In 2023, the bank's general and administrative expenses rose by 4%, largely due to higher IT-related costs such as vendor services and software investments. As part of its digital transformation strategy, Deutsche Bank partnered with Google Cloud to migrate critical applications to the public cloud, aiming to enhance agility and client responsiveness. This move aligns with broader technological initiatives focused on reducing operational costs, improving control mechanisms,

and driving revenue growth through expanded service offerings. The bank seeks to capitalize on current market trends—including the platform economy, open banking, and third-party collaborations—by building an integrated ecosystem that supports services like robo-advisory tools, digital insurance recommendations, and retail deposit platforms, all centered around its core banking infrastructure (Deutsche Bank, 2022).

DZ Bank

The DZ Bank Group prioritizes the digitization of its business models and workflows, viewing efficiency improvements across the group and its affiliates as a continuous objective. Within the Cooperative Financial Network, R+V serves as the central provider of insurance and retirement services and is advancing its digital transformation by adopting a capital investment strategy that supports an omnichannel sales approach, combining personal and digital interactions. Similarly, DZ HYP is aligning real estate and public-sector financing with cooperative banking efforts and has launched the FK Digital project to modernize its corporate customer operations. This initiative focuses on creating a centralized digital lending platform equipped with an integrated database and user-friendly interfaces. TeamBank AG Nürnberg complements this network by specializing in liquidity management solutions while also investing in the technological infrastructure required to support its strategic growth goals (DZ Bank Group, 2024).

Commerzbank

Commerzbank is directing significant investments toward expanding its online banking capabilities by introducing a modern technological infrastructure and enhancing the overall customer experience. A key area of focus is the digitalization of its Trade Finance product range, with resources allocated to the development of distributed ledger technology-based solutions and strategic partnerships aimed at delivering added value to customers. Additionally, the bank is strengthening inter-system communication to facilitate closer collaboration with clients and partners. Further investments are planned for the transaction banking division, including a comprehensive overhaul of the payment systems landscape to support future product growth. Efforts will also continue to digitalize account management services, improve

functionalities in online portals, and enable access through APIs, virtual accounts, and expanded SWIFT offerings (Commerzbank, 2022).

1.4. Turkish Banking System

The Turkish banking sector is a substantial and influential component of the country's financial system, with extensive implications for the economy as a whole. As a critical intermediary in resource transfer within the economy, the banking sector plays a crucial role in facilitating financial access. Despite a gradual decline in its relative share within the overall financial system over time, the banking sector's importance remains exceedingly high in Türkiye (Akın, 2018).

Türkiye's banking sector is a key and lively part of its economy, known for its toughness, firm regulatory system, and quick embrace of new technology. Despite various global and local economic hurdles, Turkish banks have shown remarkable flexibility, maintaining stability and consistent growth. The sector is strictly regulated by the Banking Regulation and Supervision Agency (BRSA), which ensures tight risk management and compliance with international banking standards. At the same time, the Central Bank of the Republic of Türkiye (CBRT) plays an important role in shaping monetary policy and maintaining financial stability, thus strengthening the overall health and ability of the sector to adapt to economic shifts. Banks have notably moved towards digitization, investing heavily in digital infrastructure to improve customer service quality and operational efficiency. This shift towards digital banking has not only enhanced service quality but also extended financial inclusion, bringing banking services to remote areas and a broader part of the population. Moreover, Turkish banks are crucial in funding significant national infrastructure projects, driving economic growth, and boosting Türkiye's ties in international trade. Continuously evolving, the Turkish banking sector remains a fundamental part of the nation's economic framework and an important player in the wider regional financial scene.

As of December 2024, there are a total of 63 banks operating in the Turkish Banking Sector. Among these, 33 are Deposits banks, 20 are Development Investment banks, and 9 are Participation banks, highlighting the diversity of banking institutions present in the country.

The Turkish Banking Sector has evolved to a stage where it can contend with developed nations, owing to its robust financial framework, autonomous management approach, contemporary banking infrastructure, efficient regulatory mechanisms, technologically advanced services, skilled workforce, and high-quality offerings. The sector has experienced remarkable growth, particularly since the initiation of the "Restructuring Period" in 2002, which has fostered rapid expansion and facilitated its ability to compete on a global scale (Çalım et al., 2022).

1.4.1. The Central Bank of the Republic of Türkiye (CBRT)

The central bank's relationship with the banking sector extends to digital banking as well, reflecting the evolving nature of financial services. Central banks play a pivotal role in shaping the regulatory framework that governs both traditional and digital banking activities. They ensure that financial institutions, whether operating physical establishments or digital platforms, adhere to standards that promote financial stability, consumer protection, and trust in the banking system. As technology advances and digital banking becomes more prevalent, central banks often find themselves revisiting and updating regulations to accommodate new trends and challenges. This includes decisions related to digital identity verification, cybersecurity standards, data privacy, and even the potential introduction of central bank digital currencies (CBDCs). In essence, the central bank's role is to balance innovation in the banking sector with the overarching goals of safeguarding the financial system and protecting consumers.

The CBRT serves as the primary institution responsible for the implementation of monetary and exchange rate policies in the country.

As outlined by the Turkish Central Bank Law, the bank's duties and responsibilities are categorized into five fundamental areas:

Price Stability

The primary objective of the Central Bank is to ensure price stability, which is characterized by a low inflation rate that does not significantly influence economic decisions. The bank possesses the autonomy to determine and implement its monetary policy, as well as to select the tools it will employ to achieve this objective, thereby demonstrating instrument independence.

Financial Stability

Financial stability serves as a complementary goal for the Central Bank. In this regard, the Bank is responsible for implementing regulatory measures pertaining to money and foreign exchange markets to maintain the stability of Türkiye's financial system.

Exchange Rate Regime

The Central Bank collaborates with the Government to determine, develop, and execute the country's exchange rate regime. Furthermore, the Central Bank holds the responsibility for storing and managing Türkiye's gold and foreign exchange reserves, ensuring that these assets are aligned with the nation's interests.

Authority for Banknote Production and Distribution

Pursuant to Article 87 of the Constitution of the Republic of Türkiye, the prerogative to manufacture currency is vested in the Turkish Grand National Assembly (TGNA). Nevertheless, the TGNA has delegated this responsibility for the indefinite production and distribution of banknotes to the Central Bank.

Payment System Framework

The Central Bank is tasked with devising innovative systems to facilitate the secure and expeditious transmission and settlement of funds and securities. Additionally, the Central Bank ensures the continuous functionality of these existing and forthcoming systems, supervises their operation, and implements necessary regulations to maintain their efficiency.

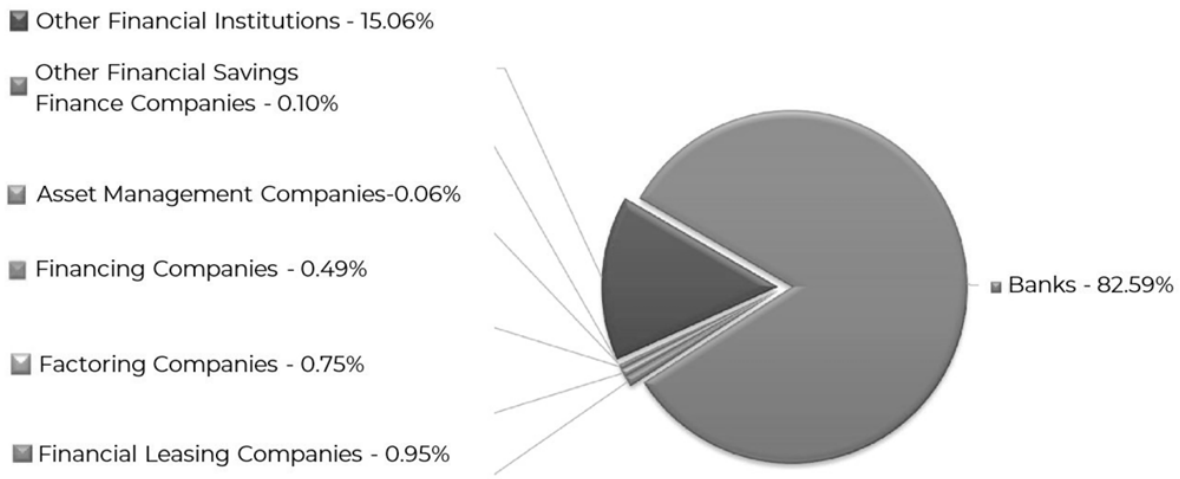
1.4.2. The Banking Regulation and Supervision Agency (BRSA)

The BRSA functions as the primary authority in overseeing and regulating a substantial portion of the financial sector. It is committed to fostering financial stability, advancing the sector, reinforcing supervisory and regulatory frameworks, safeguarding depositors' rights and interests, and augmenting institutional capacity to establish an efficient financial system and robust banking infrastructure. This role is crucial for the development of the Turkish economy in relation to the sector's growth.

The asset size of the financial sector has reached TL 28.5 trillion (approximately USD 968.7 billion) as of the end of 2023. When we analyze the asset distribution of the financial sector, which has reached approximately 1.09 times the gross domestic product (GDP), we see that the Turkish banking industry has the largest share with 82.6% (BRSA, 2024).

Figure 1 shows the pie chart that presents the asset size distribution among various financial institutions regulated by the BRSA. Banks hold the largest share, comprising 82.59% of total assets, while other financial institutions represent a smaller, yet notable, portion of 15.06%. Financial leasing and factoring companies contribute modestly, with proportions of 0.95% and 0.75%, respectively. Financing companies account for 0.49%, whereas asset management companies and other financial savings finance companies represent the smallest segments, at 0.06% and 0.10%, respectively. This distribution emphasizes the dominant position of banks within the financial sector, highlighting their critical role in asset management and overall market dynamics.

Figure 1. Shares of Institutions under BRSA Supervision in the Financial Sector (2023)



Source: BRSA, 2024

The BRSA oversees and regulates 85% of the financial sector by asset volume, playing a vital role in enhancing financial stability and fostering the reliability and efficiency of the financial system. In 2023, total assets saw significant growth across various institutions compared to the previous year: banks grew by 64.1%, financial leasing companies by 66.2%, factoring

companies by 57.8%, financing companies by 87.5%, asset management companies by 87.8%, and savings finance companies by 109.6% (BRSA, 2024).

1.4.3. Turkish Banking Sector at Glance

Figure 2 highlights Türkiye's demographic and financial landscape and shows the growth potential of its banking sector compared to the European Union (EU). With a total population of 85.7 million, of which 53% are under 35 years old, Türkiye benefits from a predominantly young and dynamic demographic that can drive demand for innovative financial services. However, the proportion of the population aged 15 and above that does not have a bank account remains significant at 26%, compared to only 1% in the EU, indicating a clear gap in financial inclusion. On the other hand, Türkiye's internet penetration rate of 91%, well above the global average of 63%, provides a solid foundation for the expansion of digital banking initiatives. In addition, the household debt-to-GDP ratio is only 13%, well below the 59% in the EU and the 49% in emerging markets, suggesting great growth potential in consumer lending. These figures highlight both the challenges and opportunities facing the Turkish banking sector and underscore the crucial role of digitalization and innovative strategies in realizing its full potential.

Figure 2. Turkish Banking Sector (Favourable Demographics with a Digital-Savvy Population and Still Underserved Banking Sector Compared to Europe)



Source: Garanti BBVA, 2023

Key players and asset rankings in the Turkish banking sector in 2023 reveal that, based on consolidated asset size, Ziraat Bank, VakıfBank, and İşbank lead the market. Ziraat Bank remains the largest bank, with assets totaling USD 129.1 billion, maintaining its leadership position. VakıfBank holds the second position with consolidated assets amounting to USD 95 billion. İşbank ranks third, with a total asset size of USD 83.35 billion, followed by Halkbank in fourth place with USD 74.57 billion. The top ten Turkish banks by consolidated assets are presented in Table 4.

Table 4. Top 10 Turkish Banks by Consolidated Assets in Billion USD (2023)

Bank Name	Consolidated Assets (Bil $)
Ziraat Bankası	129.1
Vakıfbank	95
İş Bankası	83.35
Halkbank	74.57
Garanti BBVA	65.56
Akbank	60.78

Yapı ve Kredi Bankası	59.06
QNB Finansbank	33.56
Denizbank	34.23
Türk Eximbank	20.65

Ziraat Bankası

Ziraat Bank maintains a diverse portfolio of domestic and international subsidiaries in areas such as banking, investment services, portfolio management, venture capital, real estate investment trusts, and financial technologies.

Ziraat Bank has distinguished itself within the sector through its advanced use of technology and ongoing integration of digital solutions into its products and services. Throughout 2021, the Bank continued to enhance the quality and efficiency of its IT infrastructure while closely monitoring technological developments. As part of its strategy to expand alternative distribution channels, Ziraat Bank reported 27.7 million digital banking customers, including 17 million active users by year-end. It also achieved notable success in card services, with 10.3 million credit cards and 42.6 million debit cards in circulation, corresponding to market shares of 12.3% and 22.5% in monthly turnover, respectively. Additionally, the Bank maintained a strong presence in merchant services, reporting 895 thousand affiliated businesses, 660 thousand physical terminals, and a 15% market share in year-end turnover, amounting to a total of TRY 282 billion. Ziraat Bank's leadership in point of sale and cash register systems remained steady, with expectations of continued growth in the medium to long term (Ziraat Bankası, 2022).

VakıfBank

VakıfBank continues to play an active role in shaping the future of digital banking by leveraging key technologies of the digital age, including big data, artificial intelligence, data analytics, cybersecurity, open banking, and robotic process automation. In 2021, the Bank completed the development of its innovative project "Vinov," described as "Next Banking," which offers a fully digital, end-to-end payment management solution supported by VakıfBank guarantees for deferred payments. Additionally, the launch of the All Account product within the framework of open banking allows businesses to access consolidated financial information from multiple

banks via VakıfBank's digital channels, streamlining account management. In line with its digitalization goals, VakıfBank also introduced a remote customer onboarding system in May 2021, resulting in 74,000 new customers by year-end. Overall, the Bank added 1.2 million new digital users in 2021, bringing its total to over 9 million, while digital transaction volumes rose by 36% compared to the previous year (VakıfBank, 2022).

Türkiye İş Bankası

İşbank's digital banking strategy focuses on delivering contextual and personalized customer interactions through end-to-end digital experiences. In 2021, key enhancements were made under the Maximum Mobil program, including digital approvals for credit card contracts and expanded contactless payment features. By year-end, the number of Maximum Mobil users rose to 3.9 million, marking a 22.2% increase from the previous year, with 2.1 million identified as active users. Investments in digital transformation programs across retail, commercial, and branch services reached 44.2 million TL, contributing to the renovation of 510 branches. The bank has also adopted a strategic approach to artificial intelligence (AI), aiming to improve customer service and operational efficiency by automating routine tasks and reallocating employees to more value-added functions. An agile model governs AI-related efforts, which received 15.79 million TL in investment by the end of 2021. Robotic process automation has been deployed extensively, with the number of robots reaching 83 and 250 new robotic processes implemented, collectively saving approximately 600,000 work hours across operational and headquarters departments (Türkiye İş Bankası, 2022).

İşbank works to develop technology and business models that are well-suited to the latest competitive conditions, allowing for the accurate prediction and timely execution of strategic moves in the rapidly developing digital world. To achieve this goal, the bank adopts an open innovation approach, leveraging ideas and technologies developed by external entities such as technology companies, universities, and startups, to develop innovative new products and services.

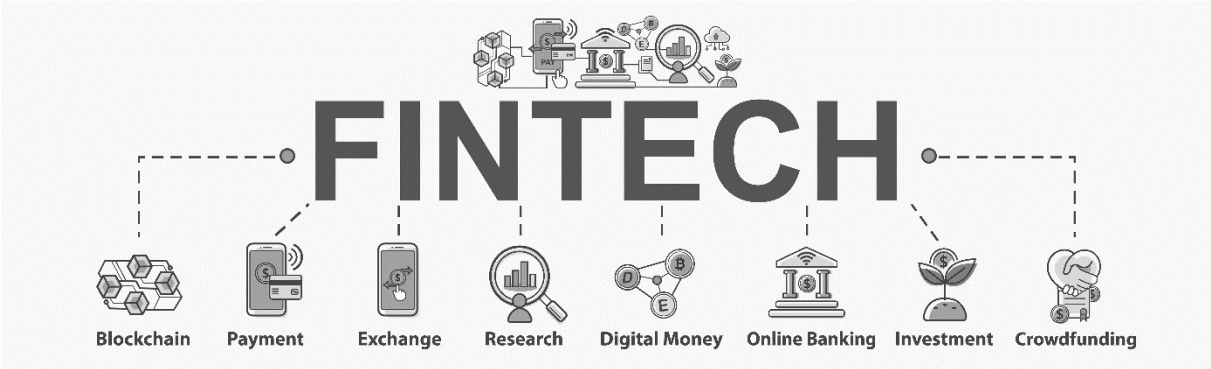
2. FINANCIAL TECHNOLOGY

The application of information, communication, and technology has had a profound influence on numerous sectors, including financial services. The advent of digital transformation has introduced significant changes to the financial industry and has stimulated the development of artificial intelligence (AI) technologies in finance. In particular, the widespread utilization of data has played a crucial role in this development (Çöllü, 2021).

According to the Oxford Dictionary, "fintech" refers to the utilization of computer programs or other technological innovations for the provision of banking and financial services. Figure 3 presents a visual representation of the core facets of financial technology, with "Fintech" at the center anchoring a network of interconnected components. These components include advancements such as blockchain, digital payments, currency exchange, and online banking. The figure also highlights the growing significance of research, digital money, investments, and crowdfunding in today's financial ecosystem. Overall, the illustration offers a concise overview of the technological innovations that are reshaping the modern financial industry.

Figure 3. Technological Innovations in Modern Finance:

A Snapshot of Fintech Dynamics



Source: Howat, 2020

The fintech industry is an emerging sector that aims to challenge traditional approaches by employing technology and innovation to enhance the delivery of financial services. The industry's primary objective is to leverage technology-driven solutions to optimize financial operations.

Fintech companies are novel financial entities that combine the domains of finance and technology to enhance the delivery of financial services. This integration is aimed at providing services that are more efficient, quick, and user-friendly, thereby making them accessible to a wider audience. These fintech firms utilize technological innovations—such as data analytics, artificial intelligence, and machine learning—to tailor financial services to the specific needs of their clients. By leveraging technology, fintech institutions have created new ways of delivering financial solutions, enabling access to services that were previously difficult to obtain. The overarching goal of such firms is to revolutionize the financial industry by introducing innovative methods that enhance efficiency, security, and cost-effectiveness.

Individuals with experience in financial institutions or those who were unable to find a place for themselves have brought innovative perspectives to the finance sector by combining their expertise with software production and technological developments, resulting in the emergence of fintech companies. Although innovation processes can be complex, entrepreneurs who are experts in their fields have been able to bring innovative financial products to the sector in a systematic way (Wonglimpiyarat, 2017).

By prioritizing customer experience and utilizing software and artificial intelligence, fintech companies have made significant contributions to the industry and have gained a reputation for being forward-thinking and innovative. These companies have reduced transaction costs through the use of technology and products, and they have facilitated economies of scale in the collection and use of big data. Additionally, they have provided cheaper and more secure information transfer and have reduced verification costs (Thakor, 2020).

Fintechs have ushered in a transformation in the customer journey of financial services, as digitization has given rise to innovative financial technologies that offer increased accessibility to financial products and services. Financial institutions are keen on adopting fintech solutions to keep pace with the rapidly evolving regulatory landscape and leverage big data to strengthen customer relations. Fintech represents a novel dimension in the financial industry and has driven the sector to new heights. Financial institutions are increasingly leveraging fintech solutions to enhance their services and gain a competitive edge. These entities are utilizing fintech technologies to improve their offerings and stay relevant in a rapidly evolving financial

landscape. The adoption of fintech solutions is a vital step towards embracing technological advancements in the financial industry and transforming the way financial services are delivered (Alam et al., 2021).

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2.1. History of Financial Technologies

The fintech sector has been characterized by a continuous process of innovation and change since the introduction of credit cards in the 1950s, which represented the initial wave of disruptive technology in banking systems. In the following decades, there were several significant advancements in financial technology. The 1960s witnessed the advent of automated teller machines (ATMs), which replaced cashiers and branches. In the 1970s, electronic stock trading was introduced in the stock market. The 1980s marked a significant turning point for the financial sector, as banks began to adopt host computers and more advanced data and record-keeping systems. The 1990s saw the proliferation of business models for the internet and e-commerce, which further transformed the financial industry. These technological advancements have had a profound impact on the financial industry, enabling financial institutions to offer more efficient and user-friendly services to their customers (Alam et al., 2021).

During the 1990s, the adoption of online banking services was facilitated by the emergence of the internet, while the 2000s saw the rise of Fintech innovations centered on mobile payments

and crowdfunding. Arner et al. (2015) categorized this long-term interaction process into three distinct periods, which are outlined as follows (Arner et al., 2015):

Fintech 1.0 (1866-1967): The period of financial globalization, which began with the telegraph and transatlantic cable, experienced a transformation with the introduction of the ATM by Barclays Bank in 1967. This era, referred to as Fintech 1.0, was marked by the integration of technology in the financial services sector, although the industry structure remained predominantly analogue. In addition, also Diners Club began its proud history in 1950, all because a man named Frank McNamara had dinner in a New York restaurant but left his cash in another suit. Unable to pay the bill without his wife coming to bail him out, he resolved never to be embarrassed again and founded Diners Club.

Fintech 2.0 (1967-2008): Following the introduction of the ATM and the calculator, the financial industry moved from an analogue structure to a digital one in what is now known as the Fintech 2.0 era. This period witnessed the emergence of electronic payment systems and the establishment of the SWIFT interbank financial communication association. Additionally, the establishment of NASDAQ in the United States and the development of the national market system facilitated a transition from physical to electronic trading of securities. The traditional regulated financial services sector played a dominant role in providing financial products and services, utilizing technology in this era.

Fintech 3.0 (2008-Present): The end of Fintech 2.0, marked by the global financial crisis, gave way to the Fintech 3.0 era, which saw non-bank startups and technology companies offer financial products and services directly to businesses and the public, challenging the dominance of traditional financial institutions. This era has been marked by increased diversity and innovation in the sources of financial services.

The 2008 Global Economic Crisis was a pivotal moment for the fintech industry. Financial technologies became prominent during the crisis for their ability to reduce costs, provide transparency, eliminate intermediaries, and grant access to financial information. As banks struggled with liquidity issues and unpaid loans, several entrepreneurs recognized an opportunity to enter the market by combining financial services with technology, thereby reducing costs and prices. Fintech technologies emerged around the time of the financial crisis

and rapidly expanded in the past five years. The development of technology has enabled more efficient use of information, leading to the creation of many innovative financial products in the past two decades. This, coupled with the diversity of financial products, has led to an increase in the number of participants, growth of the markets, and diversification of risks. The financial crisis of 2008 was a catalyst for the rise of fintech and highlighted the industry's potential to offer innovative and effective solutions to traditional financial challenges.

In line with the global progress in fintech, Türkiye's development in this sector began to emerge in the early 2000s, happening at the same time as the Fintech 3.0 era. The late 1990s had already prepared the way with the introduction of internet banking. Turkish financial organizations quickly recognized the changing power of digital technologies, leading to significant investments in online banking systems. This period was characterized by the introduction and slow public acceptance of various online banking features. A major step was the establishment of the ICC (Interbank Card Center) in 1990, which played a key role in normalizing and making card transactions safe, thus creating the foundation for future progress in fintech in Türkiye.

After 2008, following the global financial crisis, there was a significant increase in activity in Türkiye's fintech sector, mirroring the global move towards more creative financial solutions. The economic distress highlighted the need for financial services that were not only quick and clear but also focused on customer needs. This time experienced a surge in entrepreneurial activities in the Turkish fintech field. New startups appeared, challenging the traditional banking models with services like mobile banking, digital wallets, various payment options, and peer-to-peer lending. The start of events such as the Istanbul Fintech Week and supportive actions from the government greatly enhanced the growth of this sector. The regulatory structure also changed, shown by the establishment of the Fintech Türkiye platform by the Participation Banks Association of Türkiye, which encouraged a supportive atmosphere for fintech innovation while ensuring customer safety.

The fintech industry's significant impact on financial services brings to the front a critical focus: Security in Financial Technologies. Cybersecurity is essential in this area. Fintech companies prioritize advanced encryption, cyber threat intelligence, and continuous monitoring to protect against cyber attacks. These firms dedicate resources to protecting customer data and

maintaining the integrity of financial transactions. The following section highlights how fintechs are not only at the leading edge of financial innovation but are also deeply committed to incorporating rigorous cybersecurity measures. This approach ensures that the fintech sector remains a secure, reliable, and trusted component of the modern financial landscape.

2.2. Security in Financial Technologies

The significance of cybersecurity within FinTech initiatives is a crucial legal issue, as advancements in financial technology have raised concerns regarding financial cyber attacks. Trust among customers and financial institutions is often approached with caution due to the potential risks associated with the ecosystem. The importance of information security has become more apparent with the development of FinTech, and there are concerns within the industry that certain applications may weaken it (Ulbrich, 2019).

Numerous security and privacy measures are being studied to enhance the acceptability of fintech startups by users, reflecting significant efforts towards ensuring their security and privacy. In the era of rapidly evolving technology, security and privacy are critical at every stage. Certain FinTech services have achieved success in delivering financial services through non-face-to-face authentication systems, emphasizing security and privacy.

The proliferation of digitalization and technological advancements has led to a corresponding increase in the incidence of cybercrime, resulting in instances of corporate banks being vulnerable to cyberattacks in recent times. As a case in point, currency attacks represent the most severe form of attacks faced by banking systems in recent years. FinTechs have responded to this challenge by focusing on web-based accounts and mobile applications, recognizing the potential dangers posed by hackers and seeking to take appropriate precautions. Given the critical importance of customer privacy and bank security, it is imperative that banks continuously update their security measures to guard against cyberattacks, and establish collaborative teams to address emerging attack scenarios. In this context, the innovations of FinTechs have assumed heightened importance, as their innovative models have saved banks time while simultaneously enhancing security measures (Efe et al., 2019).

2.3. Financial Technology Ecosystem

The development and utilization of Fintech services have significant implications for a wide range of stakeholders, including financial institutions, regulators, customers, and retailers in diverse industries. The emergence of novel trends and requirements in the delivery of financial services has led to the creation of a new ecosystem that has an impact on both FinTech firms and non-financial businesses. As such, it is imperative for stakeholders to stay informed about these changes and adapt to the evolving landscape of financial services, to capitalize on the opportunities afforded by FinTech while mitigating potential risks and challenges that may arise.

The emergence of Fintech ecosystems has created avenues for growth across numerous industries, such as software, data analytics, mobile banking, payments, and algorithmic asset management systems. These opportunities have the potential to drive innovation and competition, leading to improved products and services for consumers.

With the evolving dynamics of the banking sector, there has been a notable shift in customer preferences and expectations. As consumers become more accustomed to digital interactions, their expectations and demands have concurrently transformed, leading to a growing preference towards personalized applications within the sector (Menteş, 2019).

The vast environment in which financial enterprises implement and operate their initiatives, contributing to the development of financial technology, is referred to as the FinTech ecosystem. The FinTech ecosystem encompasses a variety of stakeholders, which can be classified into the following categories (Aktürk, 2021):

- The state and its implemented policies are crucial stakeholders in the FinTech ecosystem, as they play a role in shaping the legal and regulatory environment for financial technology.
- Regulatory supervisory institutions and the legal frameworks that they establish are vital contributors to the FinTech ecosystem, as they ensure compliance and provide a level of stability and trust for consumers.
- Financial structures and institutions are significant actors in the FinTech ecosystem, as they provide the infrastructure and services that underpin financial technology innovation and development.

- Angel investors are essential stakeholders in the FinTech ecosystem, providing crucial funding and support to early-stage startups and contributing to the growth of the industry.
- Consumers, or users, of FinTech services are key stakeholders in the ecosystem, as they drive demand and adoption of new technologies, thereby influencing the direction of innovation.
- The dynamics of supply and demand are fundamental to the FinTech ecosystem, as they shape market trends and opportunities for growth.
- Entrepreneurs, specifically tech companies, are primary actors in the FinTech ecosystem, as they drive innovation and development in financial technology.
- New technological developments and infrastructure investments are critical to the FinTech ecosystem, as they provide the foundation for new products and services, and enhance the capabilities of existing ones.
- A skilled and experienced workforce is a significant contributor to the FinTech ecosystem, as it fosters innovation and development through the application of knowledge and expertise.
- Universities and non-governmental organizations play a vital role in the FinTech ecosystem, as they provide education, research, and training opportunities, and contribute to the development of new ideas and innovations.
- Incubation centers are essential contributors to the FinTech ecosystem, as they provide a supportive environment for early-stage startups and contribute to the growth and development of the industry.
- Clubs, foundations, and organizations engaged in organizational activities are significant stakeholders in the FinTech ecosystem, as they provide a range of services and support that facilitate the growth and development of the industry.

2.3.1. Fintech Business Models

After looking into the dynamics of the Financial Technology Ecosystem, it's imperative to understand its practical implications in the business world. This ecosystem doesn't just represent technological advancements; it lays the foundation for a variety of innovative business strategies and models. In the following section, we will explore how financial technology has revolutionized traditional business models, forming the way for novel approaches to both finance and commerce.

The business models utilized in the FinTech industry are generally focused on digital wallets and payments, financing and crowdfunding, asset management, insurance services, and compliance services.

2.3.1.1. Digital Wallet and Payments

Digital wallets, also known as e-wallets or electronic wallets, are secure systems designed to store payment information for cashless transactions. This technology digitally stores a user's payment cards, allowing them to make online payments via electronic devices such as smartphones, tablets, or computers. The primary aim of digital wallets is to eliminate the need for physical wallets. To utilize a digital wallet, users must first download and install the appropriate application on their electronic device. Cryptocurrency wallets are also becoming increasingly popular, as they allow users to store private passwords for digital currencies such as Bitcoin. By utilizing digital wallets, consumers can enjoy the convenience of cashless transactions while benefiting from increased security measures that protect against fraud and other security risks associated with traditional payment methods. Digital wallets are revolutionizing the way consumers interact with their finances, facilitating the adoption of new payment methods that are both efficient and secure. The potential applications for digital wallets are extensive and extend beyond their current use in cashless transactions. These applications include real estate purchases, housing finance, utilities, school payments, investments, donations, money transfers, healthcare payments, luxury spending, and more. The primary objective of digital wallets is to enhance the shopping experience for both buyers and sellers, offering a convenient and secure payment method that eliminates the need for physical wallets and traditional payment methods (Alam et al., 2021).

Fintech enterprises that concentrate on payment activities are attracting customers rapidly due to their cost-effective services, and are among the fastest adopters of new payment methods. These companies operate in two distinct markets: the consumer and retail payment markets, as well as the wholesale and corporate payments markets. Since retail payment services, including payments, are used extensively on a daily basis, they necessitate relatively low levels of regulation.

2.3.1.2. Financing and Crowdfunding

Following the global financial crisis, banks have become more cautious about granting loans, making it harder to secure personal or commercial financing. This has led Fintech companies to focus more on developing lending and financing solutions to address the challenge. Consequently, Fintech firms have introduced numerous innovative innovations that encompass the development of alternative financing models, the establishment of online data sources, the utilization of data analytics for risk pricing, the expediting of lending procedures, and the provision of low operating costs. This has led to the emergence of various novel alternative financing channels, distinct from conventional systems.

Crowdfunding represents a significant alternative financing method, enabling businesses to acquire funds at reduced costs or through non-traditional means. This modality of financing entails the aggregation of monetary contributions from numerous participants to achieve a collective objective. Distinct from conventional banking institutions, the crowdfunding platform operates as an intermediary in this funding approach. Moreover, Fintech firms may also furnish services encompassing factoring services or loan disbursement without necessitating mass participation within the ambit of financing endeavors (Dorfleitner et al., 2017).

Fintech companies have conducted extensive analyses of their customers' unique requirements and have created a range of specialized products to cater to various user segments. These offerings include finance against invoices, revolving credit, factoring loans, credit listings, investment management, financial advice, and credit comparison. Such efforts have been made by fintechs to appeal to a diverse range of customer needs.

Obtaining a loan from traditional banks can be a challenging task for individuals who lack a credit score or possess a poor one, as the low credit score would serve as an obstacle in securing a loan. Conversely, fintech firms employ diverse data sets, such as social media analytics, educational history, and business potential, to assess a borrower's creditworthiness in such scenarios. As a result, the determination and evaluation of an applicant's creditworthiness can be accomplished within a matter of seconds. This underscores the crucial role that data plays as a primary resource for fintech companies.

Fintech companies have automated various tasks such as loan application risk assessment, in conjunction with the credibility determination of the financing applicant. The automated risk assessment process accelerates the lending process, while simultaneously reducing operational expenses for fintechs. As a result, fintech firms can offer improved and competitive financing rates for borrowers (Alam et al., 2021).

2.3.1.3. Asset Management

Fintech solutions for the asset management sector enable firms to collect and utilize vast amounts of data to improve decision-making capabilities. Amidst a complex and competitive investment landscape, asset managers leverage these technologies to differentiate their service offerings (BDO, 2020).

Fintech companies that adopt the asset management business model offer financial advisory services, particularly in the areas of asset management and disposition (Dorfleitner et al., 2017).

The asset management industry relies heavily on fintech solutions that incorporate advanced technologies, such as artificial intelligence, internet of things, big data, cryptocurrency, and blockchain.

Among the various fintech business models for asset management, robo-advisors or automated asset managers have emerged as one of the most popular. Robo-advisory entails algorithmic and highly automated portfolio management systems that provide investment advice, taking into account an investor's risk tolerance, preferred investment period, and other objectives. Such advisors offer financial advice at a significantly lower cost compared to human advisors (Shin et al., 2018).

2.3.1.4. Insurance Services

Fintech companies providing insurance services have introduced a business model that establishes a direct connection between insurers and customers. These Fintechs enable insurers to collect data from non-traditional sources, in addition to conventional sources, to enhance risk analysis. These Insurtechs utilize data analytics to compute and match risk, and as the potential customer base expands, they offer novel products to fulfill diverse needs.

Moreover, Insurtechs play a crucial role in simplifying the billing process for healthcare services, customizing insurance packages, and resolving issues such as inadequate savings and the absence of personalized retirement solutions for members of pension insurance programs (Sung et al., 2018).

In fact, the insurance Fintech business model has become the most widely adopted model by conventional insurance providers.

Emerging Insurtech can enable insurers to better understand risk estimation to more accurately identify and forecast their losses. The most important benefit of fintech for insurance companies is that it reduces costs.

Cloud-based platforms enable insurance companies to reduce their entry costs and ongoing infrastructure expenditures. Cutting out intermediaries, self-service and automation of basic insurance functions will surely lead to more savings (PwC, 2020).

2.3.1.5. Compliance Services

Regtech, stands for regulation technology, refers to the deployment of advanced technological solutions to address the mounting compliance demands in the financial sector, particularly in the wake of the 2008 global financial crisis.

The primary objective of regtech is to transform the regulatory environment of the financial industry by working closely with financial institutions and regulatory bodies. These companies utilize cloud computing and big data technologies via software-as-a-service (SaaS) to aid companies and industries in achieving efficient and effective regulatory compliance (Alam et al., 2021).

Regtech services are an adaptable and valuable asset for both banks and regulatory agencies. These services can assist financial institutions in achieving compliance more efficiently and effectively, thereby saving time and money.

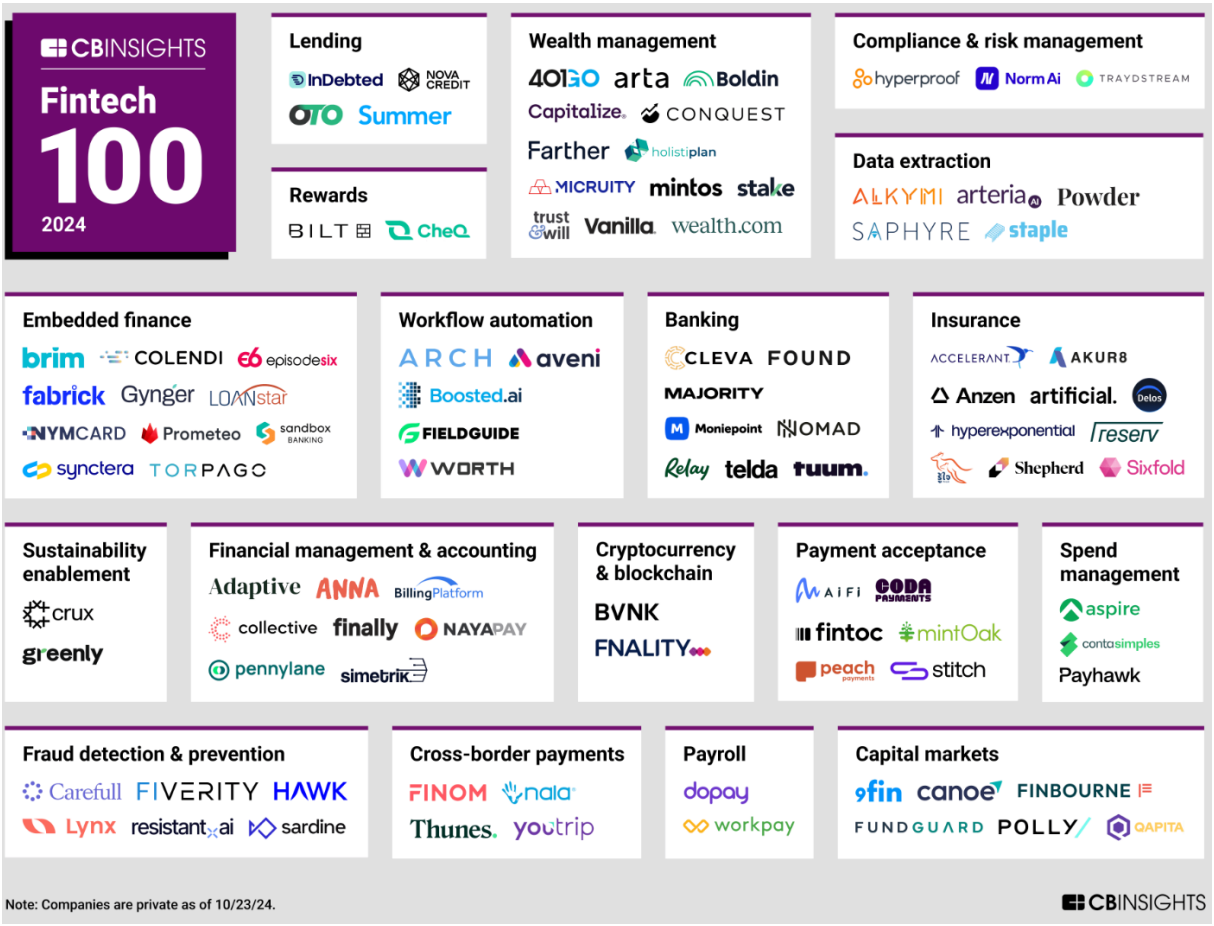
Additionally, regulators can leverage regtech services to ensure that financial institutions are meeting their regulatory obligations. Regtech companies primarily provide services and solutions in the areas of regulatory reporting, risk management, identity management and verification, compliance, and transaction monitoring.

2.4. Fintech Worldwide

The COVID-19 pandemic has had an impact on FinTech firms, depending on the source and nature of their funding. Many FinTech companies rely on investor funding, which initially decreased during the pandemic. Consequently, larger and more established FinTech companies performed better, while smaller, less well-funded firms, many of which are not yet profitable, struggled. Partnerships with traditional financial institutions are becoming more common and can provide a lifeline for some of these smaller companies. Furthermore, many FinTech firms collaborated with governments to provide aid payments and credit during the pandemic.

The infographic presented in Figure 4 illustrates the top 100 financial technology companies of 2024, categorized based on their primary areas of operation, including "Lending," "Wealth Management," "Cryptocurrency & Blockchain," "Fraud Detection & Prevention," and "Embedded Finance," among others. Each category highlights companies that have introduced notable innovations or have significantly influenced their respective domains, reflecting the diversity and rapid evolution of the fintech sector. This classification serves as a benchmark for understanding how these companies align with emerging trends and consumer demands, providing valuable insights into the growth patterns of different categories and identifying potential areas for further research and development.

Figure 4. Fintech 100: The most promising fintech startups of 2024



Source: CB Insights, 2024

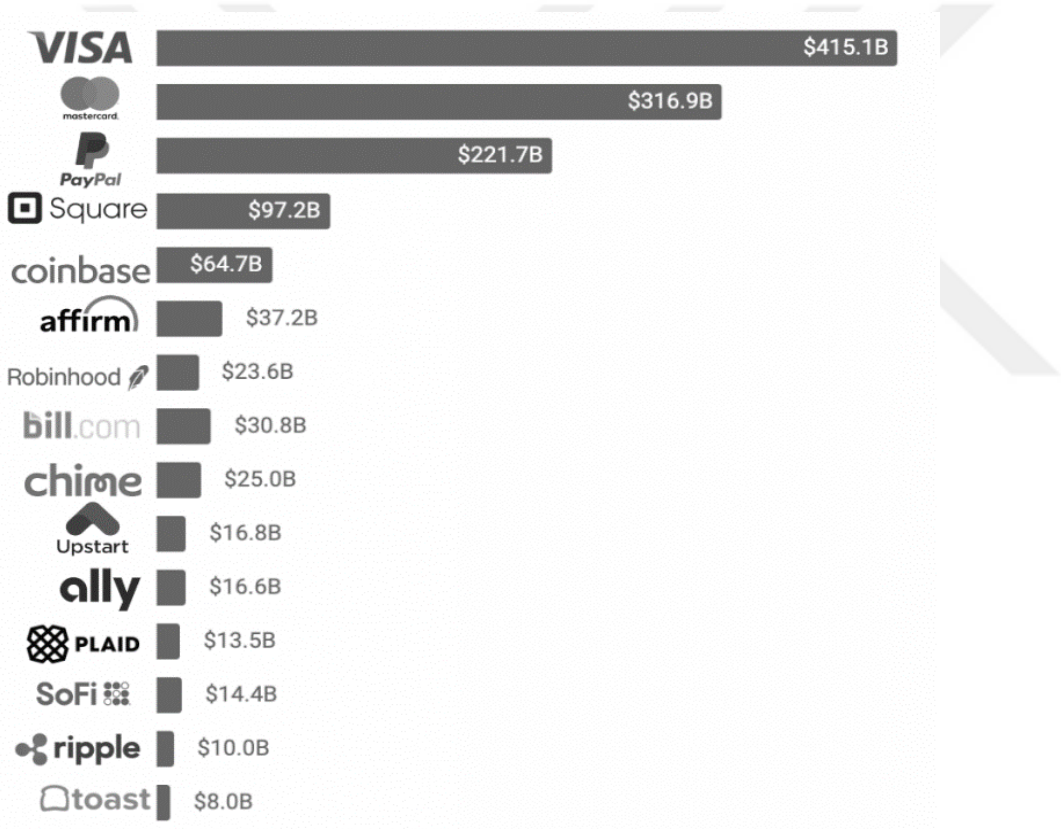
2.4.1. Fintech in the United States

The United States has established itself as a global leader in Fintech, with an impressive 105 Fintech unicorns. This surpasses China and is a notable achievement in the financial technology industry. North America's continued growth in the number of fintech unicorns is fuelled by the significant funding that the sector has received in the region. In 2021, the number of venture capital deals continued to rise steeply in Q2 2021, in contrast to Asia and Europe, where the number of deals decreased (Centre for Finance, Technology and Entrepreneurship (CFTE), 2021).

The Figure 5 depicts the market valuation of prominent fintech unicorns in the USA, with valuations expressed in billions of dollars in 2023. Visa leads significantly with a market

valuation of $415.1 billion, followed by Mastercard at $316.9 billion, and PayPal at $221.7 billion. Square and Coinbase also feature prominently with valuations of $97.2 billion and $64.7 billion, respectively. The chart includes other notable fintech entities such as Affirm, Robinhood, and Chime, with their respective values ranging from $37.2 billion to $25.0 billion. Upstart, Ally, Plaid, SoFi, Ripple, and Toast are listed as well, with valuations from $16.8 billion down to $8.0 billion, reflecting a dynamic and highly valued sector within the financial industry.

Figure 5. Market Valuation of Fintech Unicorns in the USA (Market Valuation in $ Billion-2023)

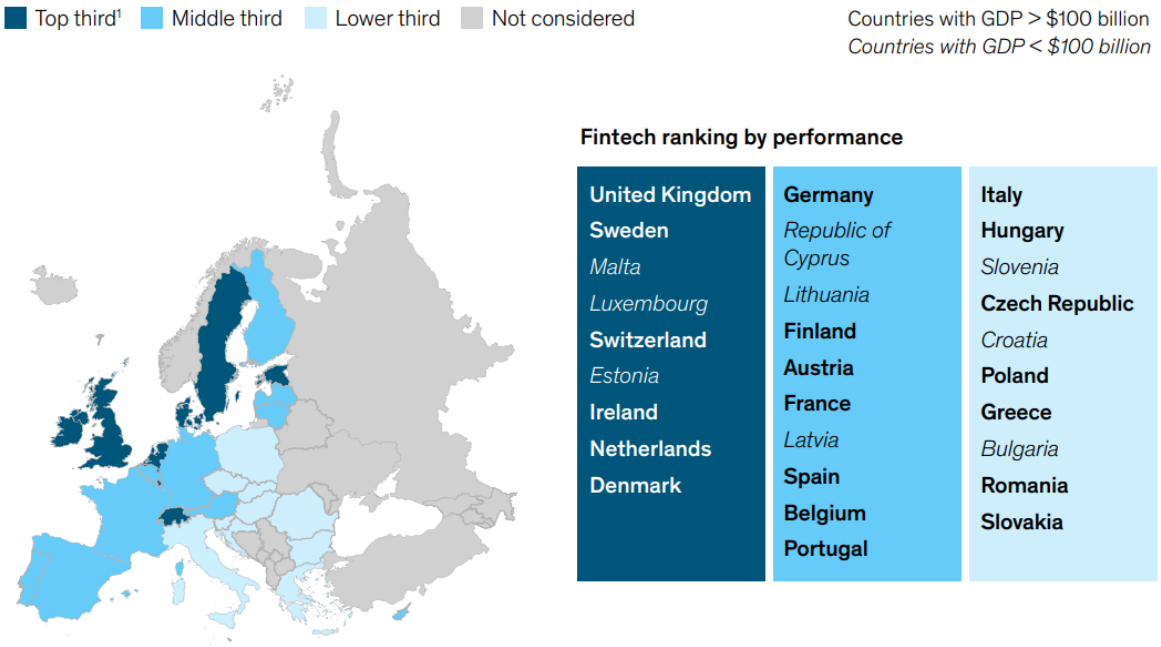


Source: CFTE, 2021

2.4.2. Fintech in Europe

Fintech activity is on the rise in every country across Europe, including some unexpected pockets of strength in comparably smaller economies like Estonia, Luxembourg, and Malta. However, there is a notable divergence in maturity and performance levels among fintech ecosystems across different countries, with significant gaps between the top-performing one-third and the rest, as illustrated in Figure 6. Two countries, the United Kingdom and Sweden, stand out for their exceptional fintech ecosystem performance. (McKinsey & Company, 2022).

Figure 6. European Fintech Performance Variation by Country with Ranking (2021)



Source: McKinsey & Company, 2022

Table 5 presents the top-valued fintech companies in Europe as of August 2024, ranked by market capitalization in billion US dollars. (Statista, 2024).

Table 5. Valuation of Top European Fintech Companies (2024)

Company Name	Country of Origin	Last Known Valuation
Revolut	UK	45
Checkout.com	UK	11
N26	Germany	9.23
Rapyd	UK	8.75
SumUp	UK	8.5
Blockchain.com	UK	7
Klarna	Sweden	6.7
Mollie	Netherlands	6.5
Mambu	Netherlands	5.5
Trade Republic	Germany	5.36

Source: Statista, 2024

2.4.3. Fintech in Germany

Germany is a significant market for Fintech in Europe, and it ranks as the fourth largest globally. Numerous Fintech companies are launching their operations in Germany, and the country is becoming more attractive to international Fintech companies that are setting up branches in Germany to serve the large domestic market.

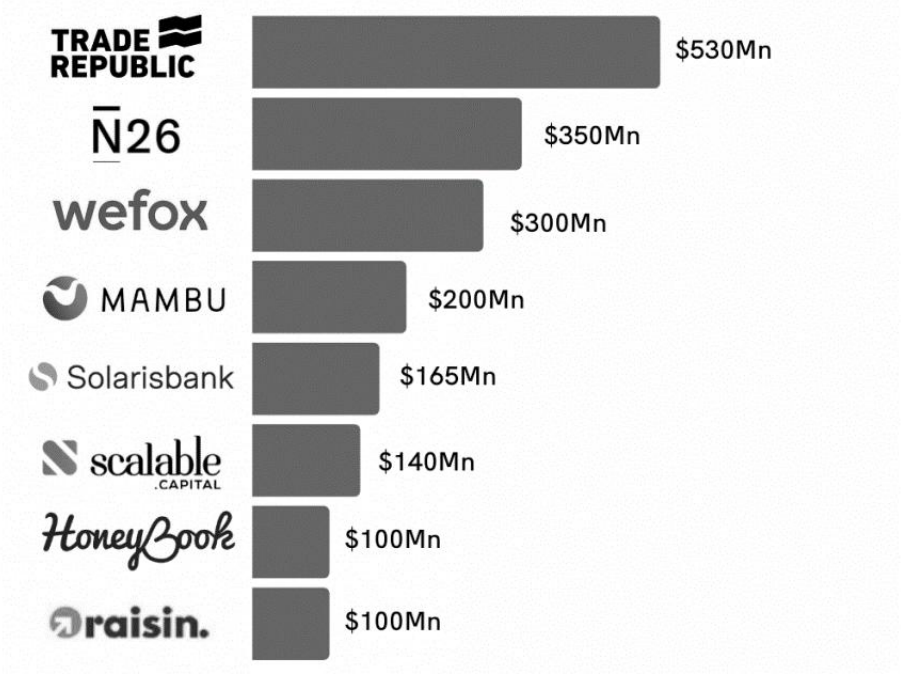
Germany's fintech sector continues to advance, with approximately 1,038 fintech companies as of October 2023 (FinTech Consult, 2023). Berlin remains the hub of fintech innovation in the country. Notably, Germany is home to several fintech unicorns, highlighting its significant role in the global fintech arena. As the fourth-largest fintech market worldwide and a key player in Europe, Germany attracts both domestic and international fintech companies seeking to establish a presence within its borders (The International Trade Administration, U.S. Department of Commerce, 2023). Germany's fintech industry has continued to evolve, receiving steady attention from investors, with significant venture capital funding contributing to its growth. Over recent years, the sector has witnessed a rise in investments, driven by the growing demand for innovative financial solutions. This increase in funding demonstrates the confidence of global and domestic investors in the flexibility and potential of fintech companies

operating in Germany. The country's strong financial ecosystem and technology-driven economy additionally strengthen its position as an important center for fintech growth in Europe.

Here is a list of the fintech companies that became unicorns in Germany in 2023, as shown in Figure 7:

- Trade Republic is a fintech company in Germany that provides investment opportunities through a mobile-only and commission-free brokerage platform.
- N26 is a German digital bank founded in 2013 by Valentin Stalf and Maximilian Tayenthal, currently valued at $3.5 billion.
- Wefox is an InsurTech startup based in Berlin that offers a digital platform connecting brokers, insurance agencies, and individuals with personalised and accessible consultations for various types of insurance. The company is valued at $1.5 billion.
- Mambu, founded in 2011, is a fintech company in Germany that provides a lean, cloud-based core-banking solution for financial services, with a focus on microfinance software-as-a-service technology.
- Solarisbank is a Berlin-based fintech company that provides Banking-as-a-Service Platform, operating under a German banking license.
- Scalable Capital was founded in 2014 and provides digital wealth management and a brokerage with a trading flat rate for private individuals. The company creates and manages globally diversified ETF portfolios for its clients with sustainable investment strategies when requested.
- HoneyBook offers a client experience and financial management platform for independent business owners, combining tools such as billing, contracts, and client communication. This helps business owners stay organized and manage their finances effectively.
- Raisin is a marketplace that provides customers with easy and transparent access to deposits across Europe. They also offer ETF portfolios and pension products in Germany.

Figure 7. Market Valuation of Fintech Unicorns in Germany (Market Valuation in $ million-2023)

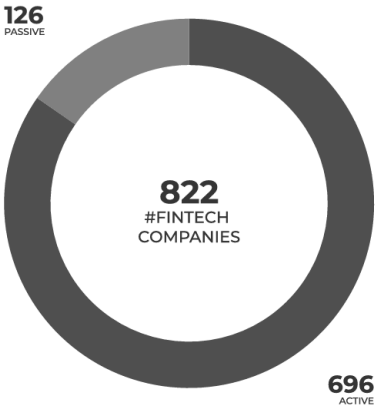


Source: CFTE, 2021

2.4.4. Fintech in Türkiye

Türkiye holds a strong position in banking, technology adoption, and digitalization. With 117.7 million credit cards, it ranks 5th in the world in terms of credit card transactions. The country also has 2 million point-of-sale (POS) devices, 52,900 ATMs, and an impressive 106.6 million active retail digital banking customers, further solidifying its reputation as a leader in the banking sector. Supported by regulations that encourage innovation, Türkiye's fintech ecosystem continues to grow steadily. As of the most recent data, there are 696 active fintech companies and 126 passive ones, making up a total of 822 fintech companies in Türkiye, as illustrated in Figure 8. Fintech startups in Türkiye have become a preferred sector for both banks and venture capital funds (Finance Office of the Presidency of Türkiye, 2024).

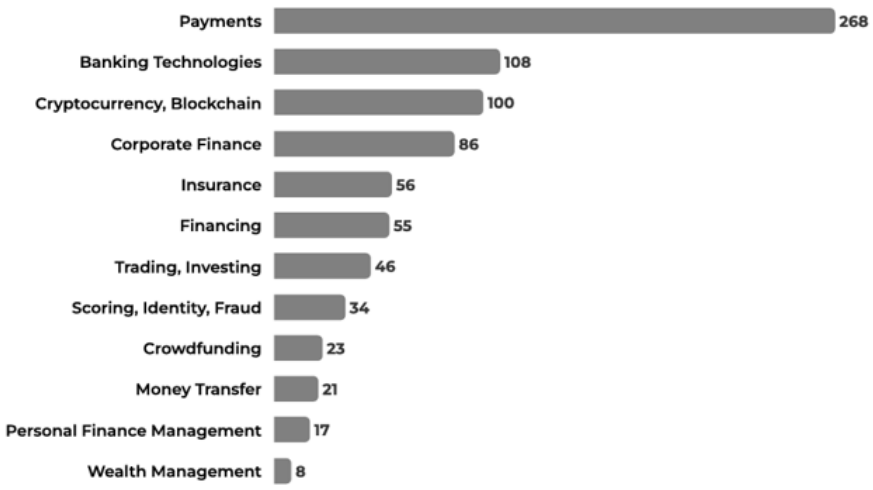
Figure 8. Fintech Company Status: Active and Inactive Numbers in Türkiye-2023



Regulatory developments such as the implementation of share-based crowdfunding, open banking, service model banking, digital banking, and remote authentication are among the most significant indicators of the growing activity within Türkiye's fintech ecosystem.

According to recent data, the fintech industry in Türkiye encompasses a wide range of fields, including 268 payment, 108 banking technologies, 100 cryptocurrency and blockchain, and 86 corporate finance companies, as shown in Figure 9. (Finance Office of the Presidency of Türkiye, 2024).

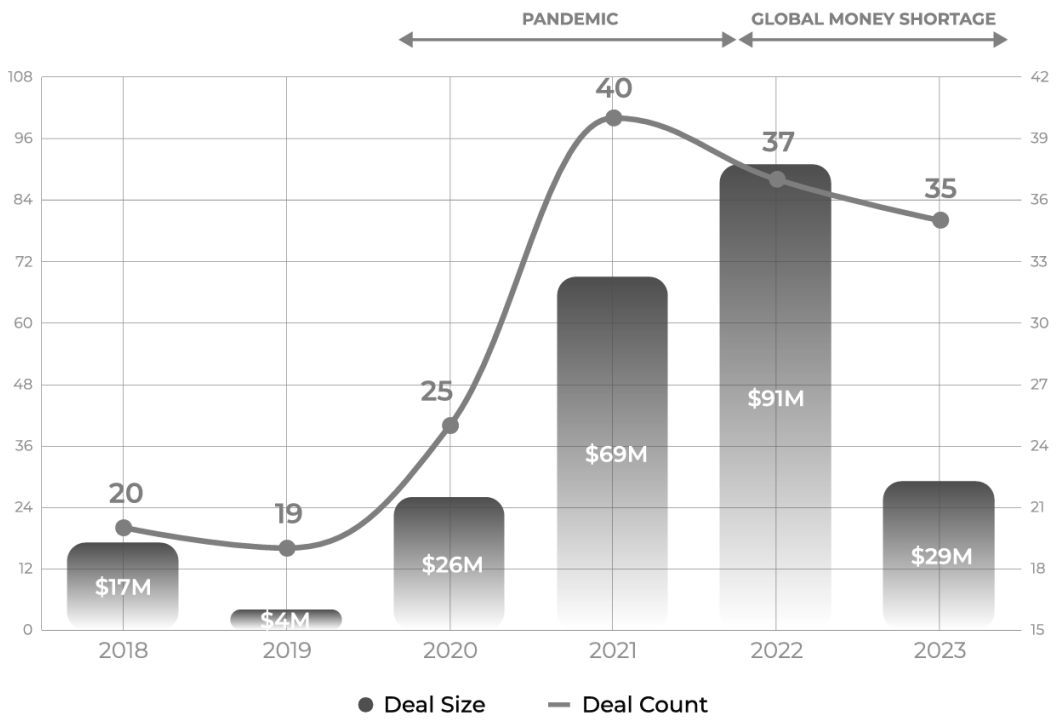
Figure 9. Distribution of Fintech Companies in Türkiye by Category



Source: Finance Office of the Presidency of Türkiye, 2024

During the first quarter of 2022, the combination of slowing digitalization and regional conflicts resulted in a global funding shortage across startup ecosystems. Consequently, many investors shifted their focus to protecting existing portfolios rather than exploring new investment opportunities, leading to a worldwide decline in fintech funding. Türkiye followed this global trend, experiencing notable fluctuations in investment size and deal counts over recent years. Fintech investments in Türkiye reached a high of $91 million across 37 deals in 2022 but fell to $29 million over 35 deals in 2023, reflecting a significant drop. While Türkiye ranked 15th globally for the number of fintech deals, it placed 49th in terms of the total investment amount. This underperformance can largely be attributed to the global financial constraints, alongside the limited international expansion efforts of Turkish fintech startups, as shown in Figure 10. (Finance Office of the Presidency of Türkiye, 2024).

Figure 10. Growth in Fintech Investment and Deal Count in Türkiye



Source: Finance Office of the Presidency of Türkiye, 2024

2.5. Bigtech Companies

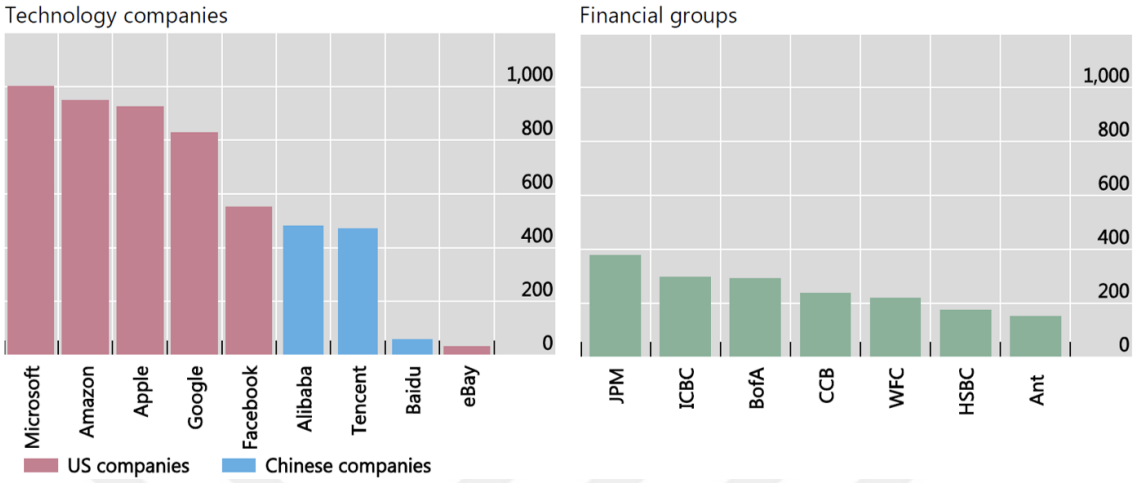
BigTech companies refer to large technology firms that possess established customer networks. Some BigTech firms utilize their platforms to provide financial services, positioning them as a subset of the broader category of FinTech firms. While FinTech firms can encompass a range of technology companies, including smaller entities, BigTech firms are distinct due to their extensive size and established customer base.

The business models of BigTech companies are primarily centered around online platforms that enable diverse users, such as buyers and sellers, to interact. This creates network externalities, whereby the appeal of the platform increases as more users participate. Other industries, such as telecommunication networks and credit card payment networks, also feature network externalities (FSB, 2019).

BigTech firms can rapidly attain significant scale in the financial services industry by capitalizing on several competitive advantages. These advantages include their established customer networks, strong brand recognition, access to proprietary customer data, and cutting-edge technology. Some BigTech firms have demonstrated a swift pace of expansion in the financial services sector.

BigTech companies are already involved in a diverse array of financial activities, particularly in China. In fact, the market capitalizations of BigTech firms in China are comparable to those of the world's largest financial institutions, as shown in Figure 11, and they provide a broad range of financial services through their subsidiaries. (FSB, 2019).

Figure 11. Market Capitalisation of Major Financial Groups and BigTech Firms in 2019, in billions of US dollars



Source: FSB, 2019

Note: Ant = Ant Financial; BofA = Bank of America; CCB = China Construction Bank; ICBC = Industrial and Commercial Bank of China; JPM = JPMorgan Chase; WF = Wells Fargo. Stock market capitalisation.

BigTechs have become increasingly significant players in the financial services industry. As a result, they have come under examination from policymakers, who are calling for new antitrust and competition legislation to address the potential risks associated with their expanding presence in this sector. In particular, regulators must be attentive to the risks posed by big techs' unique characteristics, including their vast scale, extensive customer base, and access to large volumes of data. A new policy approach is needed to effectively address these risks and capture the significant interconnections between various entities within big tech groups and the broader financial system. At the same time, demand for BigTech financial services has been rising, especially in regions with lower financial inclusion and among populations that adopt innovative technologies. BigTechs' ability to offer lower-cost services further fuels this demand. On the supply side, the widespread use of mobile phones, better internet access, novel data sources, official sector support, and increasing availability of funding and talent have all contributed to the expansion and accessibility of their services. Such a policy must strike a balance between promoting innovation and competition while ensuring that the financial sector remains stable and resilient in the face of potential threats posed by the activities of big techs (FSB & BIS, 2021).

Big tech companies initially entered the financial industry through payments services and have since then gained significant market share in certain countries. For instance, in China, big tech firms had processed payments equaling 38 % of the country's GDP by 2018. These companies have since expanded their offerings to include other sectors such as consumer financing, microloans with shorter maturities, banking, crowdfunding, asset management, and insurance, as presented in Table 6 (FSB, 2020).

Table 6. Financial Services Expansion by Major Technology Companies (2021)

Big tech	Main business	Banking	Credit provision	Payments	Crowd-funding	Asset management	Insurance
Google	Internet search/advertising	✓		✓			
Apple	Tech/producing hardware			✓			
Facebook	Social media/advertising			✓			
Amazon	E-commerce/online retail		✓	✓	✓		✓
Alibaba (Ant Group)	E-commerce/online retail	✓	✓	✓	✓	✓	✓
Baidu (Du XIAOMAN)	Internet search/advertising	✓	✓	✓	✓	✓	✓
JD.com (JD Digits)	E-commerce/online retail	✓	✓	✓	✓	✓	✓
Tencent	Tech/gaming and messaging	✓	✓	✓	✓	✓	✓
NTT Docomo	Mobile communications	✓	✓	✓	✓		
Rakuten	E-commerce/online retail	✓		✓		✓	✓
Mercado Libre	E-commerce/online retail		✓	✓		✓	

Source: Crisanto et al., 2021

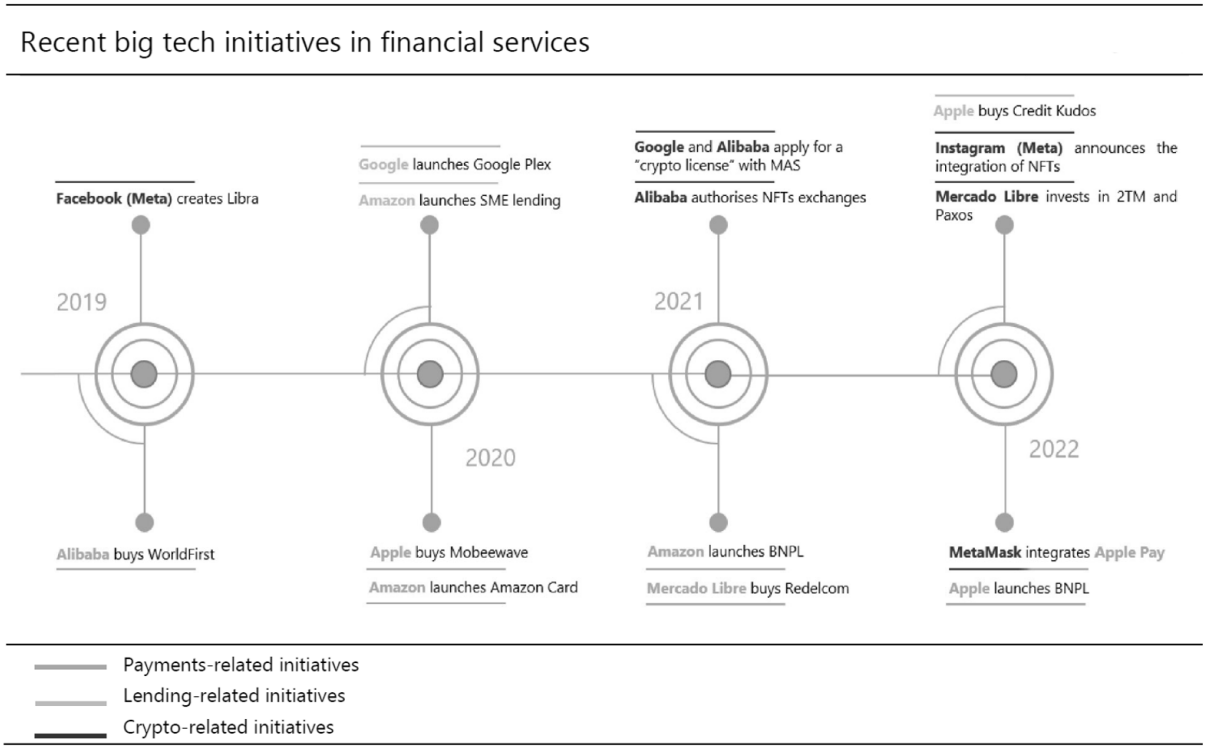
Provision of financial service through big tech entity and/or in partnership with financial institutions outside big tech group in at least one jurisdiction. The core activity of an entity engaged in banking is taking deposits, though regulations vary across countries.

A significant and extensive trend in the financial services industry has been the increasing involvement of technology firms in this market. Large digital service providers, also known as big techs, have made significant strides in several segments of the financial sector and its value chain (FSB & BIS, 2022).

Big techs have acquired significant market shares in digital payment services and have established notable market positions in other areas such as credit and wealth management, particularly in certain jurisdictions like Asia.

The infographic shown in Figure 12 provides a visual representation of the significant progress big technology companies have made in the financial services sector between 2019 and 2022. The timeline is marked by major milestones, differentiated by color codes indicating the type of initiative: payments, lending, or crypto-related. In 2019, notable events include Facebook (now Meta) launching Libra and Alibaba's acquisition of WorldFirst. The year 2020 witnessed Google introducing Google Plex, Amazon's venture into SME lending, Alibaba's endorsement of NFT exchanges, Apple's purchase of Mobeewave, and Amazon launching its card service. The advancements continued in 2021 with Google and Alibaba seeking a "crypto license" with MAS, Apple's acquisition of Credit Kudos, Instagram (under Meta) integrating NFTs, and Mercado Libre's significant investments. Lastly, in 2022, Apple rolled out its BNPL service, MetaMask incorporated Apple Pay, and Amazon and Mercado Libre launched their own BNPL platforms. The graphic concisely encapsulates the evolving role of big tech in reshaping the financial landscape over these years.

Figure 12. Recent Big Tech Initiatives in Financial Services



Source: FSB & BIS, 2022

3. CONCEPT OF DIGITAL BANKING

The development and advancement of the internet have given rise to emerging concepts such as cloud technology, artificial intelligence, the internet of things, augmented reality, and virtual reality. This phenomenon has led to the centralization of computer systems and the automation of the manufacturing process, resulting in the advent of the Industry 4.0 era. Despite their apparent differences and diverse applications, the underlying commonality among these technologies is their primary input and output, which is based on "information." Consequently, the terms "information" and "informatics" are frequently employed to describe this transformative process. Although information has always been a significant input in the production process, the hallmark of the new era is the digital encoding of information.

Digitalization is a complex concept stemming from technological elements that has resulted in cultural, behavioral, and life-cycle changes. It encompasses a broad range of digital activities including e-books, e-commerce, e-banking, e-learning, and more. The emergence of the information society and subsequent acceleration of digitalization are outcomes of these developments. Advancement in world systems, economy, and technology are necessary for the continuous progress of digitalization.

Digital banking refers to a platform that allows banking transactions to be conducted via technology-based devices and applications such as the internet, mobile phones, ATMs, and kiosks, without the need for physical banks or bank personnel. This platform enables various banking services, such as opening deposit accounts, paying bills, transferring funds, including EFT and money orders, and applying for loans, among others (Beybur, 2021).

Digital banking is a modern approach to banking that leverages technology to provide seamless and efficient banking services. It differs from traditional banking in that digital banks strive to develop flexible digital products and services that meet to their customers' specific needs. Unlike traditional banks that rely on pre-designed software, digital banks employ IT specialists such as software developers and analysts to identify customer demands and tailor products or services accordingly (Singhania et al., 2018).

In a digital banking ecosystem, the core component is the Digital Banking Platform, which serves as the main interface between customers and the bank. This platform is integrated with

multiple access channels, including ATMs, kiosks, online banking, mobile banking, payment agents, chatbots, and bank tellers, offering customers various ways to interact with banking services. At the same time, the platform communicates with the bank's back-office systems, which include the core banking system, CRM, switch services, identity management (IdM), and other banking infrastructure. Additionally, the use of APIs allows seamless integration with external services such as payment providers and facilitates operations like loan repayment, money transfers, insurance, tax payments, and internet services. This interconnected structure ensures efficient and real-time service delivery across all digital channels (Kamali, 2020).

The primary goal of digital banking is to meet the changing preferences and demands of customers with the advancements in technology, by offering services at a lower cost and with greater speed. To achieve this goal, digital banking aims to identify the needs of customers and develop products and services that are appropriate for them. Another objective of digital banking is to gain a competitive advantage through the use of technology, by continuously improving processes that cause cost and time loss. By achieving these objectives, digital banking can increase efficiency, improve profitability, and reach new generations of customers who are increasingly relying on technology to manage their finances.

3.1. Differences Between Digital Bank, and Online Banking (Internet Banking and Mobile Banking)

Online banking is a method of conducting personal banking activities via the internet. Customers can perform various tasks such as checking their account balances, paying bills, and transferring money to beneficiary bank accounts using a bank's website or mobile application. It is a broad term that also includes mobile banking, which is banking services accessible through a mobile device like a smartphone or tablet. Although there are differences between online and mobile banking, such as the user interface and services offered, they both offer customers the convenience of managing their finances remotely.

Online banking offers several advantages that enhance both efficiency and convenience for users. Customers can open checking, savings, and other types of accounts online without needing to visit a physical branch. It allows for the electronic transfer of money instead of using traditional checks and makes fund transfers quick and simple. The loan application process is also faster through digital platforms, and users can deposit checks using a mobile device.

Additionally, online banking is often considered safer than traditional methods, making it a secure and time-saving option for modern financial transactions (Khartit, 2022).

Mobile banking is a technological innovation that emerged in the banking sector as part of the digitalization trend, following the introduction of internet banking. With the widespread adoption of smartphones, mobile banking applications allow customers to access their banking information through an application interface installed on their mobile devices. This has led to a significant increase in the use of mobile banking, as it provides a convenient way to conduct banking transactions without the need to physically visit a bank branch (Chang, 2015).

Internet banking refers to the websites developed by banks during the computer age to reduce costs associated with branch personnel and time, and to offer customers a platform where they can conduct transactions without visiting a branch. While it was once a popular banking option, the usage rate of internet banking has decreased considerably due to the rise of mobile banking resulting from digital developments. It is believed that the technology usage skills of users and their adoption of internet banking are interrelated factors influencing the shift towards mobile banking (Hernando et al., 2006).

Digital banking encompasses a broader concept than online banking, as it involves the use of web-based programs by customers to conduct their banking transactions. In contrast to online banking, which only offers digital services to customers, digital banking involves the digitalization of all bank systems, whether they are customer-facing or operating in the background. In essence, digital banking requires the digitalization of all marketing and operational units of the bank, leading to a more comprehensive and integrated digital banking experience for customers (Beybur, 2021).

Online banking and digital banking are both banking methods that utilize technology to provide customers with more accessible and convenient banking options. Online banking focuses on replacing existing banking functions with digital alternatives, allowing customers to access their accounts and conduct transactions remotely through the internet. In contrast, digital banking aims to virtualize the entire banking process, reducing the need for physical bank branches and allowing customers to conduct all banking activities remotely, including account

opening and other financial services. The ultimate goal of digital banking is to create a fully integrated and digital banking experience that is more efficient and accessible for customers.

3.2. Differences Between Fintech Companies and Traditional Banking

Financial consumers who frequently utilize digital technologies desire fast and convenient access to financial services, regardless of time and location. These preferences, influenced by the digital age, have resulted in a growing demand for digital products and services. Consequently, banks fear losing their market share to FinTech institutions as they struggle to keep up with changing consumer demands.

Banks are facing increasing cost pressures in the payments area from tech giants such as Apple, Google, and PayPal. Additionally, the rise of robo-advisors that provide digital financial consultancy services is putting pressure on banks' income in the wealth management sector. Furthermore, peer-to-peer lending (P2P lending) platforms, a form of crowdfunding that provides financing to individuals and small to medium-sized businesses, have the potential to reduce banks' brokerage fees and interest rate revenues. These challenges pose a significant threat to the traditional banking model and require banks to adapt to the changing financial landscape (Bofondi et al., 2017).

Traditional banks are struggling to innovate and are losing customers to FinTechs who offer services that are tailored to their needs and expectations. FinTech companies leverage technological advancements and in-depth analysis of customer needs, which traditional banks are unable to meet. Moreover, FinTech companies have flat hierarchies and adaptable organizational structures that allow them to offer flexible and cost-effective alternatives. They quickly adapt to market changes and prioritize customer focus, transparency, and innovation, which distinguish them from traditional banks (Grewe et al., 2016).

Grewe et al. has identified the difficulties faced by traditional banks in the face of FinTech developments and the advantages of FinTechs, as seen in Table 7.

Table 7. Differences Between Banks and FinTech Companies

Challenges for Traditional Banks		Chances for FinTech Companies
• Moving transactions towards digital channels that are more efficient in terms of cost. • The consistent limitation in production caused by information technologies necessitates structural changes. • Decreasing surplus capacity without a notable rise in profit.	**Technology**	• Developing products and services by harnessing technological advancements, building intelligent networks, and utilizing interdisciplinary collaboration. • Flexible information technology infrastructure capable of adapting to changing needs. • Reduced legal obligations.
• To remain competitive, reconsider the business model or implement changes. • Establishing an end-to-end sustainable digital approach requires forming a suitable management and workforce within the organization to ensure success. • Significantly boost the drive for change.	**Organizational Culture and Structure**	• The ability to gain a competitive advantage through faster time-to-market. • Extremely versatile and flexible. • Flat hierarchies (horizontal organization) promoting efficient and rapid exchange of information both internally and externally.
• Organizational structures, processes, and systems that prioritize products. • Frequently prioritizing profit and cost goals over the desires and needs of customers. • The digital transformation is rendering traditional customer segmentation methods less effective.	**Customer Focus**	• Customer-centric placement of product and service development centers. • Delivery of products and services with a focus on the customer. • Smooth customer engagement facilitated by open systems that enable the collection of customer information/data.
• The products and services offered in the banking industry lack differentiation and can be altered to better suit the needs of the customer. • Branch expansion is no longer a source of competitive advantage. • Inadequate differentiation of products and services can lead to reduced customer loyalty.	**Differentiation**	• Systems and products that are easily accessible and available on mobile devices 24/7. • Streamlining banking operations by enhancing convenience and entertainment through the seamless integration of core and add-on services using (mobile) technology.

		• Providing customer-specific products and services that are transparent in terms of cost.

Source: Grewe et al., 2016

3.3. Digital Banking Evolution

Digital transformation has the power to introduce new players capable of creating entirely new markets by leveraging innovative solutions and creative approaches. One of the primary drivers of digital transformation is the necessity to redefine customer interactions. The customer journey now needs to meet expectations shaped by the continuous and daily use of new technologies. This rapid evolution affects how customers perceive the services they use. As a result, efforts must go beyond merely raising awareness about banking services or providing online access. It is crucial to captivate customer interest through a continuously evolving social and economic strategy that enhances the overall journey (Nicoletti, 2021).

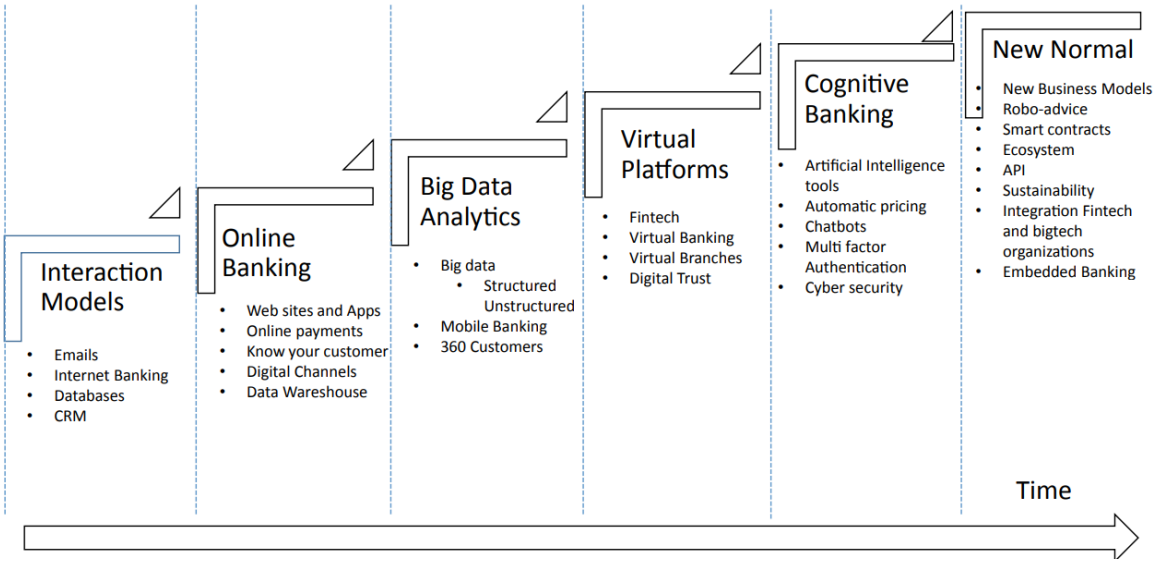
Figure 13 outlines the chronological development of the banking industry alongside technological advancements. Initially, banks utilized Engagement Models featuring emails, online banking, databases, and CRM systems to interact with customers. This phase focused on establishing fundamental digital communication channels and efficiently managing customer relationships.

As the digital landscape progressed, banks transitioned to Online Banking, marked by the introduction of websites and apps, online payments, and other digital channels. This stage emphasized understanding customer needs through data warehouses and enhancing customer experience via mobile banking solutions. The integration of Big Data Analytics allowed banks to analyze both structured and unstructured data, providing a comprehensive view of customers and enabling further personalization of banking services.

The next phase involved the adoption of Virtual Platforms, including fintech, virtual banking and digital trust mechanisms. These platforms have enabled a seamless and secure banking experience in line with the increasing demand for digital financial services. Cognitive Banking has emerged through the incorporation of artificial intelligence tools, automated pricing, chatbots, multi-factor authentication and cybersecurity measures, streamlining banking operations and improving service delivery.

Finally, the New Normal phase represents the current and future direction of digital banking. This phase includes new business models such as robo-advisory, smart contracts, API integration, sustainability initiatives, and collaboration between fintech and large technology organizations. Embedded banking and ecosystem platforms are also an integral part of this phase and represent an adaptable, innovative and customer-focused holistic approach to financial services.

Figure 13. Digital Banking Evolution Scheme



Source: Nicoletti, 2021

3.4. Differences Between Digital Banks and Traditional Banks

Digital banks have experienced a significant rise in prominence over recent years in the world. Operating solely through online channels, they've done away with the need for physical branches, enabling a rapid account setup via their digital platforms. Their emphasis on customer-centric interfaces guarantees a seamless online banking journey for users. While a few may charge ATM-related fees, their primary advantage lies in minimal to non-existent additional charges, thanks to the absence of costs associated with traditional bank infrastructure. This streamlined approach often allows them to offer more attractive interest rates to their customers. However, for customer support, many people might predominantly use online resources or interact with chatbots instead of speaking directly with a human representative.

Observing this digital banking trend, numerous conventional banks have enhanced their online interfaces and rolled out comparable tech-driven offerings to remain relevant.

The table below, prepared by the US-based digital bank Relay, clearly delineates the differences between digital and traditional banks and is presented as Table 8. Digital banks, like Relay, offer the modern convenience of being able to open an account remotely. They often stand out with their no-account-fees policy and lack of minimum balance requirements. Additionally, they provide multiple free checking accounts, a blend of physical and virtual debit cards, and facilitate payments and deposits via methods such as ACH (Automated Clearing House), wire, and check. However, one drawback is their general inability to handle cash deposits. Furthermore, digital banks prioritize security with features like secure role-based logins for teams and tend to seamlessly integrate with accounting software. They offer detailed transaction data and sometimes even advanced accounts payable features. While mobile banking is a standard feature, a vast ATM network might also be part of their service, but they usually don't have physical branches. Customer service in digital banks is predominantly online, using channels like email, chat, and phone. They might not always offer financing and credit cards, and savings accounts might be less common. Yet, the assurance of FDIC (Federal Deposit Insurance Corporation) insurance is typically present. In contrast, traditional banks might not offer many of these digital-forward services, but they shine with features like physical branches, in-person customer service, and more conventional financing and credit card offerings (Stefanka, 2022). In addition, it should be noted that there are examples where the services stated in Table 8, although not typically offered by traditional banks, can be provided with the legislative guidance of regulatory institutions at the conjunctural level, depending on each country’s specific legal framework. Likewise, this issue might also be valid for digital banks.

Table 8. Digital vs. Traditional Banks Comparison Chart

	DIGITAL BANK	TRADITIONAL BANK
Open an account remotely	✓	✕
No account fees	✓	✕
No minimum balance requirements	✓	✕
Multiple free checking accounts	✓	✕
Multiple physical and virtual debit cards	✓	✕
Payments and deposits via ACH (Automated Clearing House), wire and check	✓	✓
Cash deposits	✕	✓
Secure role-based logins for multiple team members	✓	✕
Direct integrations with accounting software	✓	Uncommon
Detailed transaction data	✓	✕
Advanced accounts payable features	✓	Uncommon
Mobile banking	✓	Uncommon
Large ATM network	✓	✓
Physical branches	✕	✓
Customer service	Email, phone and chat	Phone and in-person
Financing	Uncommon	Common
Credit cards	Uncommon	Common
Savings accounts	Uncommon	✓
FDIC (Federal Deposit Insurance Corporation) insurance	✓	✓

Source: Stefanka, 2022

3.5. Customer Experiences for Digital Banks' Services

In the past, bank customers had to spend a considerable amount of time waiting in line at bank branches to withdraw or deposit money. However, the emergence of alternative bank channels has significantly improved the banking experience. Customers can now conveniently make transactions via smartphones, tablets, or computers connected to the internet, saving time and energy. This service application provides a mutual benefit for both the bank and its customers, with banks reducing transaction costs as a result.

To date, research on digital banking has tended to focus on individual channels such as mobile banking or internet banking, rather than taking a holistic approach to the concept. As such, it is difficult to gain a comprehensive understanding of digital banking as a whole. Previous studies have revealed several key findings regarding the usage of digital banking channels.

In a research conducted by Turkmen in 2019, the impact of bank customers' adoption of virtual banking applications on their perceived customer value and loyalty was examined using a sample of 512 individuals who utilized virtual banking products. According to the research, participants displayed a strong ability to adapt to virtual banking applications, and this adaptation had a notable impact on their perception of value and loyalty towards the bank. Additionally, the study revealed that the convenience, benefits, and reliability provided by virtual banking applications were crucial factors that contributed to a high level of customer satisfaction and increased perceived customer value (Türkmen, 2019).

In 2019, two separate studies provided valuable insights into the banking sector's digitalization. Tekin's research highlighted a trend where younger and lower-income customers showed a higher preference and trust in digital banking services, indicating a shift towards digital channels with notable environmental implications (Tekin, 2019). Concurrently, Fettahoğlu and Kıldıze's study on retail bank customers' perspectives on digital financial literacy and fintech usage revealed that attitudes were influenced by factors such as perceived risks, security, legal issues, and the advantages of transacting without intermediaries. These findings collectively emphasize the growing importance of digital banking and the need for financial institutions to address specific concerns to enhance customer engagement with financial technology (Fettahoğlu et al., 2019).

In 2020, a study by Söylemez and Taşkın focused on understanding bank customers' attitudes towards mobile banking applications. It revealed that trust and regulatory compliance were significant factors influencing their usage, while aspects like perceived image, value, and ease of use had less impact. This underscores the importance of trust and adherence to regulations in promoting the adoption of mobile banking apps (Söylemez et al., 2020).

Çoban and Demirhan (2019) conducted a study to determine the experiential value dimensions perceived by consumers in mobile banking. The study also aimed to identify the effect of these dimensions on satisfaction and loyalty towards mobile banking. The results showed that the perceived experiential value dimensions were functional, emotional, personal, assured, intellectual, social, and sensory value, in that order. Furthermore, the study revealed that experiential value dimensions had a significant impact on satisfaction and loyalty (Çoban et al., 2019).

In another study published in 2019, Gezer et al. evaluated the service experiences of bank customers aged 65 and over from banks, using a qualitative study method within the context of experience marketing modules. The goal was to develop strategies for experience marketing to enable older customers to effectively benefit from the services. The study concluded that the 65-year-old age group should be regarded as a "specialized market segment." Moreover, the concept of an "Agingless Bank" was suggested, which would serve exclusively to the elderly and offer traditional banking services in line with experience marketing modules (Umut, 2019).

The 2023 Digital Banking Experience Report highlights significant trends shaping the banking industry in an AI-driven era. A notable 52% of banks view AI as a critical tool for generating new revenue streams, while 63% of financial institutions believe AI will significantly enhance customer service. Investment in AI-enabled automation and workflow optimization remains a priority, with 45% of banks planning to expand investments and 31% aiming to maintain current levels. Despite these advantages, risks are evident, as 37% of banking executives fear that AI increases the likelihood of cyberattacks. On the other hand, 74% of banks consider collaborative business models essential for future success. Customer trust continues to be a cornerstone, with 80% of customers trusting their specific bank, though 51% feel banks prioritize profits over customer needs. Additionally, personalization demands are growing, with 62% of clients wanting automated tools for budget management and 48% valuing advisors who understand

them well. These findings underline the evolving landscape of digital banking, driven by AI, personalization, and customer trust (Sopra-Steria, 2023).

Aksoy (2021), whose study was related to digital banking customers' perceptions of experiential marketing, found that opinions did not differ significantly according to age, gender, and education. However, there was a significant difference in opinions based on working status and monthly average income. Private sector employees had a more positive opinion of the sensory dimensions of experiential marketing than non-working or unemployed customers. In addition, student customers had a more positive opinion of sensory dimensions than non-working or unemployed customers, and private sector employees had a more positive opinion than public sector customers.

In the rapidly evolving landscape of digital banking, customer experience has become paramount. Advanced Mobile Banking Technology not only provides an omnichannel experience but ensures that banking services are accessible anytime, anywhere. Enhancements such as Facial Recognition and Biometrics have revolutionized the security aspect of transactions, making them more secure while ensuring seamless user interactions. Artificial Intelligence, particularly voice interactions, empowers customers to perform banking activities like balance checks without the need for traditional interfaces. Additionally, the simplicity introduced by QR-Code scans for mobile e-payments ensures quick and effortless transactions. Machine Learning has also taken the forefront, especially for investors, offering tools to manage their portfolios efficiently and providing automated, personalized advice. Furthermore, the migration to Cloud Technology highlights banks' commitment to agility, scalability, and innovation. By integrating these advanced technologies, banks are not only staying keeping pace with the digital revolution but are significantly elevating the overall customer experience in the digital banking sphere.

3.6. Benefits of Digital Bank Activities to the Country's Economy

Within the framework of economic theories, financial innovation contributes to the economy through efficiency, capital growth and technological innovation. The financial system plays a crucial role in facilitating the hedging, diversification, and pooling of risk. Moreover, it is responsible for allocating resources, exercising corporate control by monitoring managers, mobilizing savings, and facilitating the exchange of goods and services. These functions have

a significant impact on economic growth through the channels of capital accumulation and technological innovation. Innovation within the financial system reduces risk and improves efficiency, leading to a decrease in monitoring costs and enhancing investment efficiency for any equilibrium growth rate.

Financial innovation, as an integral part of the economy's financial system, has the potential to increase the efficiency of financial intermediation by expanding the range of available financial products and services. Financial institutions play a critical role in matching savings with firms that contribute to production, channeling the capital accumulation that results from these productive investments into economic growth.

Digital tools have the potential to expand access to finance and bring about various positive outcomes, including increased productivity and investment, reduced poverty, empowerment of women, and stronger institutions with less corruption (McKinsey Global Institute, 2016).

While numerous studies have demonstrated a positive correlation between financial innovation and economic growth, there are also perspectives that view innovation as a significant force in shaping society. Financial innovation does not always guarantee economic growth. To better understand this relationship, it is important to define what is meant by innovation and how it will impact the financial system's concentration, risk, and workforce in both the present and future. It has been suggested that the potential benefits of financial innovation may be overestimated. Additionally, the disruptive effects of financial innovation, particularly in regards to its promotion of high leverage, highlight the need to reevaluate its costs and risks (Johnson et al., 2012).

Investigations covering 70 nations, Türkiye among them, from 2011-2015 showcased the beneficial influence of digital transactions on their respective GDPs (Zandiet al., 2016). In a related aspect, a study of Spain's regional growth from 1986-2001 assessed the role of mutual funds, loan agreements, cards, and ATM counts as indicators of both business and tech advancements in banking. The findings emphasized that these banking innovations positively affected GDP, investments, and total savings in the area (Valverde et al., 2007).

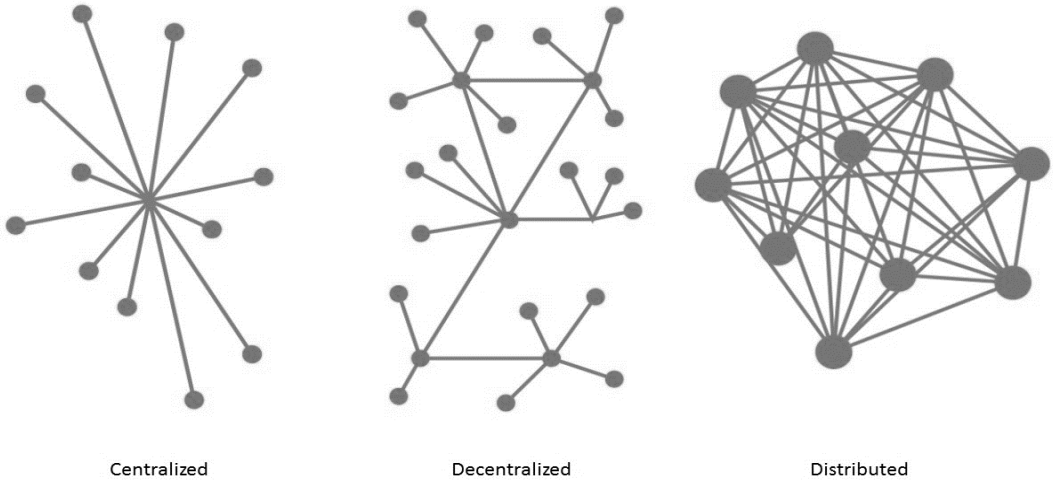
The use of digital banking facilitates faster and more efficient financial transactions, which can stimulate economic activity and increase the volume of financial transactions, ultimately contributing to overall economic growth.

3.7. Digital Banks and Blockchain Technology

Blockchain technology is a type of electronic or digital registry that enables participants within a decentralized network system to conduct transactions without the need for intermediaries. This technology is characterized by its decentralized nature, where a network of users can conduct transactions without the need for intermediaries. Transactions are recorded in blocks, which are connected to each other forming a chain. This creates an unchangeable and transparent ledger, making it extremely difficult to alter past transactions. As a result, blockchain technology has gained attention as a secure and reliable platform for various applications beyond finance, such as supply chain management, voting systems, and digital identity verification (Das et al., 2020).

Figure 14 illustrates three main types of network models that help explain different approaches in blockchain systems: centralized, decentralized, and distributed. A centralized network has one central node that controls all the others, similar to traditional databases where a single authority manages the system. In a decentralized network, control is shared across several key nodes, each connected to its own smaller group, allowing limited distribution of power and decision-making. A distributed network, on the other hand, connects all nodes equally, without a central point, so that control, data, and verification are shared across the entire system. This structure helps improve transparency, security, and system reliability.

Figure 14. New Advancements in the Banking Sector Include Emerging Technologies



Blemus (2017) examines legal initiatives in the United States and European Union that address Blockchain regulations regarding virtual currencies, smart contracts, and initial coin offerings (ICOs). The author notes that in a few years, blockchain has become a popular subject for policymakers worldwide. Instead of embracing radical change, market participants, central banks, and financial regulators aim to adopt a cautious and market-friendly approach to this disruptive and decentralized technology. In this study, the transformational trend is discussed in detail, and legislative developments in various countries are compared concerning Blockchain technology aspects such as virtual currencies, crypto tokens, smart contracts, and ICOs.

Digital-only banks, known as neobanks, are at the forefront of utilizing the capabilities of blockchain technology to offer a diversified portfolio of financial services. In the United States, pioneering neobanks like Chime leverage blockchain not only for quick loan approvals but also for ensuring transparency in cross-border transactions and improving fraud detection. Over in Germany, institutions such as N26 are using blockchain to enhance not just their lending services, but also to provide customers with secure digital wallets and rapid international money transfers. In Türkiye, prominent neobanks like Enpara and Hayat Dijital Katılım Bankası are embracing the blockchain wave, potentially optimizing services ranging from digital asset

management to peer-to-peer transactions. This global trend underscores the transformative role of blockchain in reshaping the spectrum of offerings in the digital banking sector.

3.8. Digital Banks, E-Currency (CBDC) Investments

Central Bank Digital Currency (CBDC) refers to digital versions of central bank-issued instruments of payment. Although central banks use digital currencies in their own transactions, they cannot be used by individuals for their transactions. Hence, central banks are working to enable the use of digital currencies by individuals.

The current banking system heavily relies on deposits as a source of funding for their loans. If a CBDC becomes widely available, it could potentially be used as a substitute for commercial bank money. As a result, this could lead to a reduction in the overall number of deposits in the banking system. This, in turn, could increase funding expenses for banks and limit credit availability or raise credit costs for both households and businesses. The issuance of a CBDC could potentially offer several advantages, including the provision of a safe, convenient, and electronic form of central bank money for households and businesses. Entrepreneurs could use the platform to create new financial products and services, while it could support faster and cheaper payments, including cross-border transactions, and expand consumer access to the financial system. However, a CBDC could also pose certain risks and raise policy questions, including its potential impact on the market structure of the financial sector, the cost and availability of credit, the safety and stability of the financial system, and the effectiveness of monetary policy (FED, 2022).

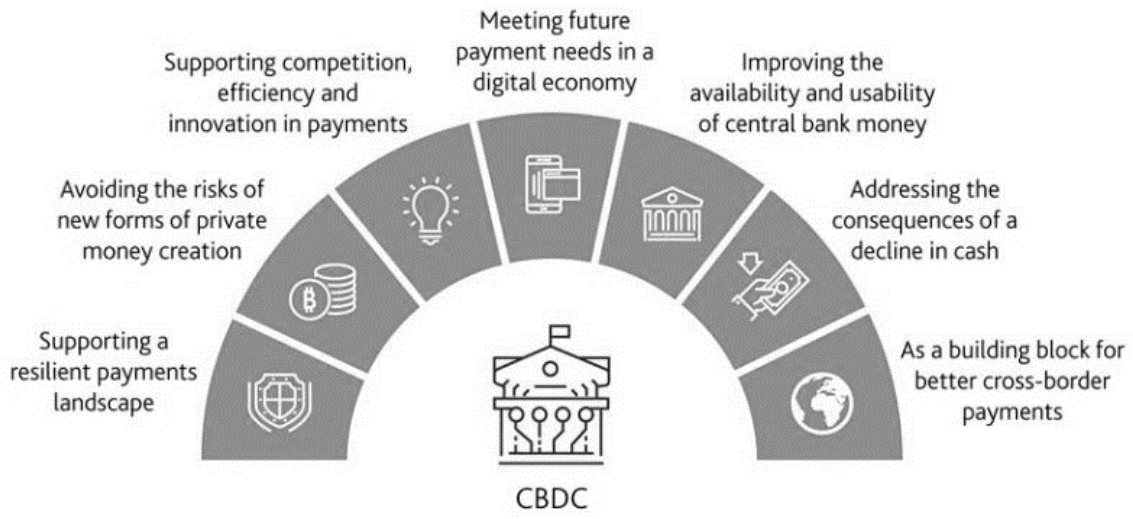
Electronic money, with its digitization of traditional money, offers several advantages including the acceleration and differentiation of payment processes, completion of transactions with low risk through reliable systems, 24/7 money transfer without space restrictions, cost reduction through online transactions, monitored transactions by Interbank Card Center (ICC) in Türkiye, prevention of informality, and faster completion of accounting transactions.

A CBDC could foster equitable competition in the field of payment innovations among private sector companies, irrespective of their size. The creation of a secure and dependable private currency may pose challenges and high costs for smaller businesses, which could hinder their ability to innovate. Nevertheless, a CBDC could offer a way forward, enabling innovators in

the private sector to focus on creating new service access methods, distribution strategies, and other associated services.

The Figure 15 illustrates the conceptual framework and objectives for CBDCs. It underscores CBDCs as a means to support competition, efficiency, and innovation within the payments sector. The design acknowledges the significance of CBDCs in mitigating risks associated with the emergence of private forms of money, such as cryptocurrencies, indicated by a Bitcoin symbol. It further emphasizes the role of CBDCs in fostering a resilient payments landscape, and in meeting the evolving payment needs of a digital economy, thereby improving the availability and usability of central bank money. Additionally, it recognizes the importance of addressing the challenges posed by the decreasing use of cash in transactions. Lastly, the framework suggests that CBDCs could serve as foundational elements for enhancing cross-border payments, signifying their potential global impact on financial systems.

Figure 15. CBDC Objectives and Benefits Overview



Source: Bank of England, 2020

In general, it is noted that developments in the field of digital currencies are in line with the logic of digital banking. In the future, with the emergence of CBDCs, remote banking activities such as online and mobile banking, as well as digital banking systems used on electronic platforms, will become more integrated with the use of CBDCs.

3.9. Digital Banks and Open Banking-API Technology

The concept of open banking, which is currently being discussed by financial regulators, has the potential to provide significant benefits. This system is seen as the future of banking and represents a secure advancement beyond traditional internet and mobile banking. Third-party institutions can access customers' financial information with their consent, allowing many services to be offered for the benefit of customers. This model is known as open banking.

Open banking system enables banks to collaborate with third-party providers and offer new products and services that bring significant benefits to customers. Through this system, customers can access their accounts from multiple banks in one place, view and compare the most advantageous offers provided by different banks, and make informed decisions based on their preferences and needs (Akın, 2020).

Open banking applications within the digital bank allow customers to monitor their financial status across all their bank accounts through a single interface. They can view all the services available to them on a single screen and make payments if desired. Customer data is protected by the principle of data security, which is a fundamental principle of open banking. Third-party service providers and banks are only allowed to use customer information to the extent required for the services they request, ensuring the confidentiality of sensitive data such as financial status and transaction history, as well as user information (PwC & GSG Hukuk, 2020).

3.10. Digital Banks and DeFi Activities

Decentralized finance, or DeFi for short, refers to financial transactions that are not reliant on any central authority or intermediary, utilizing decentralized structures instead.

DeFi typically refers to the use of distributed ledger technology (DLT) to provide financial services and products in a decentralized manner. By leveraging this technology, DeFi aims to reduce the need for traditional financial intermediaries and centralized institutions, thereby creating a more disintermediated and decentralized financial ecosystem (IOSCO, 2022).

DeFi is a novel approach to financial intermediation that aims to reduce reliance on centralized intermediaries. This is achieved through the use of applications or protocols known as decentralized applications, which are developed on top of a public blockchain infrastructure (Ernst & Young, 2021).

The concept of decentralized finance, or DeFi, is becoming increasingly familiar to those involved in the digital banking industry. By integrating this technology with smart contracts, digital banks could accelerate the loan approval and execution process for both digital and traditional currencies. Customers would be able to apply for personal or business loans via a digital banking portal using a digital fingerprint and decentralized credit database, without the need for bank personnel. This would provide benefits to both the customer, in terms of convenience and faster access to loans, and to the digital bank, in terms of reduced labor costs and increased customer satisfaction.

The rise of DeFi is largely driven by dissatisfaction with traditional banking, but even those who support DeFi acknowledge that the industry has limitations. Digital banks have the potential to offer some of the benefits and functionality of DeFi, while also providing the stability and liquidity of a licensed and insured financial institution. By doing so, they can attract customers who are interested in the benefits of DeFi but also want the security of working with a regulated entity.

3.11. Differences Between "DeFi" and "Traditional Finance"

DeFi and Traditional Finance differ significantly in terms of control, speed, privacy, accessibility, market hours, and transparency. In DeFi, users have complete control over their funds and how they are allocated, with transactions often completed within minutes and conducted under pseudonyms. It is accessible to everyone without requiring formal applications, operates continuously without market closures, and offers high transparency, allowing anyone to inspect system data. In contrast, Traditional Finance requires reliance on institutions to safeguard and manage funds, which may involve lending to high-risk borrowers. Manual processes can delay transfers by several days, transactions are directly linked to personal identities, and access to services generally requires applications. Markets operate only during set hours, and transparency is limited, with little public access to data on loans, asset management, or other records. (IOSCO, 2022).

3.12. Differences Between "Digital Bank" and "Digital Banking"

Digital banks aim to provide customers with an intuitive experience similar to social media, covering everything from onboarding to transactions, financial management, and analytics. These banks are scalable like Bigtechs, allowing for high performance and accessibility across

various channels, with seamless authentication and personalization. Customers expect data privacy and transparency from these digital banks, as well as the use of ethical AI techniques to support their financial needs. A key differentiator for digital banks is the event-driven experience based on data and AI, which traditional banks lack (Wyne, 2021).

The term "digital bank" is a broad term that encompasses various financial transactions that are facilitated through technology. While digital banking is a type of online banking, digital banks offer more than just digital and online banking services.

Digital banking refers to the different channels that customers use to access banking services, including mobile, web, smart kiosks, contact centers, remote teller and advisory services, physical branches, and chatbots. A digital bank, on the other hand, is designed as a fully digital system that focuses on the overall customer experience and modern technological functions. It offers an interface that is easy to use like social media, connects smoothly with both physical and digital environments, and supports real-time decisions with the help of AI and event-driven systems. A digital bank also creates a digital version of the customer through its core systems, provides services that can grow and scale like those of big technology companies, and gives instant access to customer activity, position, and reporting. This reflects a shift from using multiple access channels to a more connected and smart digital banking structure (Wyne, 2021).

3.13. Environmental Benefits of Digital Bank Activities

Using digital technologies to promote sustainability, companies can work towards a sustainable future, with the first step being to aim for net zero emissions, and the ultimate goal being to decrease their carbon footprint (Mobiquity, 2021).

In summary, integrating sustainability into digital banking will help ensure the endurance of businesses in an ever-evolving banking landscape. The bank of the future will not only prioritize a seamless digital banking experience that seamlessly blends physical and digital elements, but also enable customers to live a sustainable digital lifestyle, thus expanding and retaining its customer base.

Sustainable finance involves incorporating environmental, social, and governance (ESG) criteria into financial services to make business or investment decisions that benefit both clients and society in the long run (Oertli, 2020).

Integrating digital transformation into the operations of banks is a reliable and effective way to make significant progress towards environmental targets. Some experts suggest that sustainability can only be achieved in the digital age, and therefore sustainability and digitalization must be considered together. This approach recognizes the importance of integrating technology and sustainability efforts to achieve long-term environmental goals.

4. METHODOLOGY AND FINDINGS

4.1. Survey Methodology and Analysis of Digital Banking and Fintech Implementations and Transformations

The emergence of new behaviors in the banking sector enables individuals to structure and build their banking activities. Economic and political factors, psychological aspects, and personal and cultural elements all play an active role in shaping interest and engagement with digital banking. This sector, which experiences continuous changes every day, combines with emerging technologies to introduce numerous innovations in digitalization. The aim of this study is to measure the knowledge levels and usage of innovations in digital banking among individuals in Türkiye, Germany, and the United States. After examining the innovations in digital banking in the specified countries and presenting the current situations, the study seeks to investigate the impact of digitalization on customers. By exploring the integration of innovative technologies such as decentralized finance, blockchain, artificial intelligence, and bigtech into the banking sector, and their potential effects, it aims to reveal how banks adopt and plan to use these technologies. Furthermore, the study analyzes how customers adopt digital banking services, the factors influencing this adoption, and predicts expected changes in consumer behavior, thereby identifying potential future directions of the sector. This research aims to contribute to the banking sector by presenting innovations emerging from digital transformation. Scientifically, it is expected to serve as a reference for future researchers in the field. From a cultural perspective, it provides a comparative view of changes in services offered to international communities and how these services should be differentiated.

The research population consists mainly of Turkish, foreign, and local individuals residing in Türkiye, Germany, and the United States. Germany was selected to represent the European Union in this study because of its status as the EU's largest economy, the maturity of its banking sector, and its influential role in shaping continental financial regulations. In this study, a total of 455 participants completed the survey via online platforms, email, and printed forms. The quantitative research is limited to the questionnaire form used (Annex-1). Academic and professional contacts in Türkiye, Germany, and the United States were reached to distribute the surveys. Data were collected between March 12, 2024, and May 10, 2024, with a total of 287 male and 168 female participants. Of the total, 142 participants were from Türkiye, 181 from Germany, and 132 from the United States.

Several survey questions used in this study were adapted from established academic research and previous studies in the fields of banking and financial technologies. One source was a master's thesis by Alemdar (2020), and the other was an article by Roh et al. (2022) These sources provided validated question structures and measurement items relevant to the scope of this study. The items were reviewed, refined, and incorporated into the survey design to ensure consistency with the research objectives.

The survey included independent and dependent variables. Independent variables covered demographic and background details such as gender, age, professional status, work field, country, income level, income period, and income source. Dependent variables focused on fintech and digital banking usage patterns, preferences, privacy concerns, ease of use, adaptability, financial impacts, investment habits, literacy levels, and evaluations of service quality and trust using Likert scales. Based on these variables, descriptive statistics were used to summarize participant profiles and overall trends. Appropriate statistical methods were applied to assess the reliability of the scales and to examine potential differences and relationships among variables. This approach provided both descriptive and inferential insights into the collected data.

The following analyses present the key insights and conclusions derived from the survey conducted as part of this study, offering a comparative examination of digital banking and fintech adoption across Türkiye, Germany, and the USA. The findings highlight critical aspects such as user demographics, banking preferences, fintech adoption rates, security concerns, and regional variations in customer expectations. Additionally, the study examines the role of transaction costs, personalized customer interactions, hybrid banking models, and emerging fintech solutions in shaping consumer behavior.

Understanding these insights is essential for financial institutions and fintech providers aiming to develop region-specific strategies that cater to diverse customer needs. By exploring the shifting dynamics of digital banking, the study sheds light on the key drivers of satisfaction and trust, as well as the growing emphasis on security and accessibility. The conclusions drawn from this research serve as a valuable resource for industry professionals, policymakers, and technology developers seeking to enhance digital banking experiences in an increasingly competitive and evolving financial landscape.

4.1.1. Educational Status of Respondents by Age and Gender

The charts below provide a comparative analysis of the educational status of respondents from Türkiye, Germany, and the United States, categorized by age and gender. In all three regions, the largest group consists of male Master's/PhD students aged 25-34, followed by females in the same age group pursuing postgraduate studies. Undergraduate students are primarily concentrated in the 18-24 age group, with Germany showing the highest representation in this category, while Türkiye has minimal participation. The "not a student" category spans various age groups but is more prevalent among older respondents (25-44), reflecting a transition out of formal education. These findings are based on responses to the survey question, "Which of the following describes you most accurately?" Overall, the data highlight consistent trends across regions, with male postgraduate students dominating the 25-34 age group, while slight regional variations emerge in the distribution of undergraduates and non-students.

Figure 16 displays the educational status of respondents from Türkiye based on age and gender. The highest proportion of respondents are male Master's/PhD students aged 25–34, with around 35 participants. Among females, the largest group is also in the 25–34 age range, where approximately 20 participants are pursuing postgraduate studies. Undergraduate students are most prevalent in the 18–24 age group, with around 2 respondents. The "not a student" category is distributed across age groups, with a smaller number of respondents in older age categories (35–54), indicating that most participants are engaged in or have completed their education.

Figure 16. Educational Status of Respondents in Türkiye by Age and Gender

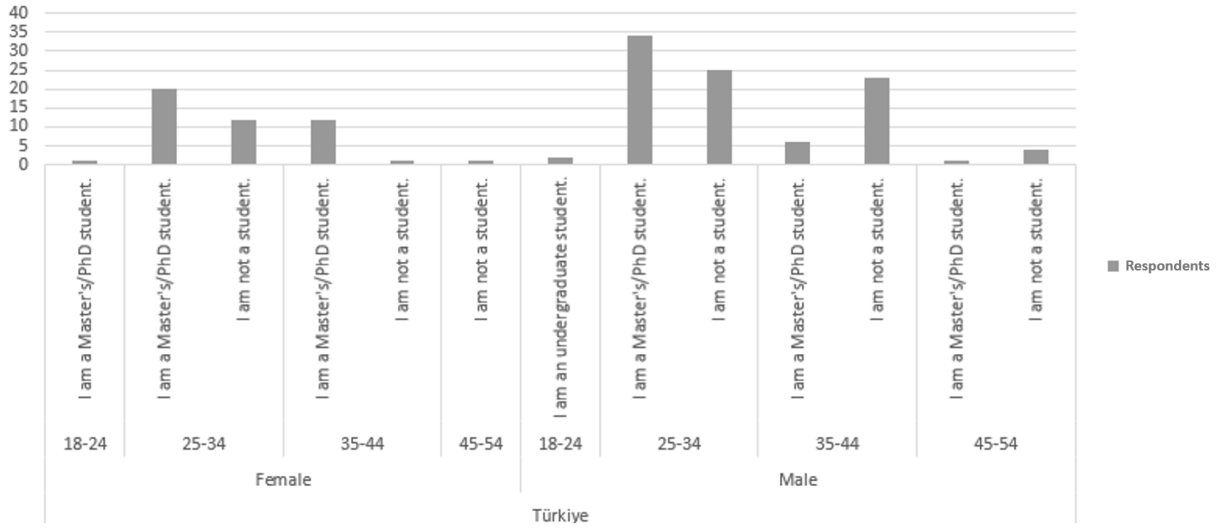


Figure 17 shows the educational status of respondents from Germany based on age and gender. The largest group consists of male Master's/PhD students aged 25–34, with approximately 30 participants. Among females, the 25–34 age group is also prominent, with around 15 respondents pursuing postgraduate studies. Undergraduate students are primarily concentrated in the 18–24 age group, with about 25 respondents for both genders. The "not a student" category is evenly distributed across age groups, particularly in the 25–44 range, indicating that most older respondents are no longer students.

Figure 17. Educational Status of Respondents in Germany by Age and Gender

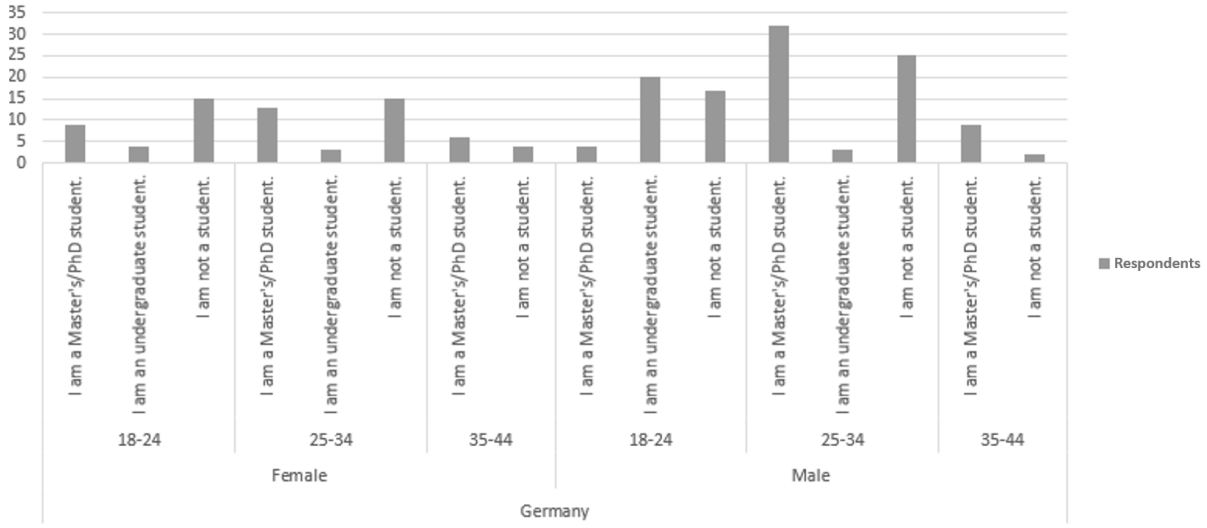
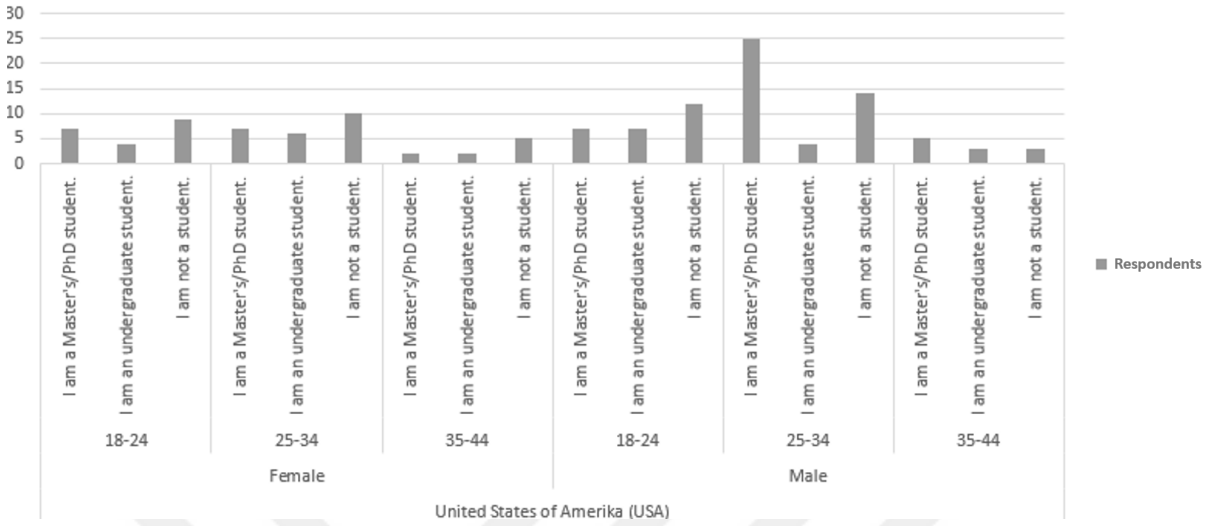


Figure 18 represents the educational status of respondents from the United States, categorized by age and gender. The largest group consists of male Master's/PhD students aged 25–34, with around 25 respondents. In the female category, the distribution is more balanced, with around 5–10 respondents across each age group and educational status. Undergraduate students are primarily found in the 18–24 age group, with a moderate number of both male and female participants. The "not a student" category is represented across various age groups, particularly in the older 25–44 age range.

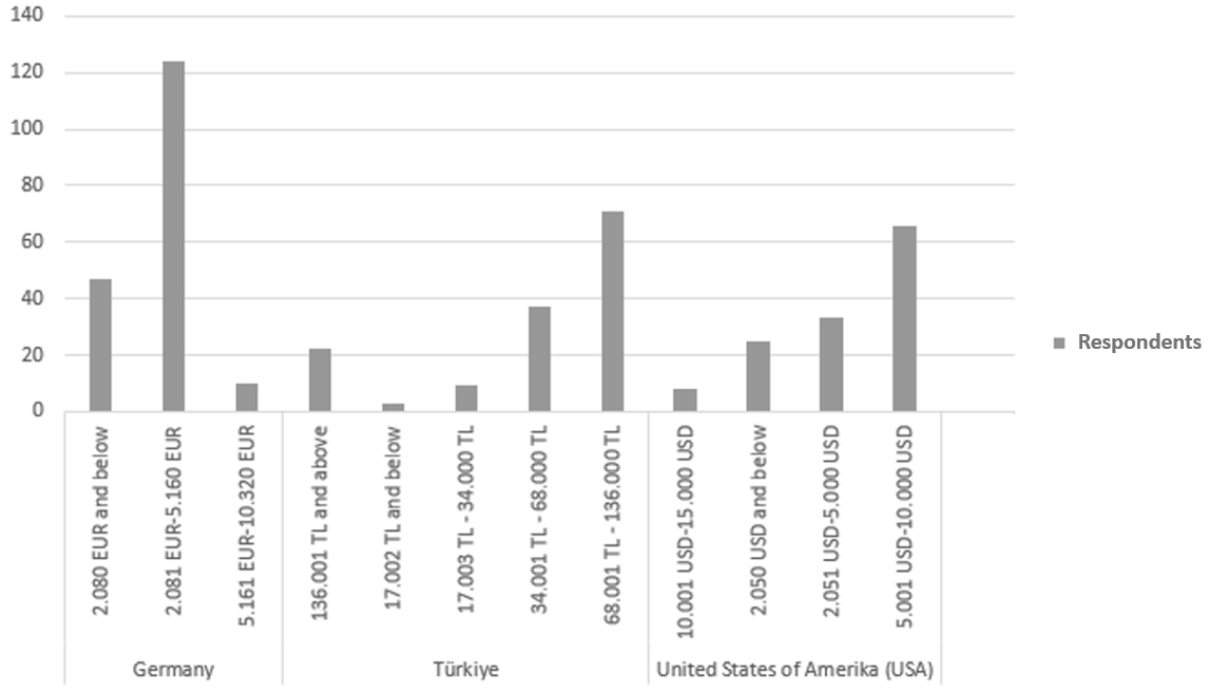
Figure 18. Educational Status of Respondents in the USA by Age and Gender



4.1.2. Monthly Net Income Distribution Among Respondents

Figure 19 shows the income distribution across Germany, Türkiye, and the USA. In Germany, the majority of respondents (about 120) fall into the 2,081 EUR to 5,160 EUR income range, with approximately 45 respondents earning 2,080 EUR and below. In Türkiye, incomes are more evenly distributed, with around 40 respondents earning 34,001 TL to 68,000 TL, and about 15 earning 17,002 TL to 34,000 TL. In the USA, the largest group of around 65 respondents earns 5,001 USD to 10,000 USD, followed by 30 respondents earning 2,051 USD to 5,000 USD. These results are based on responses to the survey question: "Which of the following best describes your monthly net income?"

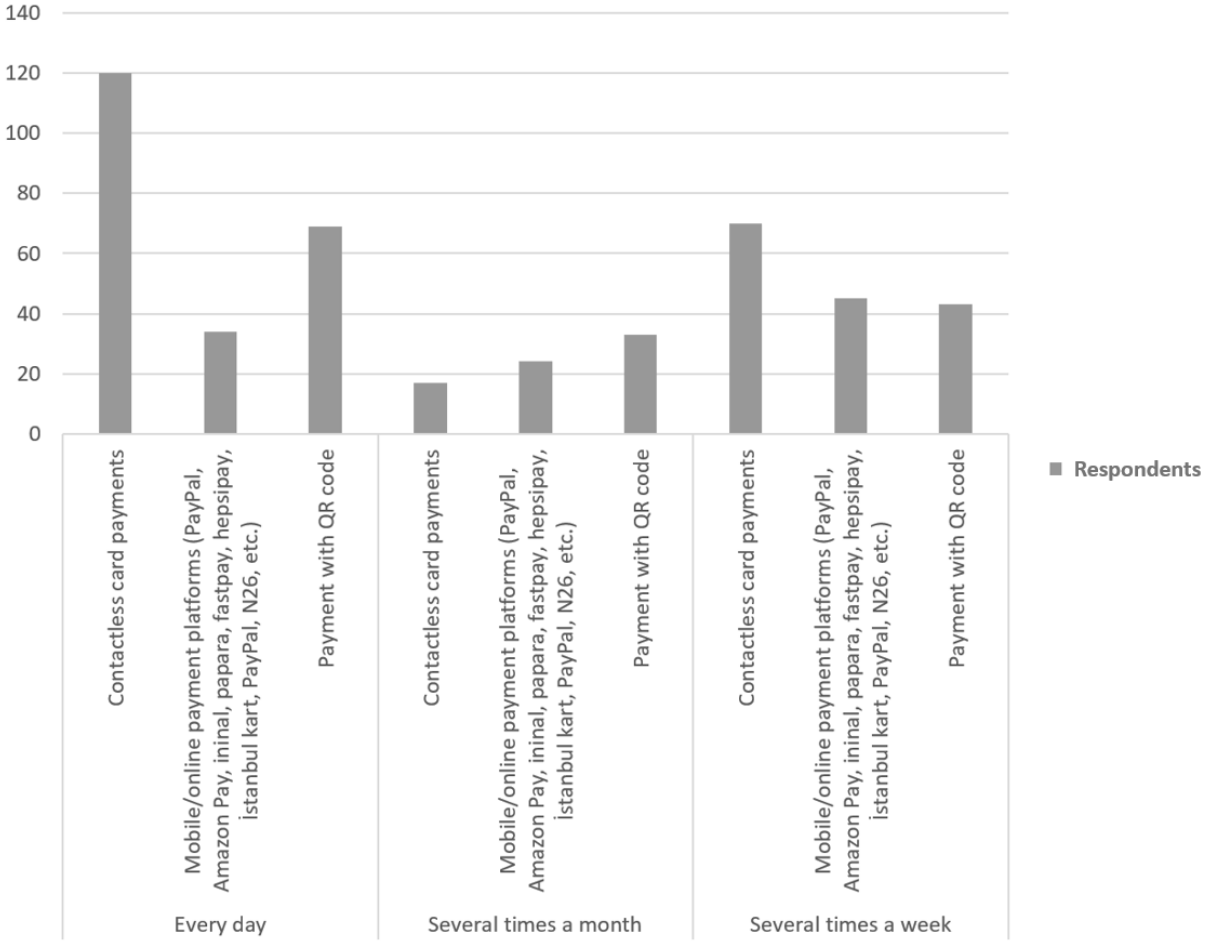
Figure 19. Respondents' Monthly Net Income Levels in Germany, Türkiye, and the USA



4.1.3. Frequency of Financial Technology Application Usage and Preference for Digital Payment Methods

Figure 20 reflects the responses to two survey questions regarding the frequency of using financial technology applications and the types of digital payment systems most often used. Specifically, the data are based on the questions: "How often do you use financial technology applications?" and "What types of digital payment systems do you use most often?" These two questions were analyzed together to assess the relationship between usage frequency and preferred payment method. "Contactless card payments" is the most common method used daily, with around 120 respondents. Among those who use financial technology several times a week, "Mobile/online payment platforms" and "Contactless card payments" are equally prominent, each with around 40-45 respondents. "Mobile/online payment platforms" are less commonly used across all categories in usage frequency. This indicates a clear preference for contactless card payments in daily transactions.

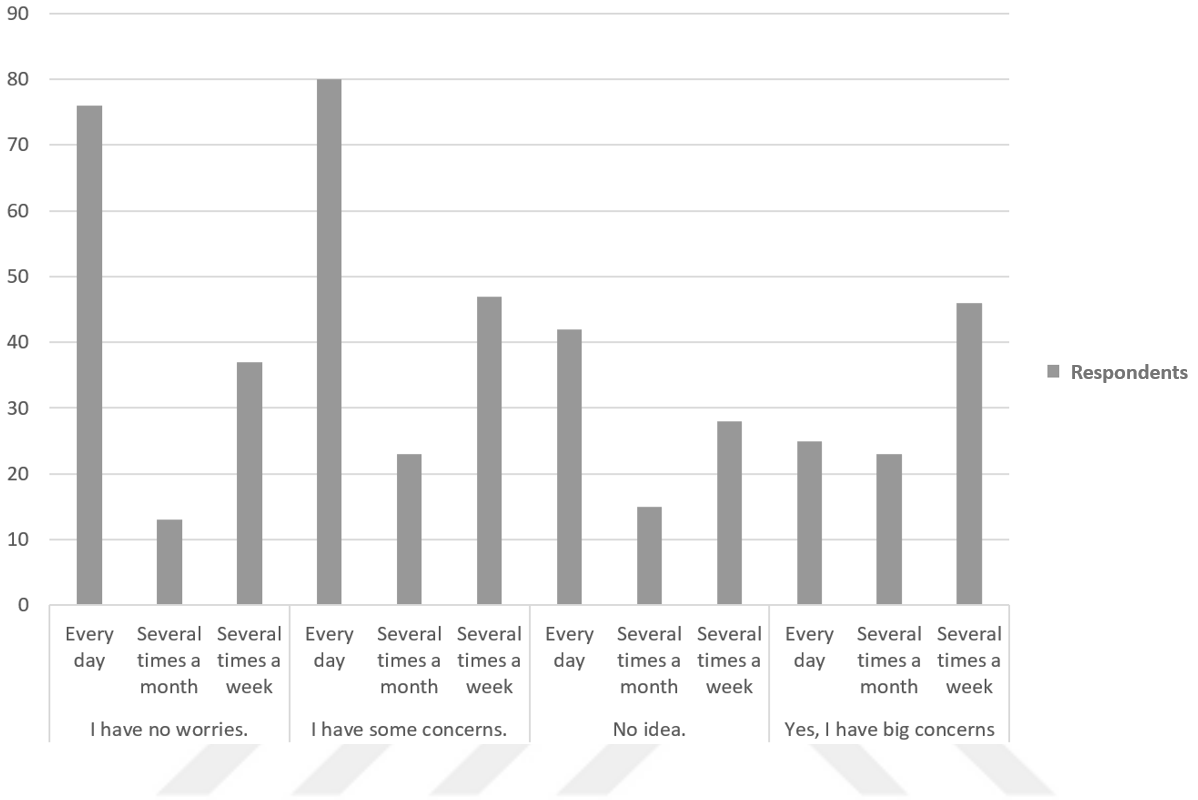
Figure 20. Frequency of Financial Technology Application Usage and Digital Payment Preferences



4.1.4. Privacy Concerns and Usage Frequency of Financial Technology Applications

Figure 21 illustrates the relationship between privacy concerns and the frequency of using financial technology applications. This analysis is based on responses to two survey questions: "Do you have privacy concerns when using financial technology applications?" and "How often do you use financial technology applications?" These questions were evaluated together to examine how privacy perceptions may relate to usage behavior. The largest group of respondents, who use financial technology every day, either have no privacy worries (approximately 75 people) or some concerns (about 80 people). For those using these applications several times a week, privacy concerns are more prominent, with many reporting some concerns or big concerns, ranging from 40 to 50 respondents. A smaller group indicated that they have no idea about their privacy concerns, distributed across various usage frequencies.

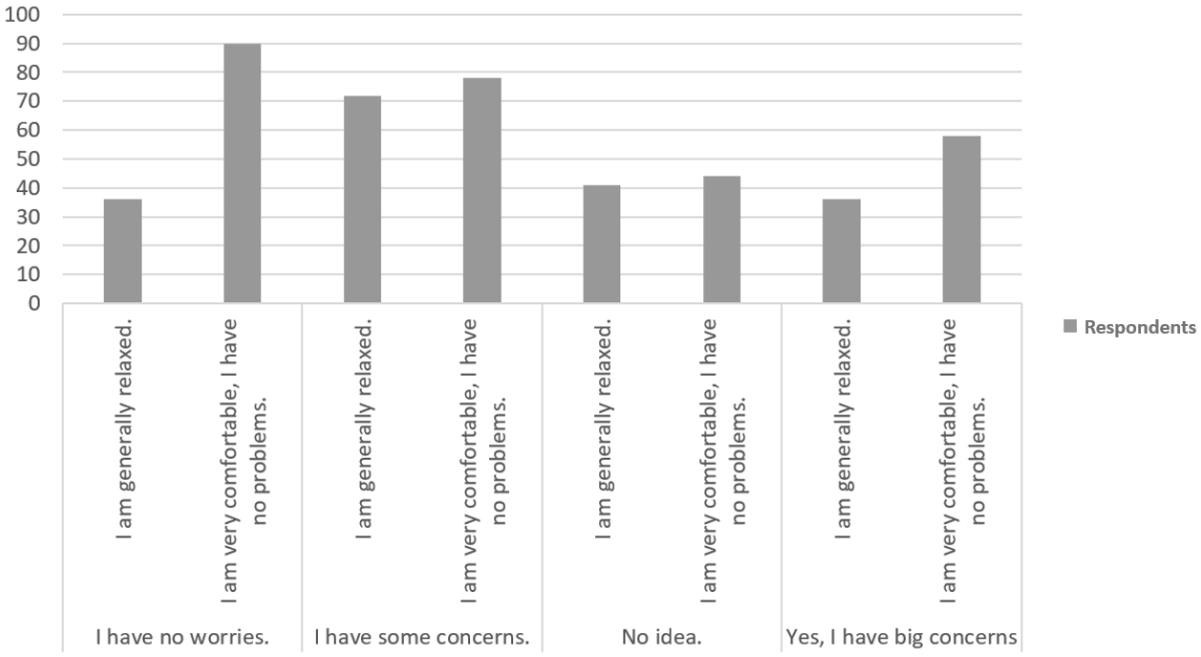
Figure 21. User Privacy Concerns and Their Influence on Fintech Application Usage Patterns



4.1.5. Relationship Between Privacy Concerns and Comfort Levels in the Use of Financial Technology Applications

Figure 22 reflects how privacy concerns relate to comfort levels when using financial technology applications. This analysis is based on responses to the questions: "Do you have privacy concerns when using financial technology applications?" and "How comfortable are you using financial technology applications?" These questions were examined together to explore how users' comfort levels correspond with their privacy perceptions. Around 80 respondents feel very comfortable with no problems and have no privacy worries. For those who have some concerns, about 75 respondents still feel very comfortable. In contrast, respondents with big privacy concerns are fewer, with about 30 feeling very comfortable. A smaller group of 70 respondents reported they are generally relaxed but still have some concerns. Around 80 respondents indicated they had no idea about their privacy issues.

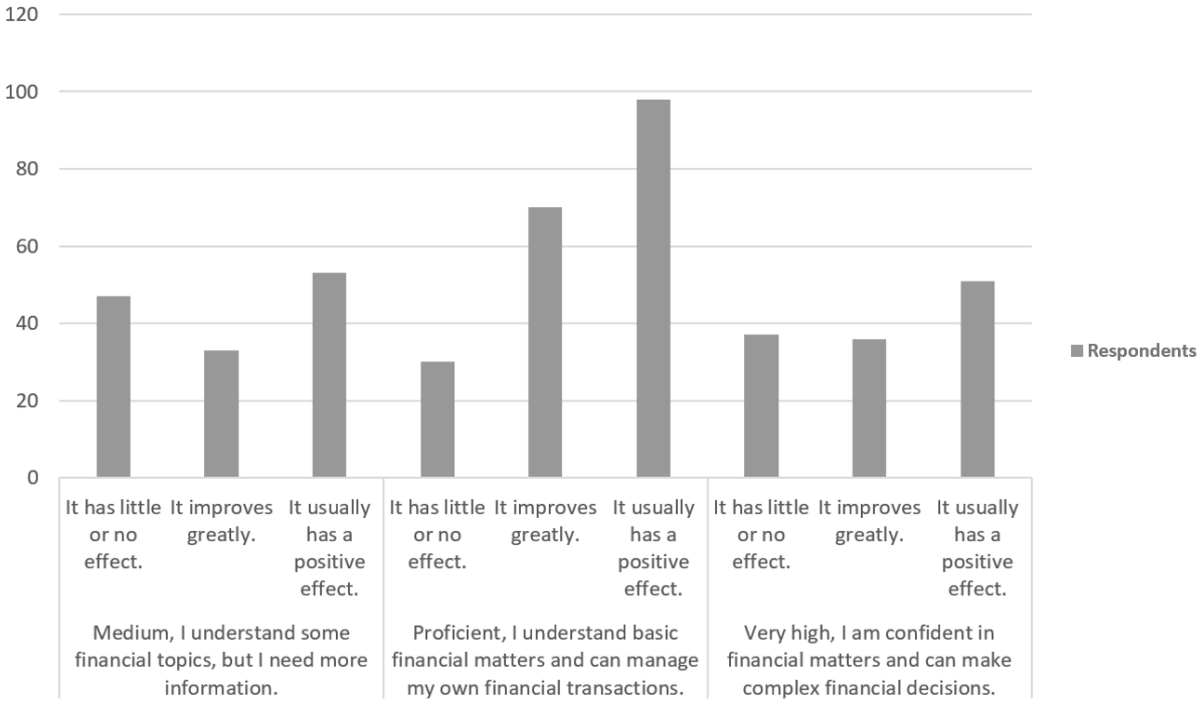
Figure 22. User Comfort and Privacy Concerns in Financial Technology Adoption



4.1.6. Impact of Financial Technology Applications on Personal Finance Management Across Different Financial Literacy Levels

Figure 23 illustrates the relationship between respondents' financial literacy levels and how financial technology applications might impact their personal finance management. This evaluation is based on the combined analysis of two survey questions: "How would you rate your financial literacy level?" and "How do financial technology applications affect your personal finance management?" These questions were analyzed together to explore whether perceptions of financial technology benefits may vary by financial literacy level. Among those with proficient financial literacy, the majority (about 100 respondents) may believe that financial technology usually has a positive effect. Respondents with medium financial literacy appear more divided, with around 55 who might perceive it as usually having a positive effect and about 45 who may think it has little or no effect. For those with very high financial literacy, a significant portion (around 50 respondents) might believe that financial technology improves greatly or has a positive effect.

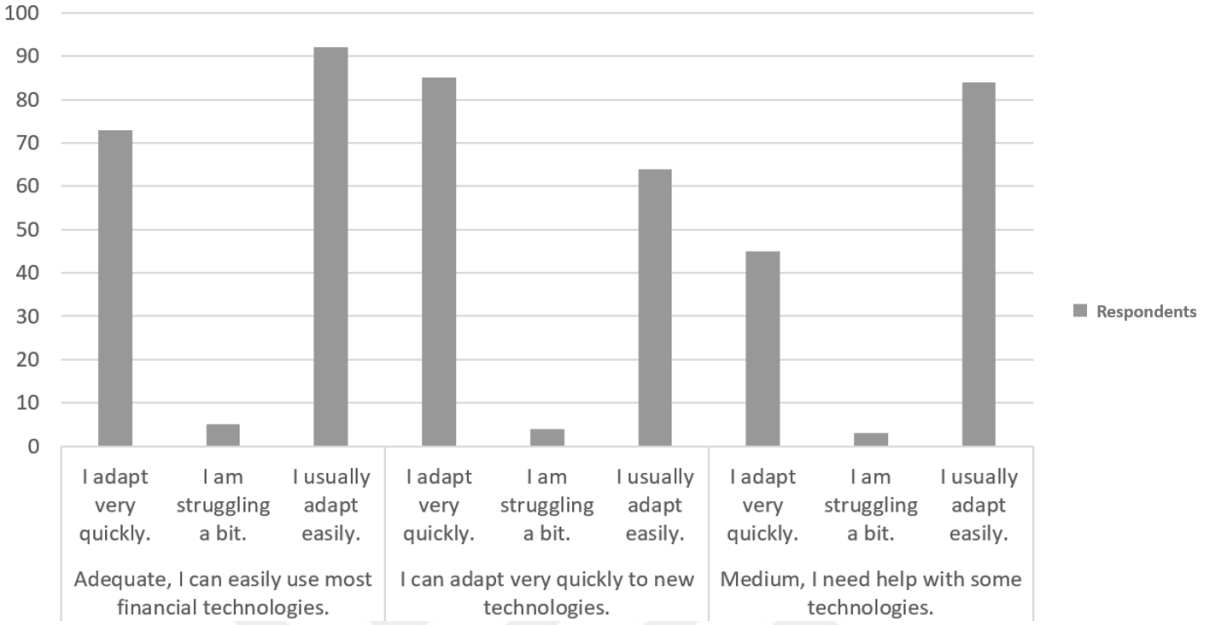
Figure 23. Financial Literacy and Perceived Fintech Benefits



4.1.7. Digital Literacy Levels and Adaptability to New Financial Technologies

Figure 24 explores the relationship between respondents' digital literacy levels and their ability to adapt to new financial technologies. This analysis is based on the responses to the survey questions: "How would you rate your digital literacy level?" and "How would you rate yourself in terms of adapting to new financial technologies?" These questions were analyzed together to examine whether higher digital literacy levels may be associated with greater adaptability. Among those who describe their digital literacy as adequate and can easily use most financial technologies, the majority (around 90 respondents) may adapt easily, while about 70 respondents might adapt very quickly. Respondents with a very high digital literacy level report that they might adapt very quickly (about 80 respondents). Those with medium digital literacy mostly may adapt easily but might need help, with about 80 respondents in this category.

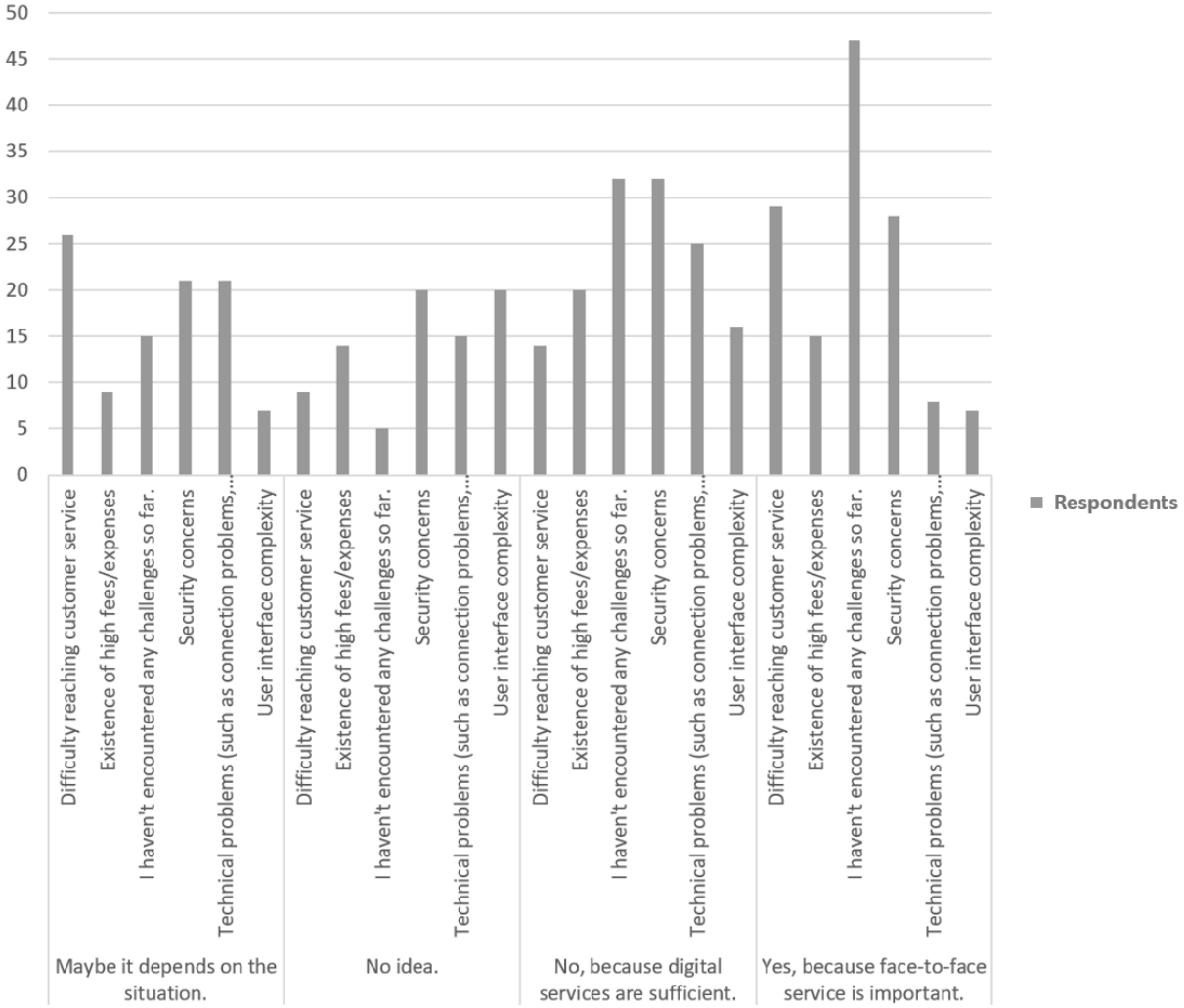
Figure 24. Relationship Between Digital Literacy and Fintech Adaptation



4.1.8. Challenges in Digital Banking Services and the Perceived Importance of Physical Branches

Figure 25 reveals two key aspects of digital banking: the challenges users face and the perceived importance of physical branches. This evaluation is based on the combined analysis of two survey questions: "Do you think it is important to have physical branches alongside digital banking services?" and "What is the biggest challenge you face when using digital banking services?" These questions were examined together to understand whether difficulties in digital banking influence the perceived need for traditional banking support. High fees/expenses and difficulty reaching customer service are prominent as the most common challenges, affecting about 30 and 25 respondents, respectively. Interestingly, around 20 respondents reported no significant issues. About physical branches, about 130 respondents indicated that in-person services are essential, while others felt that digital services are sufficient or that it depends on the situation. This suggests a clear divide in the need for traditional banking support, particularly among those facing digital service challenges.

Figure 25. Difficulties in Digital Banking and the Role of Physical Branches

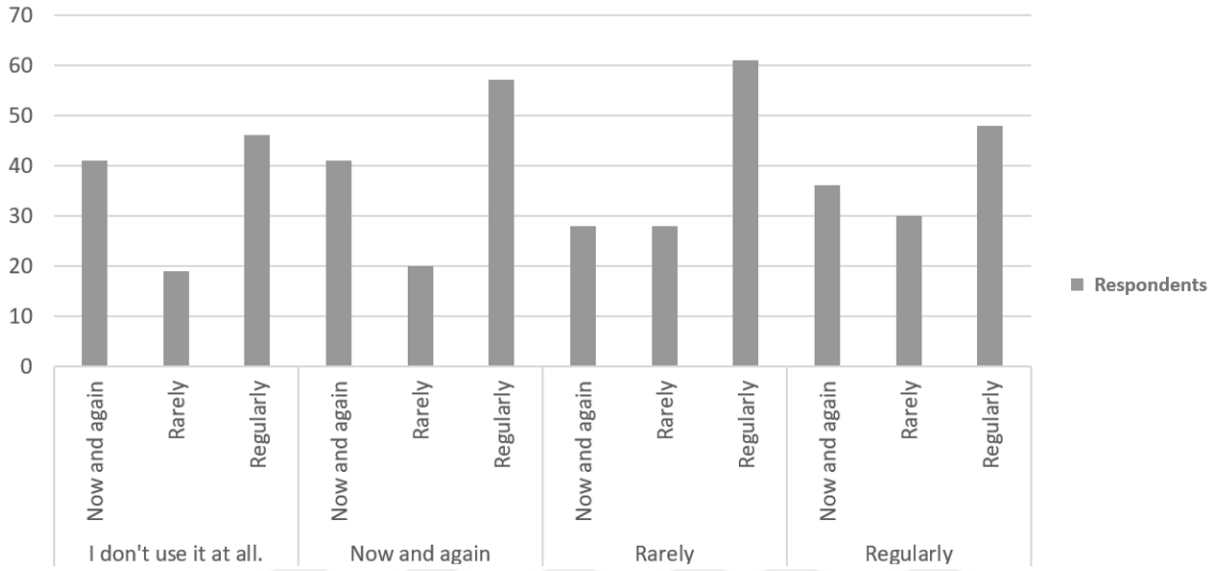


4.1.9. Correlation Between Cryptocurrency Usage and Investment Behavior in Financial Technology Applications

Figure 26 provides a detailed look at the connection between cryptocurrency usage and investments through financial technology applications. This analysis is based on the combined responses to two survey questions: "How often do you use cryptocurrencies?" and "How often do you invest using financial technology applications?" These questions were examined together to understand whether the frequency of cryptocurrency usage is related to investment behavior via fintech platforms. Among those who do not use cryptocurrencies at all (about 100 respondents), approximately 40 still invest now and again using financial technology applications. On the other hand, those who use cryptocurrencies regularly (around 110 respondents) tend to also invest regularly through fintech. This pattern suggests that while

cryptocurrency usage might be limited for some, many respondents are still engaged with fintech platforms for investments, regardless of their involvement in digital currencies.

Figure 26. Cryptocurrency Usage and Investment Behavior in Fintech



4.1.10. Regional Variations in Banking Priorities: Personal Attention, ATM Access, and Transaction Costs

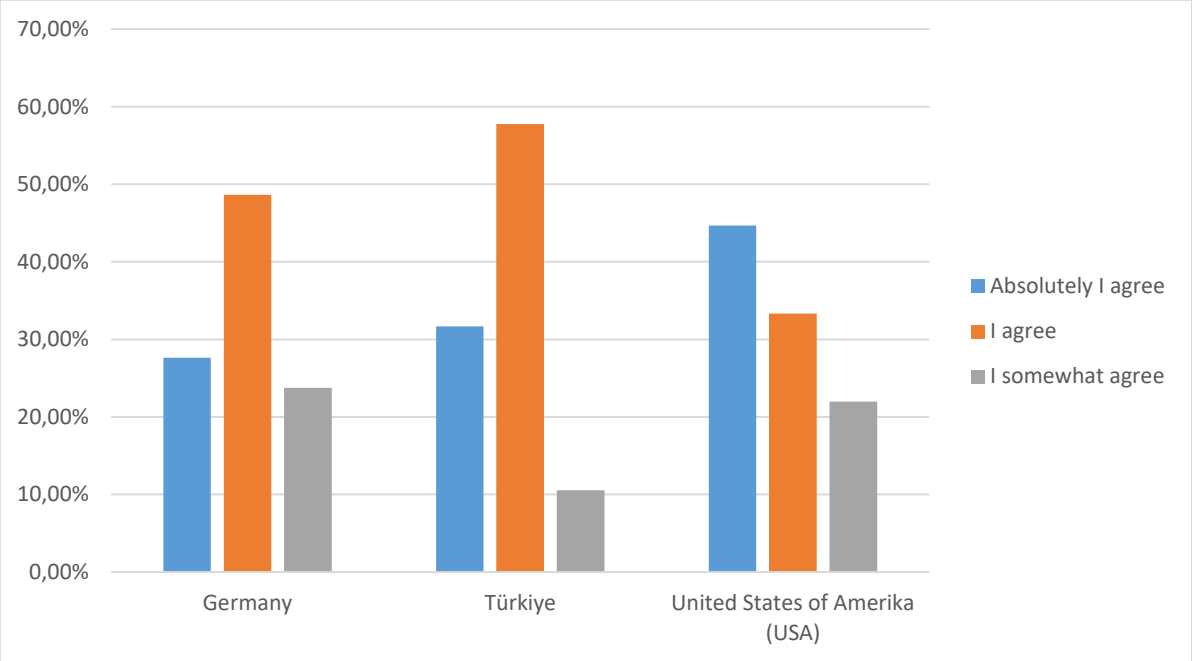
Across Germany, Türkiye, and the USA, customers show varied banking priorities: while personal attention from branch staff and alternative distribution channels receive positive feedback in all regions, Türkiye's respondents place notably higher value on robust ATM access and physical branch services compared to their German and American counterparts, where digital banking is more prevalent; however, regardless of these differences, all regions uniformly emphasize the importance of low or absent transaction costs.

4.1.10.1. Perceived Importance of Personal Attention from Branch Staff in Banking Services

Figure 27 presents the responses to the statement “The attention shown to me by the branch staff is important to me” and indicates a generally high level of agreement across the three countries. In Germany, 27.62% of respondents selected “Absolutely I agree,” 48.62% chose “I agree,” and 23.76% answered “I somewhat agree.” In Türkiye, 31.69% of participants marked “Absolutely I agree,” 57.75% selected “I agree,” and 10.56% chose “I somewhat agree.” In the United States, 44.70% indicated “Absolutely I agree,” 33.33% marked “I agree,” and 21.97%

answered “I somewhat agree.” The ANOVA test (F(2,452) = 3.536, p = .030) confirmed that there is a statistically significant difference among the countries. However, the Post Hoc analysis did not show a clear difference between specific pairs. The comparison between Germany and the United States was close to significance (p = .054) but did not meet the conventional threshold. These findings indicate that while all three countries value personal attention from branch staff, respondents in the United States show a stronger preference for the highest level of agreement.

Figure 27. Customer Perceptions of Branch Staff Attention in Banking

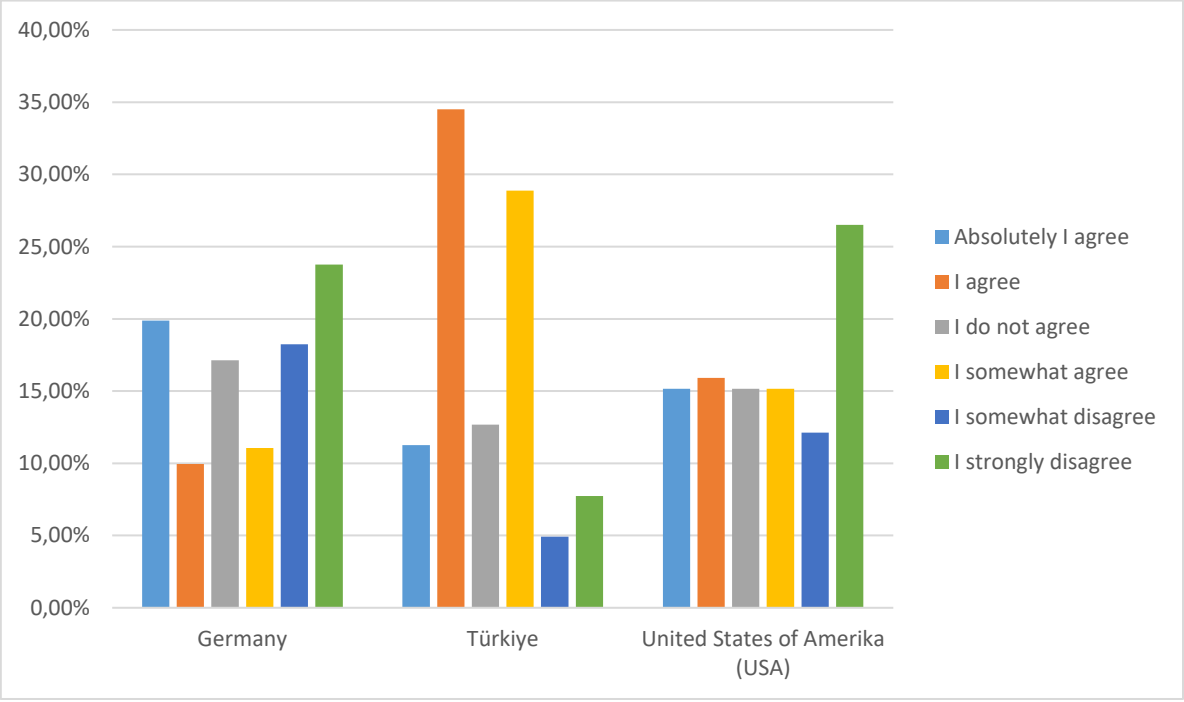


4.1.10.2. Perceived Importance of a Large Branch Network in Banking Services

Figure 28 presents the responses to the statement “Having a large number of branches is important to me” and shows clear differences across the three countries. In Germany, 19.89% of respondents selected “Absolutely I agree,” 9.94% chose “I agree,” 11.05% marked “I somewhat agree,” 17.13% selected “I do not agree,” 18.23% chose “I somewhat disagree,” and 23.76% marked “I strongly disagree.” In Türkiye, 11.27% of participants selected “Absolutely I agree,” 34.51% chose “I agree,” 28.87% marked “I somewhat agree,” 12.68% selected “I do not agree,” 4.93% chose “I somewhat disagree,” and 7.75% marked “I strongly disagree.” In the United States, 15.15% indicated “Absolutely I agree,” 15.91% chose “I agree,” 15.15% marked “I somewhat agree,” 15.15% selected “I do not agree,” 12.12% chose “I somewhat

disagree," and 26.52% marked "I strongly disagree." The ANOVA test ($F(2,452) = 10.15$, $p < .001$) confirmed significant variation among the three countries. Post Hoc comparisons indicated that Türkiye differs significantly from both Germany and the United States ($p < .001$), while there was no significant difference between Germany and the United States ($p = .996$). These results indicate that Türkiye places greater importance on having a large branch network compared to Germany and the USA.

Figure 28. Importance of Physical Branch Networks in Banking Services

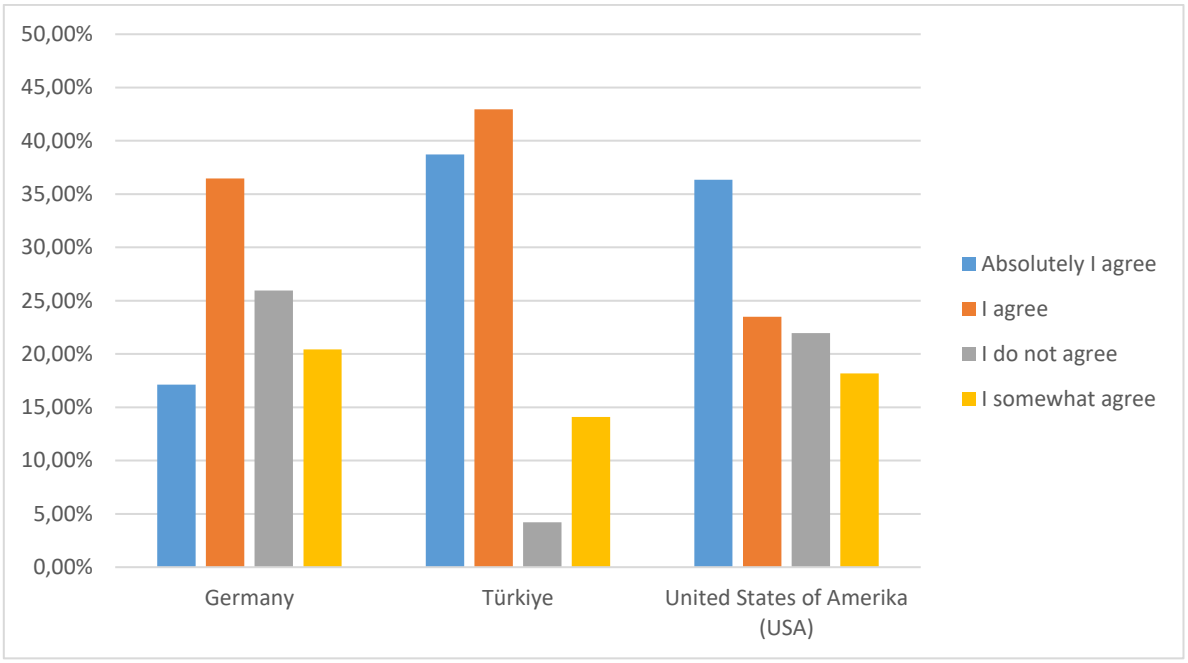


4.1.10.3. Perceived Importance of ATM Availability in Banking Services

Figure 29 presents the responses to the statement "Having more ATMs is important to me" and highlights strong differences among the three countries. In Germany, 17.13% of respondents selected "Absolutely I agree," 36.46% chose "I agree," 25.97% marked "I do not agree," and 20.44% selected "I somewhat agree." In Türkiye, 38.73% of participants indicated "Absolutely I agree," 42.96% chose "I agree," 4.23% marked "I do not agree," and 14.08% selected "I somewhat agree." In the United States, 36.36% chose "Absolutely I agree," 23.48% selected "I agree," 21.97% marked "I do not agree," and 18.18% chose "I somewhat agree." The ANOVA test ($F(2,452) = 19.63$, $p < .001$) confirmed statistically significant differences across the countries, and the Post Hoc results showed that each pairwise comparison was significant (p

< .001). Overall, these findings indicate that Türkiye places the strongest emphasis on ATM availability, while Germany shows more divided opinions and the United States reflects a moderate level of importance.

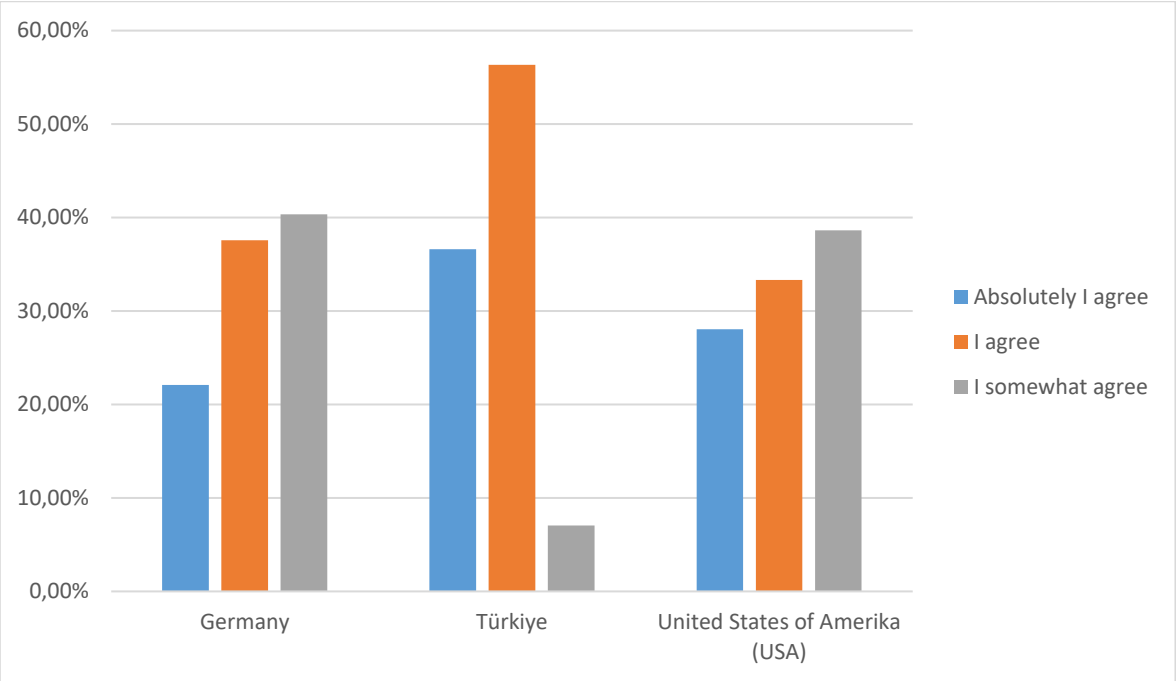
Figure 29. Customer Attitudes Toward ATM Availability in Banking



4.1.10.4. Perceived Importance of Alternative Distribution Channels in Banking

Figure 30 shows the responses to the statement "The importance that the bank I work for attaches to alternative distribution channels is important to me." In Germany, 22.10% of respondents selected "Absolutely I agree," 37.57 % chose "I agree," and 40.33% marked "I somewhat agree." In Türkiye, 36.62% of participants indicated "Absolutely I agree," 56.34% selected "I agree," and 7.04% chose "I somewhat agree." In the United States, 28.03% selected "Absolutely I agree," 33.33% chose "I agree," and 38.64% marked "I somewhat agree." The ANOVA test ($F(2,452) = 18.47$, $p < .001$) showed that there are significant differences between the countries. The Post Hoc test found that Türkiye is significantly different from both Germany and the United States ($p < .001$), but there is no difference between Germany and the United States ($p = .635$). Overall, these results highlight that respondents in Türkiye place greater importance on alternative distribution channels compared to Germany and the United States.

Figure 30. Public Perception of Alternative Banking Distribution Methods



4.1.10.5. Additional Insights from the Survey: Cross-National Perspectives

According to the ANOVA analysis in JASP, for the statement "It is important for me not to wait too long when I queue at the branch," the results ($F(2,452) = 16.74$, $p < .001$) indicated a strong difference among the three countries, with Post Hoc tests showing significant differences between Germany and Türkiye ($p < .001$), Germany and the USA ($p = .024$), and Türkiye and the USA ($p = .012$), suggesting that views on waiting time differ clearly across regions. For the statement "The knowledge level and performance of the bank staff are important to me," the results ($F(2,452) = 20.19$, $p < .001$) also revealed a notable difference, with Post Hoc comparisons showing significant differences between Germany and Türkiye ($p < .001$) and between Türkiye and the USA ($p < .001$), while no difference was found between Germany and the USA ($p = .985$); these findings suggest that perceptions of the importance of bank staff's knowledge and performance vary considerably, with Türkiye standing out compared to both Germany and the USA. For the statement "I prefer to work with the bank from which I receive my salary," the results ($F(2,452) = 15.91$, $p < .001$) confirmed significant differences, as Post Hoc analysis showed meaningful contrasts between Germany and Türkiye ($p = .002$), Germany and the USA ($p = .030$), and Türkiye and the USA ($p < .001$), indicating that salary-related banking preferences vary substantially across the three regions. For the statement

"Advertisements affect my bank choice," the ANOVA results ($F(2,452) = 0.128$, $p = .880$) showed no significant difference among the countries, and the Post Hoc tests confirmed that no pairwise comparison reached significance (all $p > .05$), meaning that the influence of advertisements on bank choice is perceived similarly across Germany, Türkiye, and the USA. For the statement "Credit card campaigns (installment options, etc.) that I use," the ANOVA results ($F(2,452) = 2.202$, $p = .112$) indicated no meaningful difference among the three countries, and the Post Hoc results also showed no significant pairwise differences (all $p > .05$), suggesting that credit card campaigns are evaluated in a comparable way across Germany, Türkiye, and the USA. For the statement "Easy and quick access to the call center is important to me," the ANOVA analysis ($F(2,452) = 25.51$, $p < .001$) demonstrated a strong difference, with Post Hoc results showing significant differences between Germany and Türkiye ($p < .001$) and between Türkiye and the USA ($p < .001$), while no difference appeared between Germany and the USA ($p = .954$); these findings highlight that quick access to call centers is valued differently, with Türkiye showing a stronger emphasis compared to the other two countries. For the statement "It is important that the bank fulfills its promises," the ANOVA results ($F(2,452) = 1.401$, $p = .248$) showed no significant difference among the countries, and the Post Hoc tests confirmed that all pairwise comparisons were not significant (all $p > .05$), suggesting that the importance of banks keeping their promises is perceived in a similar way across Germany, Türkiye, and the USA. For the statement "The public image of the bank is important to me," the ANOVA results ($F(2,452) = 6.320$, $p = .002$) indicated a significant difference, with Post Hoc tests showing differences between Germany and Türkiye ($p = .002$) and between Türkiye and the USA ($p = .031$), while no difference was observed between Germany and the USA ($p = .769$); these findings suggest that the importance attached to the bank's public image is especially emphasized in Türkiye compared to the other two countries. For the statement "It is important to me that transaction costs are low or absent," the ANOVA results ($F(2,452) = 1.046$, $p = .352$) showed no significant difference among the countries, and the Post Hoc analysis confirmed that no pairwise comparisons were significant (all $p > .05$), suggesting that the importance of transaction costs is perceived similarly across Germany, Türkiye, and the USA. For the statement "Bank type (Deposit, Participation (Interest-free), etc.) is effective in my bank choice," the ANOVA results ($F(2,452) = 0.464$, $p = .629$) revealed no significant difference among the three countries, and the Post Hoc results confirmed that no pairwise comparison

reached significance (all $p > .05$), indicating that the influence of bank type on bank choice is seen in a similar way across Germany, Türkiye, and the USA.

4.1.10.6. Summary Evaluation

The results indicate that personal attention from branch staff is important across all three countries. In Germany, most respondents agreed at different levels, while in Türkiye the agreement was even stronger, and in the USA the highest share of respondents selected the strongest level of agreement. The ANOVA test confirmed a significant difference, but Post Hoc analysis showed no clear pairwise contrasts. This suggests that while small differences exist, personal attention remains important in Germany, Türkiye, and the USA, with stronger emphasis in the USA.

The importance of a large branch network shows more regional variation. In Germany, opinions were divided, with a notable share of negative responses. In Türkiye, almost half of the respondents agreed and a considerable share remained neutral, indicating that branches continue to play a role. In the USA, views were also split, with similar shares of positive and negative answers. The ANOVA and Post Hoc results confirmed that Türkiye values branch networks significantly more than Germany and the USA, while Germany and the USA are similar.

Perceptions of ATM availability also show strong differences. In Germany, opinions were mixed, while in Türkiye support was very high, with more than four out of five respondents agreeing. In the USA, views were more moderate, with around 60 % agreeing. The ANOVA and Post Hoc tests confirmed significant differences across all countries, indicating that Türkiye values ATMs the most, the USA places medium importance, and Germany is more divided.

Alternative distribution channels are perceived differently by region. In Germany, most respondents selected agreement but with a cautious tone, while in Türkiye almost all respondents agreed, showing very strong support. In the USA, agreement was also positive but not as strong as in Türkiye. The ANOVA confirmed significant differences, and Post Hoc results showed that Türkiye is clearly distinct from the other two, while Germany and the USA do not differ.

Further statements from the survey also show notable contrasts. Waiting time at branches was evaluated differently in all three countries, with significant differences in each pair. The knowledge and performance of bank staff were valued more strongly in Türkiye than in Germany and the USA. Salary-related banking preferences also differed across the three countries. By contrast, advertisements, credit card campaigns, transaction costs, promises kept by banks, and bank type did not show significant differences, suggesting similar views across regions. However, quick access to call centers was considered much more important in Türkiye, and the public image of banks was also valued more highly in Türkiye compared to Germany and the USA.

Overall, the findings show that while personal attention, branch networks, ATMs, and alternative channels remain relevant, Türkiye consistently places stronger emphasis on traditional and service-related aspects. Germany and the USA show more balanced or divided opinions, with less reliance on physical structures and a greater openness toward digital alternatives.

4.1.11. Assessing Fintech Service Quality: A Multidimensional Analysis of User Experience, Customization, Trust, and Data Security

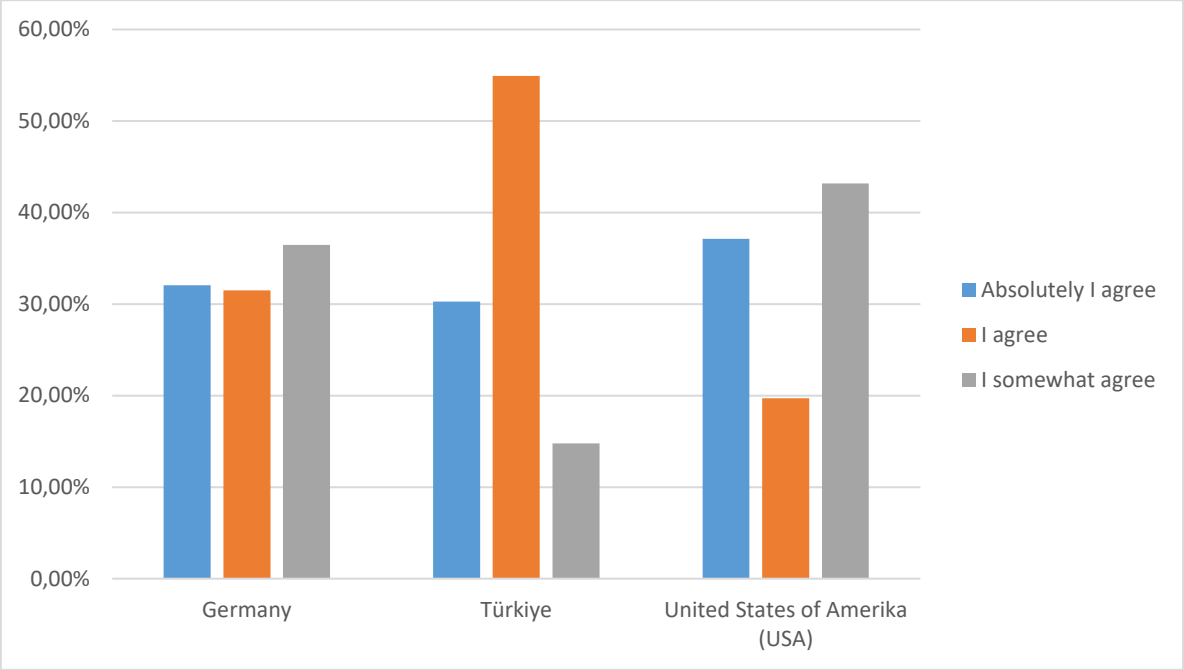
Fintech service quality is broadly characterized by positive perceptions regarding ease of use, customization, speed, and professionalism. However, concerns persist about reliability, data security, and overall trust, with variations in user satisfaction and future usage intentions observed across different markets. These mixed evaluations suggest that while certain user expectations are effectively met, further enhancements in security measures and tailored service delivery are essential to foster greater confidence and sustained adoption.

4.1.11.1. Perceived Ease of Use and Comfort in Fintech Adoption

Figure 31 shows the responses to the statement "Fintech is easy to use and comfortable to use." In Germany, 32% of respondents selected "Absolutely I agree," 31% chose "I agree," and 36% selected "I somewhat agree," showing a balanced distribution. In Türkiye, 30% selected "Absolutely I agree," 55% chose "I agree," and 15% selected "I somewhat agree," reflecting a stronger positive perception. In the United States, 37% chose "Absolutely I agree," 20% selected "I agree," and 43% selected "I somewhat agree," indicating a more moderate view. The ANOVA test ($F(2,452) = 3.251$, $p = .040$) suggested that there is a significant difference

between the three countries. However, the Post Hoc test did not confirm pairwise differences, as all comparisons were not statistically significant ($p > .05$). These results show that while fintech is generally seen as easy and comfortable to use in all three countries, the statistical evidence for strong differences between them is limited.

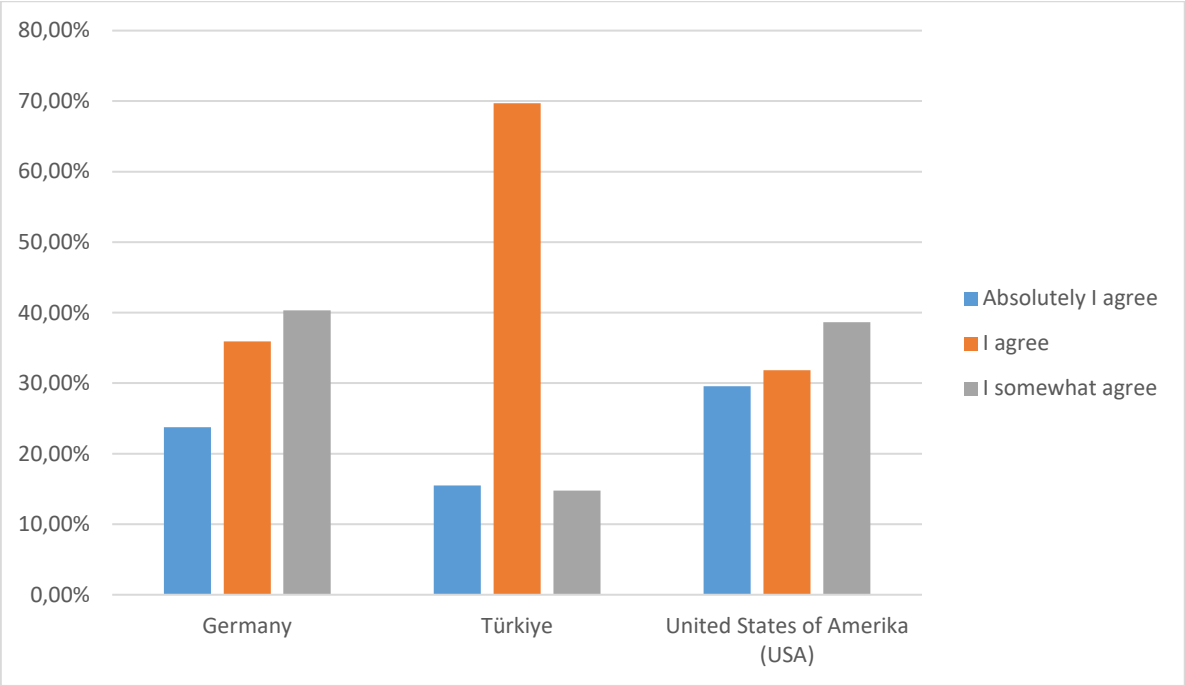
Figure 31. Fintech Adoption: Ease of Use and User Confidence



4.1.11.2. Perceived Effectiveness of Personalized Information in Fintech Services

Figure 32 shows the responses to the statement "Fintech provides me with information tailored to my needs." In Germany, 24 % of respondents selected "Absolutely I agree," 36% chose "I agree," and 40% selected "I somewhat agree." In Türkiye, 15% chose "Absolutely I agree," 70% selected "I agree," and 15% gave a more moderate answer. In the United States, 30% selected "Absolutely I agree," 32% chose "I agree," and 39% selected "I somewhat agree." The ANOVA test ($F(2,452) = 2.210$, $p = .111$) showed that there is no significant difference between the countries, and the Post Hoc analysis confirmed that none of the pairwise comparisons were statistically significant. These results indicate that although the distributions differ in appearance, the overall statistical evidence suggests that perceptions of fintech's ability to provide tailored information are similar across Germany, Türkiye, and the United States.

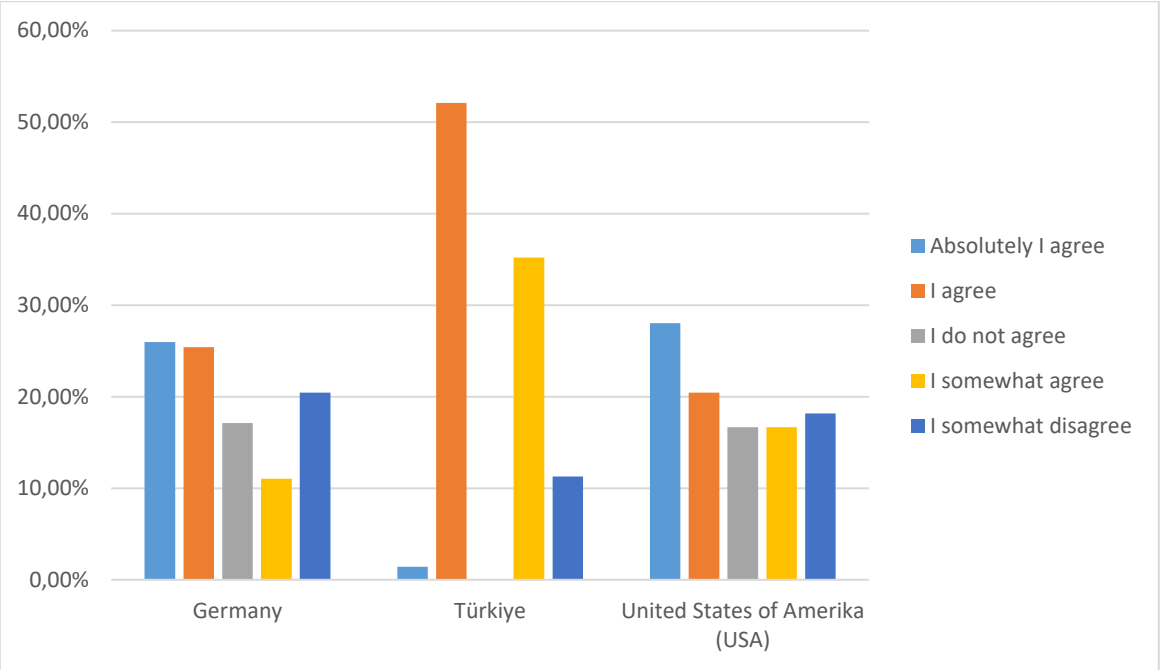
Figure 32. Consumer Views on Personalized Financial Information in Fintech



4.1.11.3. Perceived Reliability of Fintech Services

Figure 33 shows the responses to the statement "Fintech provides reliable services." In Germany, 26% of respondents selected "Absolutely I agree," 25% chose "I agree," while 17% disagreed, and 31% gave more moderate responses. In Türkiye, the results were stronger, with 1% choosing "Absolutely I agree," 52% selecting "I agree," 35% giving a moderate answer, and 11% disagreeing. In the United States, 28% selected "Absolutely I agree," 20% chose "I agree," 17% disagreed, and 35% gave moderate responses. The ANOVA test ($F(2,452) = 1.216$, $p = .297$) showed that there is no significant difference among the countries, and the Post Hoc analysis confirmed that none of the pairwise comparisons were statistically significant. These results indicate that perceptions of fintech reliability are broadly similar in Germany, Türkiye, and the United States, even though the distributions suggest slightly stronger positive views in Türkiye.

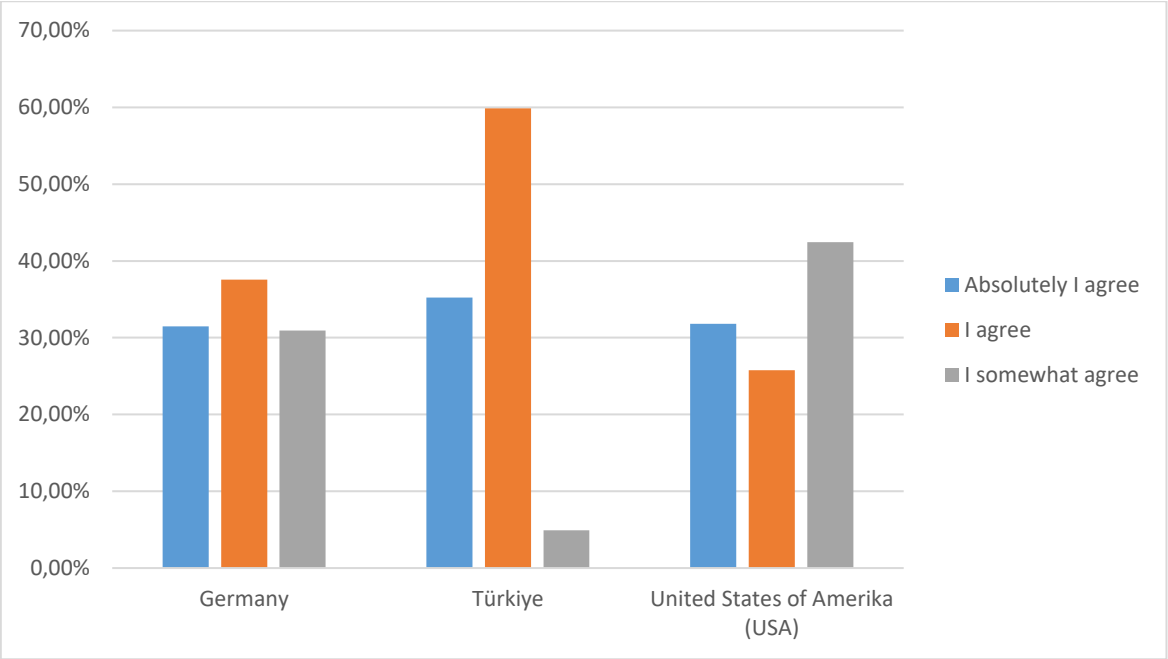
Figure 33. Fintech Reliability: User Trust and Perceptions



4.1.11.4. Perceived Speed and Efficiency of Fintech Services

Figure 34 shows the responses to the statement "Fintech provides fast services." In Germany, 31% of respondents selected "Absolutely I agree," 38% chose "I agree," and 31% gave a more moderate answer. In Türkiye, 35% selected "Absolutely I agree," 60% chose "I agree," and only 5% gave a moderate response, showing very strong satisfaction with service speed. In the United States, 32% selected "Absolutely I agree," 26% chose "I agree," and 42% gave a moderate response, indicating more mixed views. The ANOVA test ($F(2,452)=11.17$, $p < .001$) confirmed that there are significant differences among the countries. The Post Hoc analysis showed that Türkiye differs significantly from both Germany ($p = .001$) and the United States ($p < .001$), while there is no significant difference between Germany and the United States ($p = .395$). These results indicate that fintech speed is highly valued in Türkiye compared to Germany and the United States, where perceptions are more balanced.

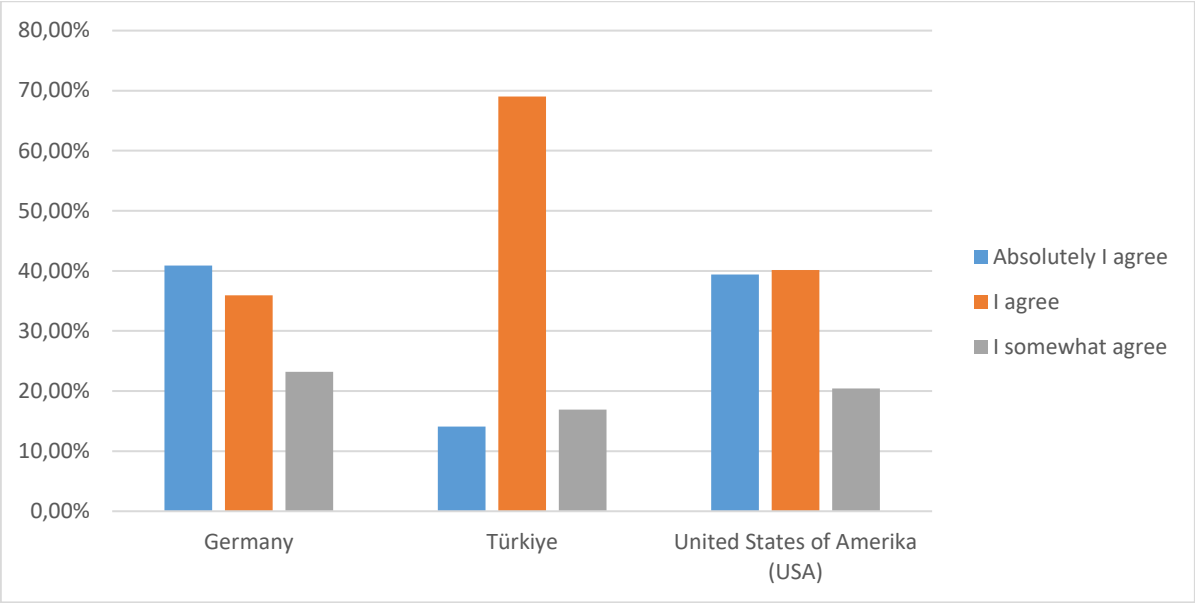
Figure 34. Consumer Satisfaction with Fintech Service Speed



4.1.11.5. Perceived Professionalism of Fintech Services

Figure 35 shows the responses to the statement "Fintech provides professional services." In Germany, 41% of respondents selected "Absolutely I agree," 36% chose "I agree," and 23% gave a more moderate answer. In Türkiye, 14% selected "Absolutely I agree," 69% chose "I agree," and 17% gave a moderate response, reflecting strong confidence in fintech professionalism. In the United States, 39% selected "Absolutely I agree," 40% chose "I agree," and 20% gave a moderate answer, showing a pattern similar to Germany. The ANOVA test ($F(2,452) = 4.284$, $p = .014$) confirmed that there are significant differences among the three countries. The Post Hoc analysis showed that Türkiye differs significantly from both Germany ($p = .028$) and the United States ($p = .031$), while no significant difference was found between Germany and the United States ($p = .987$). These results suggest that although trust in fintech professionalism is high in all three countries, Türkiye shows a stronger positive perception compared to Germany and the United States.

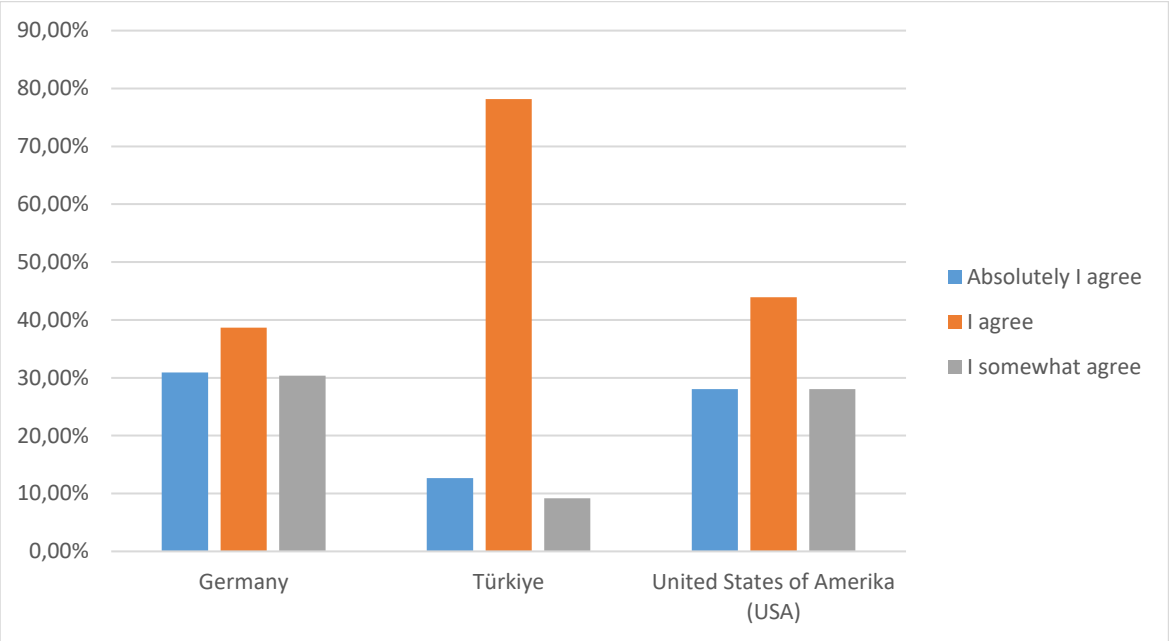
Figure 35. User Trust in the Professionalism of Fintech Services



4.1.11.6. Alignment of Fintech Services with User Needs

Figure 36 shows the responses to the statement "Fintech services meet my needs." In Germany, 31% of respondents selected "Absolutely I agree," 39% chose "I agree," and 30% gave a more moderate response. In Türkiye, 13% selected "Absolutely I agree," 78% chose "I agree," and 9% gave a moderate answer, indicating the highest level of satisfaction among the three countries. In the United States, 28% selected "Absolutely I agree," 44% chose "I agree," and 28% gave a moderate response. The ANOVA test ($F(2,452) = 0.107$, $p = .898$) showed that there is no significant difference among the countries, and the Post Hoc analysis confirmed that none of the pairwise comparisons were statistically significant. These results suggest that while Türkiye shows a stronger positive trend, overall perceptions of how well fintech meets user needs are broadly similar across Germany, Türkiye, and the United States.

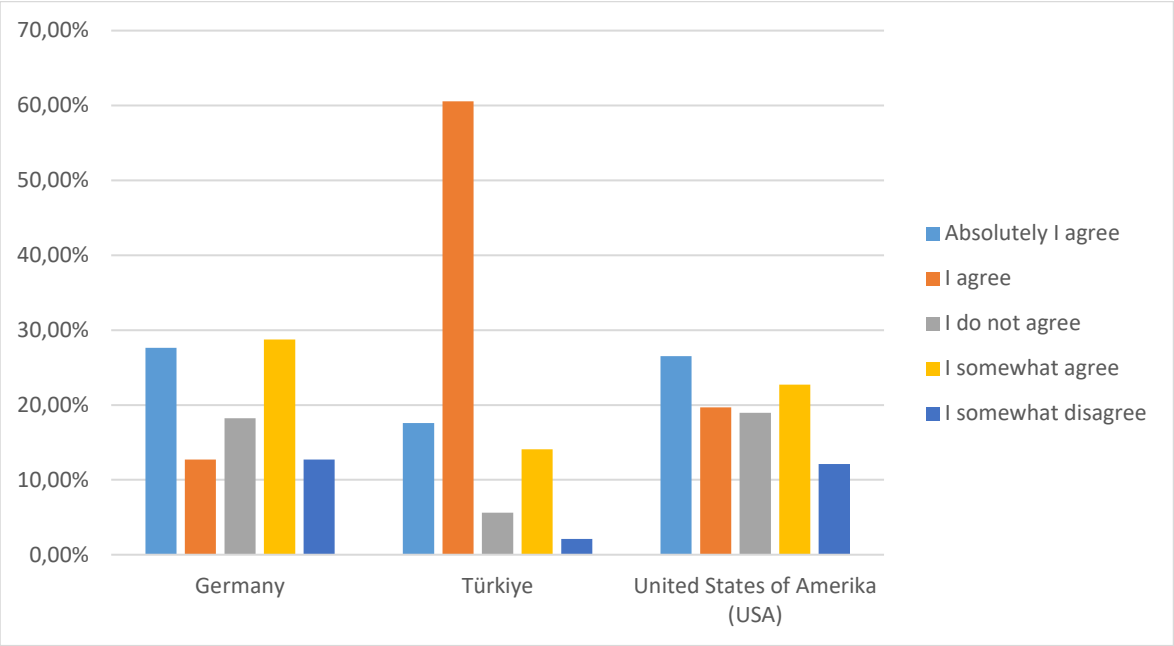
Figure 36. Perceived Effectiveness of Fintech in Meeting User Needs



4.1.11.7. Trust in Fintech Sites and Applications

Figure 37 evaluates respondents' trust in fintech sites and applications across Germany, Türkiye, and the USA. In Germany, 27.62% of respondents selected "Absolutely I agree," 12.71% "I agree," while 28.73% "I somewhat agree," and 18.23% "I do not agree," showing a mixed view with a considerable neutral stance. In Türkiye, 17.61% chose "Absolutely I agree" and 60.56% "I agree," with smaller shares in disagreement, reflecting a strong trust in fintech. In the USA, 26.52% selected "Absolutely I agree" and 19.70% "I agree," while 22.73% "I somewhat agree," and 18.94% "I do not agree," indicating more divided views compared to Türkiye. The ANOVA results ($F(2,452) = 11.02$, $p < .001$) confirmed significant differences among the countries. Post Hoc analysis showed that Germany differs significantly from Türkiye ($p < .001$), and Türkiye also differs significantly from the USA ($p < .001$), while Germany and the USA show no significant difference ($p = .962$). These results demonstrate that trust in fintech is highest in Türkiye, while Germany and the USA display more cautious and balanced perceptions.

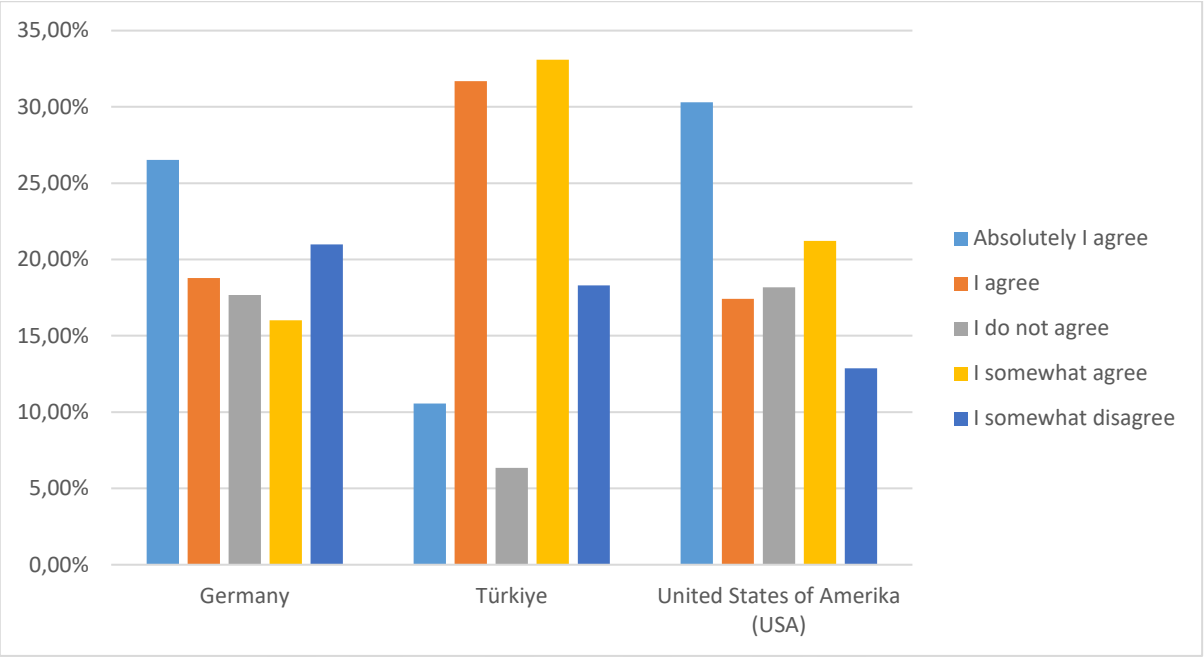
Figure 37. User Trust Levels in Fintech Platforms



4.1.11.8. Perceived Security of Stored Private Information in Fintech Services

Figure 38 evaluates how respondents in Germany, Türkiye, and the USA view the safety of their saved private information. In Germany, 26.52% absolutely agree, 18.78% agree, 17.68% do not agree, 16.02% somewhat agree, and 20.99% somewhat disagree. In Türkiye, 10.56% absolutely agree, 31.69% agree, 6.34% do not agree, 33.10% somewhat agree, and 18.31% somewhat disagree. In the USA, 30.30% absolutely agree, 17.42% agree, 18.18% do not agree, 21.21% somewhat agree, and 12.88% somewhat disagree. These results show mixed levels of confidence, with Türkiye having the highest share in the "somewhat agree" group, while Germany and the USA show stronger proportions in "absolutely agree." The ANOVA test ($F(2,452) = 0.369$, $p = .692$) indicated no statistically significant differences among the three countries, and the Post Hoc analysis confirmed that perceptions of data safety are broadly consistent across Germany, Türkiye, and the USA.

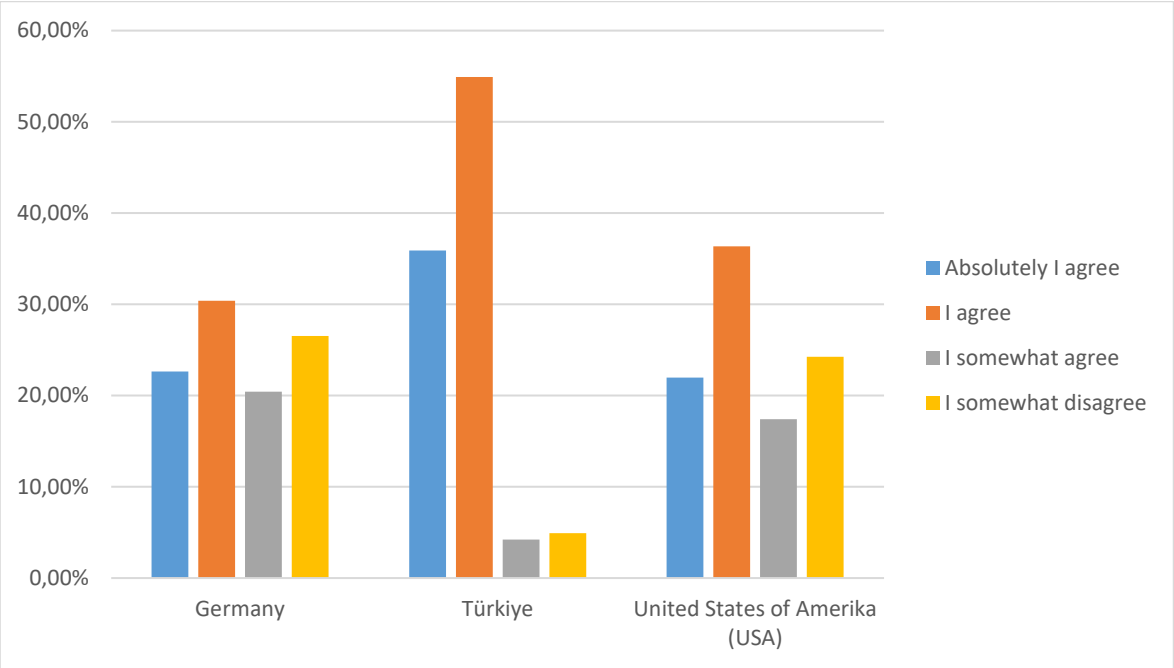
Figure 38. User Confidence in Fintech Data Security



4.1.11.9. General Attitudes Toward Fintech Services

Figure 39 evaluates respondents' attitudes toward fintech across Germany, Türkiye, and the USA, based on the statement, "I have positive thoughts towards fintech in general." In Germany, 23% absolutely agree, 30% agree, 20% somewhat agree, and 27% somewhat disagree, indicating a split perception with a notable share of skepticism. In Türkiye, 36% absolutely agree, 55% agree, and only 4% somewhat agree, showing very strong positive views overall. In the USA, 22% absolutely agree, 36% agree, 17% somewhat agree, and 24% somewhat disagree, reflecting a more divided stance compared to Türkiye. These results show that Türkiye has the highest level of positivity, while Germany and the USA display more balanced but less enthusiastic attitudes. An ANOVA test ($F(2,452) = 23.74$, $p < .001$) confirmed significant differences among the three countries. Post Hoc analysis shows that Türkiye differs strongly from both Germany ($p < .001$) and the USA ($p < .001$), while Germany and the USA do not differ significantly ($p = .821$). The results of the chart and statistical tests are consistent, indicating that positive perceptions of fintech are most pronounced in Türkiye.

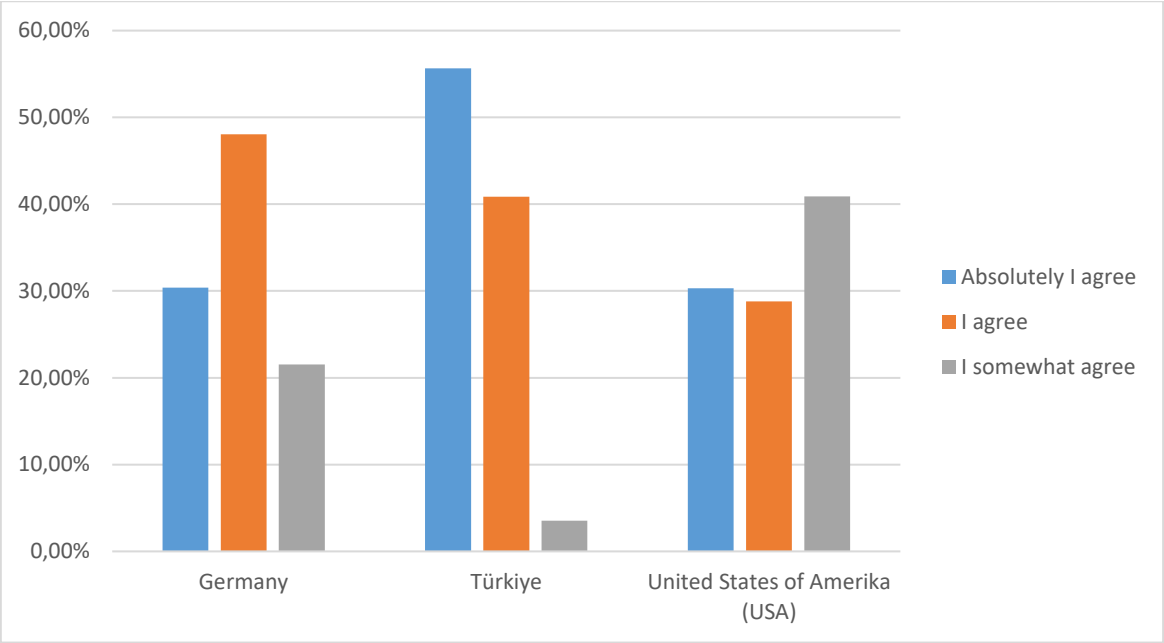
Figure 39. Trust and Attitudes Toward Fintech Applications



4.1.11.10. Future Intentions for Fintech Usage

Figure 40 illustrates respondents' intention to continue using fintech in the future across Germany, Türkiye, and the USA. In Germany, 30.39% of respondents chose “Absolutely I agree,” 48.07% “I agree,” and 21.55% “I somewhat agree,” indicating nearly 79% overall commitment. In Türkiye, 55.63% selected “Absolutely I agree” and 40.85% “I agree,” with only 3.52% opting for “I somewhat agree,” showing an overwhelming 96% positive response. In the USA, 30.30% reported “Absolutely I agree,” 28.79% “I agree,” and 40.91% “I somewhat agree,” reflecting a more moderate but still favorable view. The ANOVA test ($F(2,452) = 28.20$, $p < .001$) confirmed significant differences among the countries, with Post Hoc results showing that Türkiye differs strongly from both Germany and the USA ($p < .001$), and Germany also differs slightly from the USA ($p = .047$). These results indicate that while all three countries express positive future intentions toward fintech, Türkiye shows the strongest commitment, Germany follows with solid support, and the USA reflects a more cautious stance.

Figure 40. Trust and Attitudes Toward Fintech Applications



4.1.11.11. Other Key Points from the Survey: Cross-Country Outlooks

According to the ANOVA analysis in JASP, for the statement "Fintech is visually interesting," the ANOVA results ($F(2,452) = 1.551$, $p = .213$) indicate no significant difference among Germany, Türkiye, and the USA, and the Post Hoc analysis further confirms that none of the pairwise comparisons are statistically significant. For the statement "Fintech provides me with accurate and sufficient information," the ANOVA results ($F(2,452) = 0.869$, $p = .420$) also show no significant difference among the three countries, with Post Hoc comparisons supporting this outcome. For the statement "Fintech provides me with up-to-date information," the ANOVA results ($F(2,452) = 7.205$, $p < .001$) reveal a clear difference, and the Post Hoc analysis shows that Germany differs significantly from both Türkiye ($p = .004$) and the USA ($p = .004$), while Türkiye and the USA do not differ significantly. For the statement "Fintech offers personalized services," the ANOVA results ($F(2,452) = 11.35$, $p < .001$) demonstrate a strong difference among the three countries, with Post Hoc results indicating significant differences between Germany and Türkiye ($p = .040$), Germany and the USA ($p = .023$), and Türkiye and the USA ($p < .001$). For the statement "Fintech will benefit its users now and in the future," the ANOVA results ($F(2,452) = 2.572$, $p = .078$) indicate no statistically significant difference across the three countries, and the Post Hoc analysis similarly shows no meaningful pairwise differences. For the statement "At Fintech will be handled within the scope of appropriate

processes," the ANOVA results ($F(2,452) = 12.39$, $p < .001$) indicate a significant difference among the countries, and the Post Hoc analysis confirms this, showing significant differences between Germany and Türkiye ($p = .030$), Germany and the USA ($p = .016$), and Türkiye and the USA ($p < .001$). For the statement "I believe that the private information I save can only be viewed by legitimate parties," the ANOVA results ($F(2,452) = 0.894$, $p = .410$) reveal no significant difference among Germany, Türkiye, and the USA, and the Post Hoc analysis also indicates no statistically significant pairwise differences. For the statement "I am aware of parties collecting my personal information while using Fintech," the ANOVA results ($F(2,452) = 5.139$, $p = .006$) indicate a significant difference, with the Post Hoc analysis showing that Türkiye differs significantly from the USA ($p = .005$), while the other comparisons are not statistically significant. For the statement "I have no concerns that my personal information saved in Fintech may be misused," the ANOVA results ($F(2,452) = 9.444$, $p < .001$) show a significant difference among the three countries, with the Post Hoc analysis indicating significant differences between Germany and Türkiye ($p = .040$) and between Türkiye and the USA ($p < .001$), while the Germany–USA comparison is not statistically significant. For the statement "Fintech would be a good idea," the ANOVA results ($F(2,452)=13.26$, $p < .001$) indicate a significant difference, with Post Hoc tests showing that Germany differs significantly from both Türkiye ($p< .001$) and the USA ($p< .001$), while Türkiye and the USA show no meaningful difference. For the statement "Fintech in the future," the ANOVA results ($F(2,452) = 18.17$, $p < .001$) reveal a strong difference among the three countries, and the Post Hoc analysis shows that Germany and Türkiye do not differ significantly, while Germany and the USA ($p < .001$) and Türkiye and the USA ($p < .001$) exhibit significant differences. For the statement "I visit fintech sites/apps whenever possible," the ANOVA results ($F(2,452) = 1.268$, $p = .282$) indicate no significant difference among the three countries, and the Post Hoc analysis further confirms that none of the pairwise comparisons show statistical significance.

4.1.11.12. Summary Evaluation

The results show that fintech is generally considered easy and comfortable to use in all three countries. In Germany, responses were balanced across agreement levels, in Türkiye the majority showed clear agreement, and in the USA more respondents selected the strongest level of agreement. The ANOVA test indicated some statistical difference, but the Post Hoc test did

not confirm pairwise contrasts. This suggests that while usage comfort is positively viewed everywhere, there are no strong statistical differences across countries.

Perceptions about fintech providing personalized information were also similar. Respondents in Germany and the USA showed more balanced distributions, while Türkiye displayed a stronger share of agreement. However, the ANOVA and Post Hoc results showed no significant differences, indicating that the ability of fintech to give tailored information is perceived in a broadly similar way across regions. The same applies to reliability of fintech services, where Germany, Türkiye, and the USA showed comparable views, with Türkiye leaning slightly more positive but without significant differences.

Clearer contrasts appeared in questions about speed and professionalism. In Türkiye, almost all respondents agreed that fintech is fast, showing very strong satisfaction. Germany and the USA gave more balanced responses, with larger neutral groups. The ANOVA and Post Hoc confirmed that Türkiye is significantly different from both other countries. A similar pattern was observed in professionalism. All three countries had high agreement, but Türkiye once again reported stronger trust compared to Germany and the USA, with statistical tests confirming these differences.

When asked whether fintech services meet user needs, the majority of respondents in all three countries expressed agreement, with Türkiye showing the highest level of satisfaction. The statistical tests, however, showed no significant differences, meaning that this perception is widely shared even though Türkiye stands out with stronger support. Similarly, views on the security of stored private information were mixed but not significantly different. Germany and the USA had more respondents in the “absolutely agree” group, while Türkiye had a larger share in the “somewhat agree” group, reflecting cautious confidence across all three countries.

Trust in fintech sites and applications showed much stronger variation. Türkiye had the highest trust, with over three-quarters of respondents giving positive responses. In contrast, Germany and the USA were more divided, with significant neutral and negative shares. The ANOVA and Post Hoc confirmed that Türkiye differs from both Germany and the USA, while Germany and the USA do not differ significantly. General attitudes toward fintech followed a similar pattern. Türkiye showed overwhelming positivity, with over 90% positive responses, while Germany

and the USA showed more balanced attitudes, including notable shares of skepticism. These findings were confirmed by ANOVA and Post Hoc tests.

Future intentions for fintech usage also showed significant contrasts. In Türkiye, nearly all respondents expressed positive commitment to continue using fintech, showing the strongest support. Germany also reflected strong intentions, with almost 80% agreement, while the USA showed a more cautious but still positive outlook. The ANOVA confirmed strong differences, with Türkiye significantly different from both Germany and the USA, and Germany slightly different from the USA.

Further statements from the survey provide additional insights. No significant differences were found in areas such as visual design, accuracy of information, overall benefits of fintech, and type of bank information collected. However, clear differences were observed in timeliness of information, where Germany was rated lower than both Türkiye and the USA, and in personalized services, where Türkiye and the USA reported higher satisfaction compared to Germany. Questions on process reliability also showed significant differences, with Türkiye and the USA standing apart from Germany. Awareness of data collection showed variation, with Türkiye differing significantly from the USA, while concerns about data misuse revealed that Türkiye was more trusting than both Germany and the USA. Respondents in Türkiye also showed stronger agreement that fintech is a good idea and expressed more positive expectations for the future of fintech compared to Germany and the USA.

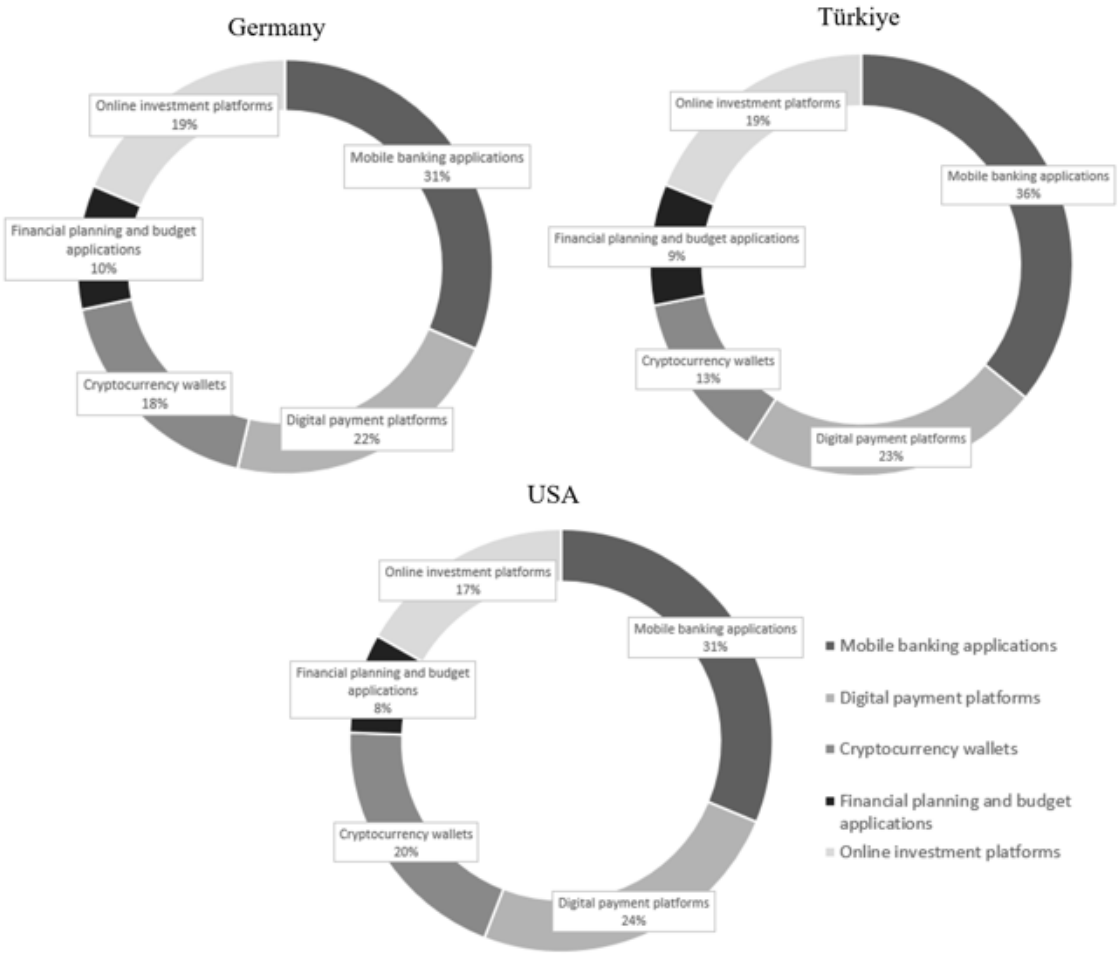
Overall, the findings show that while basic elements such as ease of use, reliability, and meeting user needs are shared across all three countries, Türkiye consistently demonstrates stronger trust, satisfaction, and long-term commitment to fintech. Germany and the USA show more balanced or cautious views, with larger neutral or skeptical shares. These results suggest that fintech adoption in Türkiye is driven by stronger enthusiasm and positive expectations, while in Germany and the USA it is accepted but with more measured attitudes, reflecting cultural and structural differences in financial behavior.

4.1.12. Adoption of Financial Technology Products Across Different Regions

In response to the survey question “Which financial technology products do you use?”, Figure 41 presents a comparison of the most frequently used financial technology products among

respondents in Germany, Türkiye, and the United States. Mobile banking applications are the leading fintech product in all three countries; 31 % of respondents in Germany and the United States use these applications, while the percentage is even higher in Türkiye (36 %). Digital payment platforms are the second most used tool, with usage rates ranging from 22% in Germany to 24% in the United States and 23% in Türkiye. This trend highlights a global preference for mobile and digital solutions that offer convenience and accessibility for everyday financial tasks. Specialized fintech products reveal distinct regional preferences. Cryptocurrency wallets are used by 20% of respondents in the United States, 18% in Germany, and 13% in Türkiye, suggesting greater openness to digital assets among American users. Online investment platforms are equally popular at 19% in Germany and Türkiye, while financial planning and budgeting applications remain the least used category, at only 8–10% across all regions. These findings suggest a growing interest in diverse, specialized fintech solutions, while users continue to prioritize tools that enhance transactional convenience and support investment opportunities.

Figure 41. Distribution of Financial Technology Product Usage in Germany, Türkiye, and the USA

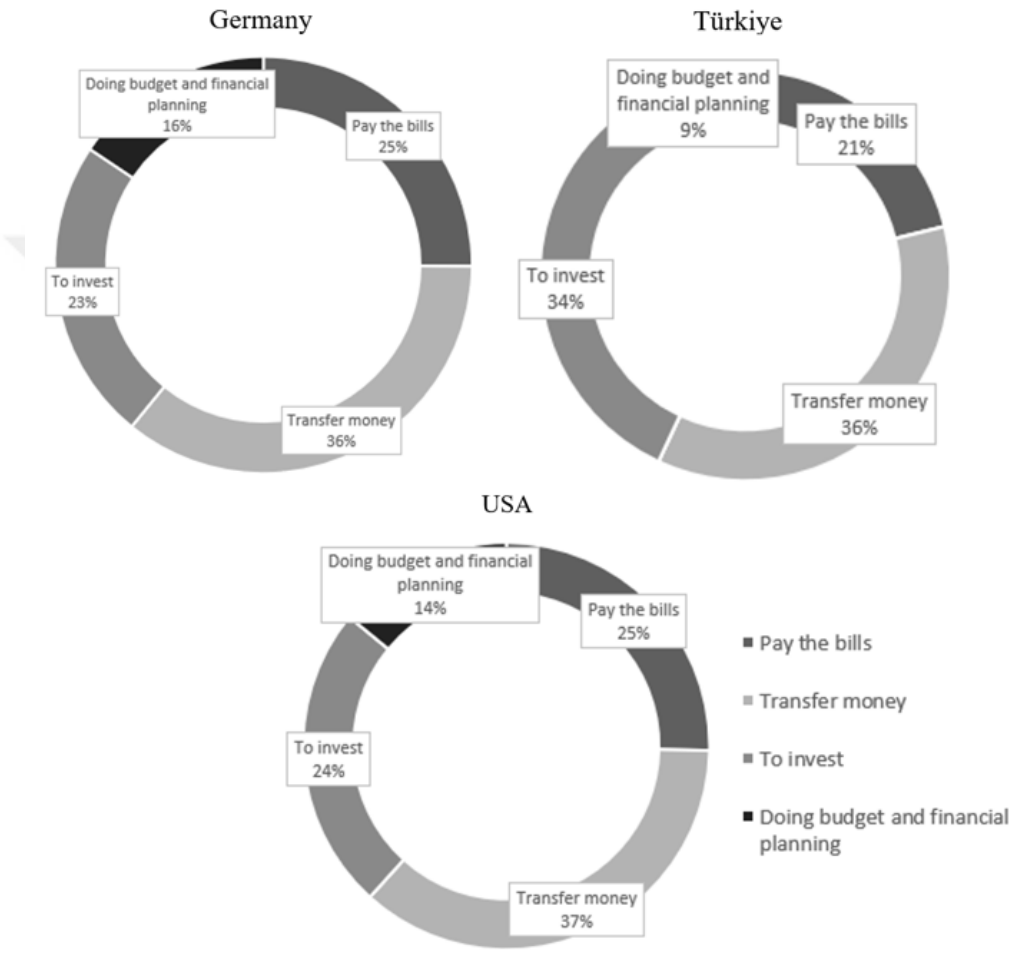


4.1.13. Primary Purposes for Using Financial Technology Applications

In response to the survey question "What is your purpose(s) for using financial technology applications?", Figure 42 presents a comparison of user intentions across Germany, Türkiye, and the United States. In all three countries, money transfer emerges as the most common fintech use-case, with usage rates at 36% in Germany and Türkiye, and slightly higher at 37% in the USA. This consistency underscores the global demand for fast and seamless digital transactions. Investment-related use follows, with Türkiye showing the highest proportion at 34%, compared to 23% in Germany and 24% in the USA, indicating a stronger tendency among Turkish users to leverage fintech for wealth generation beyond basic transactions. Bill payments are also a prevalent purpose, reported by 25% of respondents in both Germany and the USA, and 21% in Türkiye. Budgeting and financial planning rank lowest across all regions, ranging

from 9% in Türkiye to 16% in Germany. These results reflect that while day-to-day financial tasks dominate fintech usage, there is a growing interest in investment and long-term financial planning, particularly in Türkiye and to a lesser extent in Germany and the USA.

Figure 42. Primary Purposes of Fintech Use in Germany, Türkiye, and the USA

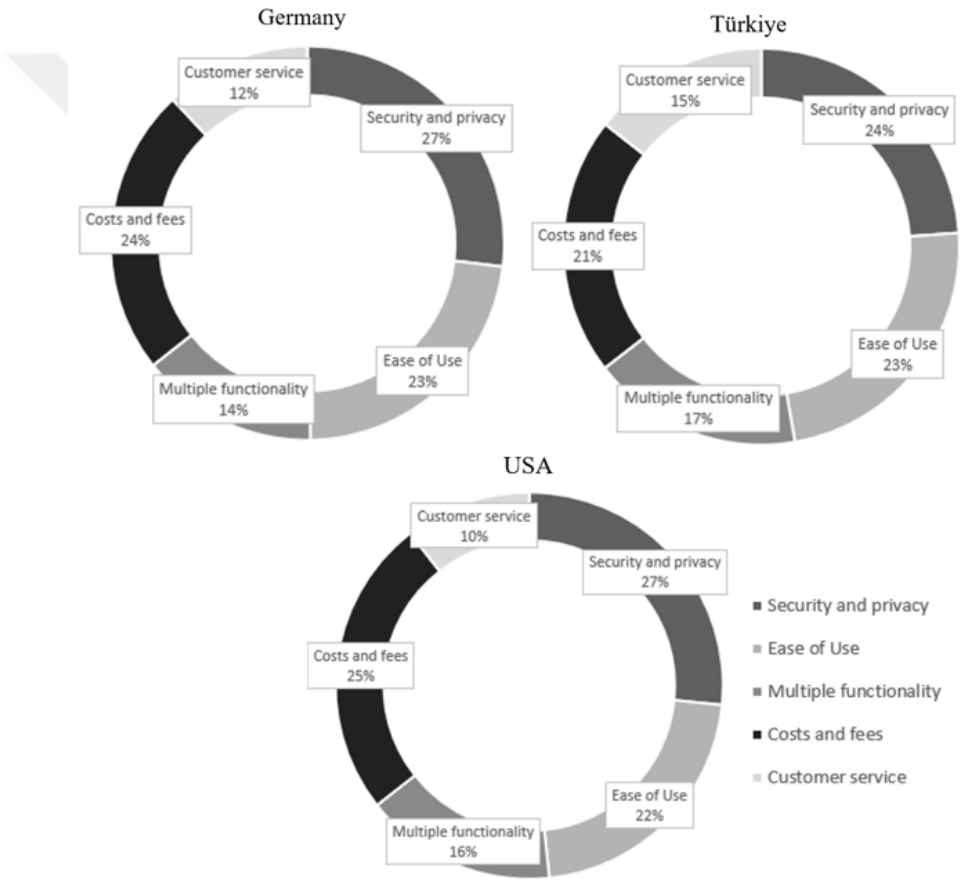


4.1.14. Key Factors Influencing the Selection of Financial Technology Applications

In response to the survey question "What factors are most important to you when choosing financial technology applications?", respondents from Germany, Türkiye, and the United States consistently highlighted security and privacy as the most important factor. As shown in Figure 43, in Germany and the USA, 27 % of participants emphasized data protection, while 24 % did so in Türkiye. Cost-effectiveness was the next most important factor, with 24 % of German, 25 % of American, and 21 % of Turkish respondents citing transparent fees as a priority. Ease of use was particularly significant in Türkiye, where 23 % of users preferred user-friendly

interfaces, compared to 23 % in Germany and 22 % in the USA. In all three countries, features such as multifunctionality and customer service were rated as less critical. Customer service ranked the lowest overall, with 12 % in Germany, 15 % in Türkiye, and 10 % in the USA, indicating that while support services matter, users are primarily driven by security, cost, and usability when selecting fintech applications.

Figure 43. Key Factors in Selecting Fintech Applications in Germany, Türkiye, and the USA

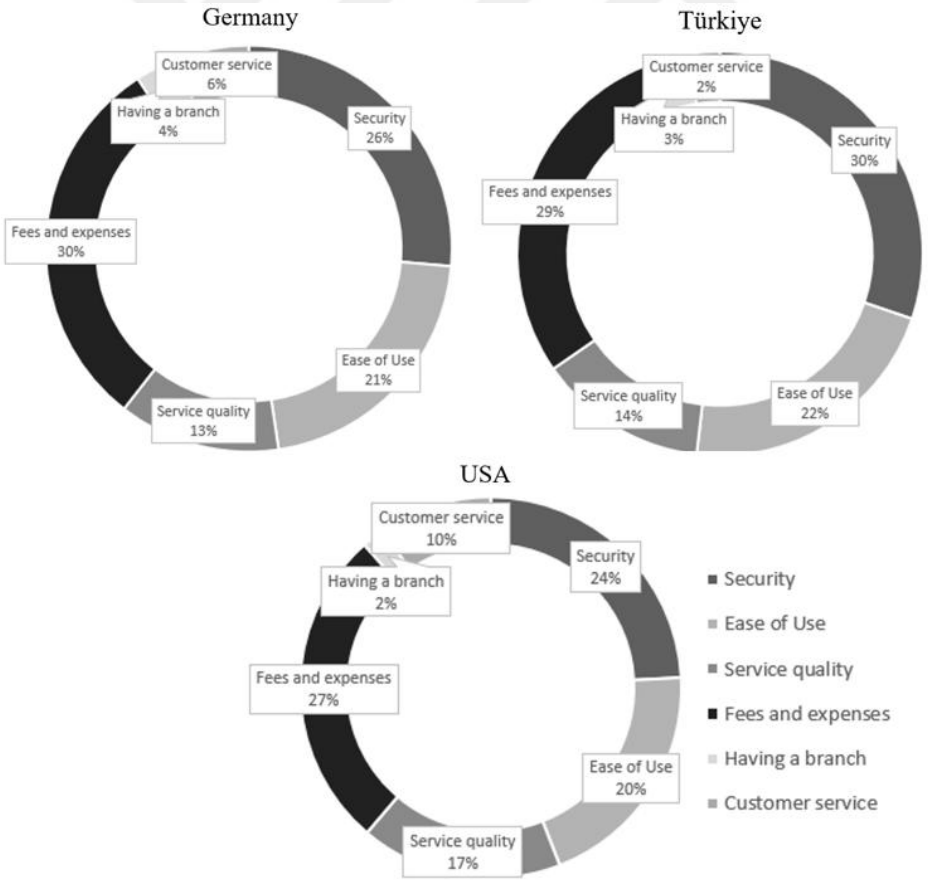


4.1.15. Determinants of Bank Selection: Key Factors Influencing Customer Preferences

In response to the survey question “Which factors play the important role in your bank selection?”, Figure 44 presents a comparison of user preferences across Germany, Türkiye, and the United States. Cost-effectiveness and security consistently emerge as the most influential factors in all three countries. In Germany, fees are the leading criterion at 30 %, followed by security at 26 % and ease of use at 21 %, reflecting a cautious and cost-conscious banking

culture. Türkiye displays a similar pattern, with 30 % of respondents prioritizing security and 29 % emphasizing fees and expenses. Ease of use follows at 22 %, indicating the growing importance of convenience in digital banking access. In the United States, 27 % of participants identified fees and expenses as the top factor, while 24 % valued security and 20 % ease of use. Notably, American respondents place slightly more importance on service quality (17 %) and customer service (10 %) than their German and Turkish counterparts. Across all three countries, having a physical branch ranks among the least important considerations—4 % in Germany, 3 % in Türkiye, and 2 % in the USA—demonstrating a widespread shift toward digital-first banking preferences. These findings suggest that secure, affordable, and user-friendly digital banking services are now favored over traditional face-to-face interactions, in line with broader digital transformation trends in the financial sector.

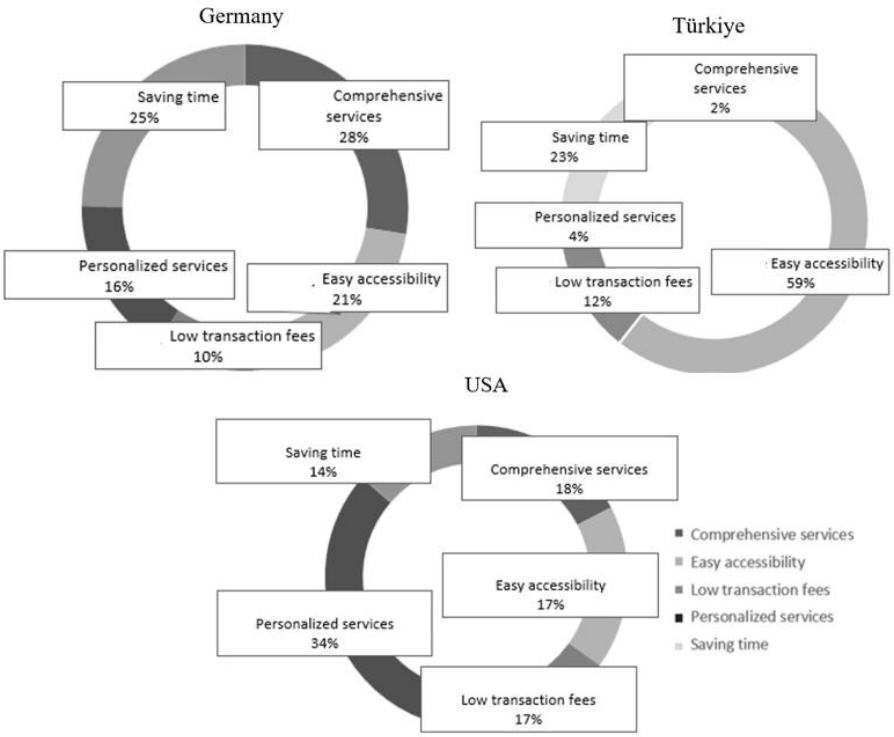
Figure 44. Main Considerations for Selecting a Bank in Germany, Türkiye, and the USA



4.1.16. Customer Satisfaction Drivers in Digital Banking Services

In response to the survey question "What is the feature you are most satisfied with about digital banking services?", Figure 45 presents a comparative analysis of user satisfaction across Germany, Türkiye, and the USA. In Germany, the most valued features are comprehensive services (28%) and time-saving capabilities (25%), reflecting an emphasis on efficiency and broad service offerings. Accessibility (21%) and personalized services (16%) follow, while low transaction fees (10%) are the least cited factor. In Türkiye, easy accessibility stands out as the dominant satisfaction driver, with 59% of respondents selecting it, followed by time-saving features (23%) and low transaction fees (12%). Personalized services (4%) and comprehensive offerings (2%) play a minimal role. In the United States, 34% of respondents prioritize personalized services, indicating a preference for tailored experiences. This is followed by other features such as comprehensive services and efficiency, though with comparatively lower percentages. These regional differences suggest that while efficiency and accessibility are widely appreciated, user satisfaction is shaped by local priorities—highlighting the importance of regional customization in digital banking services.

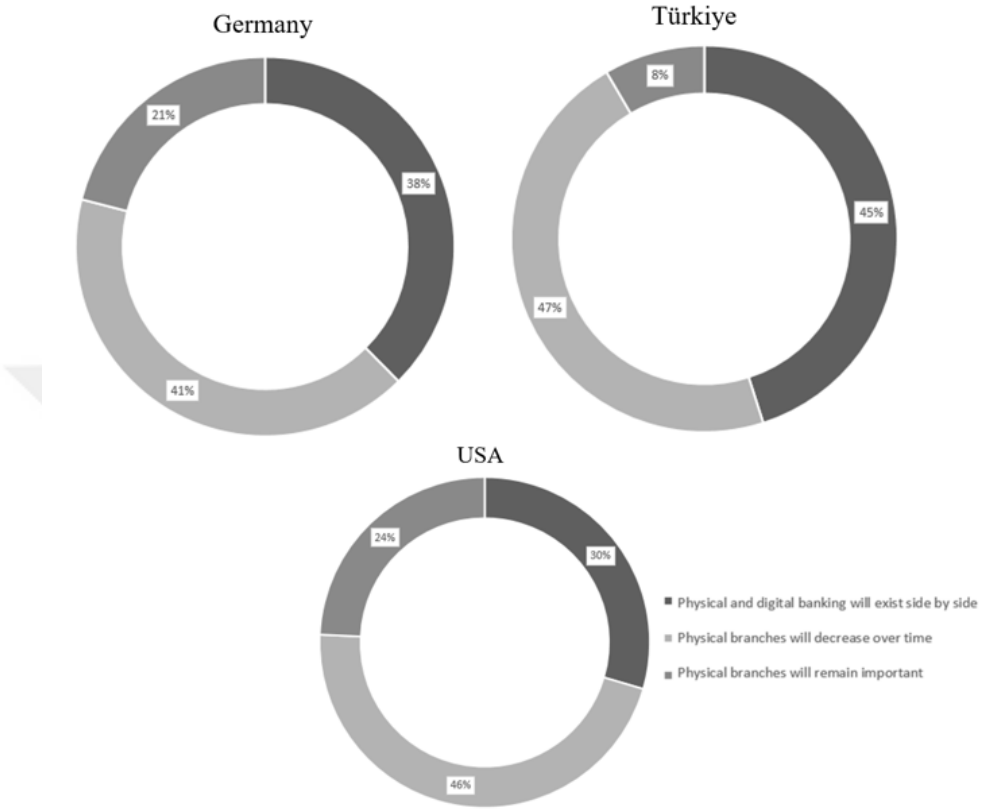
Figure 45. Key Factors Driving Digital Banking Satisfaction in Germany, Türkiye, and the USA



4.1.17. The Future of Physical Bank Branches in the Era of Digital Banking

In response to the survey question “With the spread of digital banking, how do you see the future of physical bank branches?”, Figure 46 compares public expectations across Germany, Türkiye, and the USA, revealing both global alignment and regional distinctions in attitudes toward physical banking. A significant share of respondents in all three countries anticipates a continued decline in physical branches, led by Türkiye (47%), followed by the USA (46%) and Germany (41%), reflecting the growing dominance of digital banking platforms. However, preferences diverge when considering the coexistence of digital and physical channels. Türkiye demonstrates the strongest support for a hybrid model, with 45% of respondents believing both channels should remain available, while Germany follows with 38%, and the USA trails at 30%. These results suggest that despite the momentum of digitalization, many users, especially in Türkiye and Germany, still value face-to-face services for certain financial needs. Interestingly, a smaller portion of respondents maintains that physical branches will remain important regardless of digital progress, particularly in the USA (24%) and Germany (21%), compared to only 8% in Türkiye. This contrast underscores how cultural, infrastructural, and trust-related factors continue to influence the perceived role of traditional banking. Overall, while digital transformation is broadly embraced, the findings highlight the importance of region-specific strategies that balance efficiency, accessibility, and personal interaction to meet evolving customer expectations.

Figure 46. Expected Trends for Physical Bank Branches in Germany, Türkiye, and the USA



5. CONCLUSION

The purpose of this study was to examine how digital banking and financial technology are being implemented and adopted in three different regions: Türkiye, Germany, and the USA. The motivation for conducting this research came from the rapid global growth of digital banking and fintech, which is reshaping the way individuals and businesses manage their finances. By looking at three countries with different economic, cultural, and regulatory backgrounds, this study aimed to understand how these differences influence adoption rates, user experiences, and expectations. The analysis also sought to highlight the similarities that exist across regions, especially in areas where customer needs and preferences align despite different local conditions.

The research used a structured online survey as the main data collection method. A total of several hundred respondents from the three countries participated. The sample included participants of different ages, education levels, genders, and income groups. Each country had its own set of respondents, making it possible to compare results within and between regions. The survey consisted of multiple questions designed to capture demographic information, banking preferences, frequency of fintech use, payment methods, privacy concerns, trust in digital services, perceived service quality, and intentions for future use. By collecting responses from people with different backgrounds and experiences, the study ensured a diverse and balanced dataset that allows for more reliable comparisons.

The demographic results showed that education level, age, and gender distribution varied between countries. For example, postgraduate education was most common among men aged 25–34, while Germany had the highest proportion of undergraduates. Türkiye had fewer respondents in the undergraduate category, reflecting possible differences in education systems and labor market entry. In terms of age, non-student respondents were more common in older age groups, especially among those who had completed their education. These differences suggest that demographic structures influence how people engage with digital banking and fintech, potentially affecting trust, comfort, and adoption.

Income distribution also showed clear differences between the countries. In Germany, a large number of respondents fell into middle-to-high income brackets, while in Türkiye incomes were more evenly spread across categories. In the USA, most respondents were in middle income

ranges, but there was also a notable number in higher brackets. These income patterns can influence the type of financial services people use, their willingness to try new technologies, and their sensitivity to fees and transaction costs.

One of the most notable findings relates to payment preferences. Across all three countries, contactless card payments were the most common daily payment method. Mobile and online payment platforms were also used, particularly by those using fintech a few times a week, but they were less dominant in daily transactions. This shows that while mobile platforms are growing, contactless cards remain the primary choice for fast and convenient payments. The preference for contactless methods can be linked to their wide acceptance in stores, ease of use, and speed.

Privacy concerns were another important area of analysis. The data showed that people who use fintech every day often report having no concerns or only small concerns about privacy. In contrast, those who use fintech a few times a week or less are more likely to report bigger concerns. This suggests that familiarity with technology may reduce perceived risk, while less frequent users remain more cautious. However, even among those with high privacy concerns, many still reported feeling comfortable using fintech, which indicates that perceived benefits often outweigh security worries.

Digital literacy may be connected to how quickly people adapt to new financial technologies. Respondents with very high digital literacy often reported that they might adapt very quickly. Those with adequate literacy may adapt easily, while those with medium literacy might often need help but could still manage. This suggests that improving digital skills through education and training could help more people adopt fintech with greater confidence. Financial literacy might also play a role, as respondents rating themselves as having high or very high literacy were more likely to report that fintech may have a positive effect on their personal financial management.

The importance of physical banking infrastructure varied significantly by country. In Türkiye, many respondents preferred a hybrid model that combines digital services with physical branches. This reflects a market where digital services are growing but in-person interactions are still valued, especially for complex transactions or for customers who prefer face-to-face communication. In Germany and the USA, the trend was more toward fully digital ecosystems,

with fewer people seeing large branch networks as essential. ATMs, however, remained important everywhere, though their perceived value was highest in Türkiye.

The survey also revealed universal needs across all three countries. Low or no transaction costs were considered important by respondents everywhere. Agreement on this point was high, showing that cost efficiency is a key expectation for modern banking. Other widely valued factors included ease of use, speed, professionalism, and the ability of fintech services to meet customer needs. While Türkiye often showed the strongest levels of agreement in these categories, Germany and the USA also recorded high levels of agreement, though with a larger share of moderate responses.

Trust in fintech varied more widely. In Türkiye, trust levels were high, suggesting that recent innovations and improvements in service quality have built strong customer confidence. In Germany and the USA, responses were more divided between agree and disagree, with a notable share of respondents expressing disagreement especially in relation to data security. This indicates that in some markets, building and maintaining trust requires continued investment in clear communication, transparency, and security.

The results also showed differences in the use of specialized fintech services. In Türkiye, agreement with statements related to investment services was stronger, reflecting a growing interest in wealth-building tools. In the USA, more respondents agreed with the use of cryptocurrency wallets, suggesting a greater openness to alternative financial assets. In Germany, the distribution of answers was more balanced, with a preference for stability and efficiency rather than high-risk, high-reward tools. Even those who disagreed with using cryptocurrencies often agreed with using fintech for other types of investment, showing that investment activity is not limited to cryptocurrency users.

In addition to these findings, the survey revealed further region-specific patterns. In Türkiye, accessibility and user-friendly design emerged as the main drivers of satisfaction, supported by a strong preference for hybrid models combining digital and physical services. Speed was also a decisive factor, with the majority of users expressing high satisfaction with rapid service delivery. In Germany, comprehensive services and operational efficiency were the primary satisfaction drivers, although there is room for process improvement to meet speed expectations. In the USA, personalization played the most significant role in shaping satisfaction, with

openness to innovative solutions such as cryptocurrency adoption. While Germany and the USA largely favor fully digital models, hybrid approaches remain relevant for certain user segments in all markets. These differences underscore the importance of tailoring strategies to the unique priorities of each region.

These findings have practical implications for financial institutions, fintech providers, and policymakers. The clear differences between countries mean that a single strategy will not be effective for all markets. In Türkiye, strategies should focus on speed, accessibility, and innovative services, while still maintaining some traditional channels for those who need them. In Germany and the USA, efforts might be better spent on improving security, building trust, and ensuring that new services are reliable and easy to use. In all markets, transparency in data protection policies and the introduction of strong security measures are essential to win and keep customer confidence.

The study has certain limitations. The data reflects a specific period and may not capture future changes in customer behavior. The sample size and demographic composition in each country may also affect how well the results represent the whole population. Additionally, because the survey relied on self-reported information, the findings reflect perceptions and stated behaviors, which may differ from actual actions. Despite these limitations, the results provide valuable insights into the current state of digital banking and fintech adoption.

For future research, it would be useful to monitor these patterns over time to see how they evolve as technology and regulation change. Including more countries, especially in developing regions, would give a broader view of global trends. Using interviews or focus groups could provide deeper insight into why customers hold certain views. Another important area for future study is how fintech integrates with emerging technologies such as artificial intelligence, blockchain, and open banking, and how these developments affect trust, accessibility, and regulation.

Based on the findings of this study, several recommendations can be made for both researchers and practitioners in the field of digital banking and fintech. For researchers, conducting similar surveys in the coming years would allow for comparisons over time, offering insights into whether technological developments, market changes, or regulatory updates have influenced trust levels, adoption rates, and customer satisfaction. Expanding the scope of the study to

include additional countries, particularly from developing regions, could provide a broader perspective on global trends and reveal unique adoption patterns. For practitioners, banks and fintech providers should conduct in-depth evaluations of their digital service offerings to identify strengths and weaknesses, especially in areas such as speed, cost efficiency, trust, and accessibility. Furthermore, segment-based strategies can be developed to tailor services to different age groups and levels of digital literacy, thereby maximizing participation and reducing barriers to adoption. By applying these approaches, stakeholders can create more inclusive, secure, and effective digital financial ecosystems that align with the diverse needs of their customers.

For Türkiye, the findings of this study suggest several policy and strategic recommendations. Given the strong emphasis on speed, accessibility, and hybrid service models, banks and fintech providers should continue to invest in rapid and user-friendly digital solutions while maintaining certain physical channels to serve customers who still prefer in-person interactions. Expanding digital and financial literacy programs through public initiatives and educational partnerships may help increase confidence and adoption across broader segments of society. Policymakers could also focus on regulatory frameworks that encourage innovation while safeguarding customer trust, particularly by promoting transparency in data protection and supporting investment-related fintech services, which show high demand in Türkiye. By prioritizing these areas, Türkiye may strengthen its position as a dynamic and innovative digital banking market in the region.

In conclusion, the shift toward digital banking is happening in all three countries, but it takes different forms depending on cultural, economic, and regulatory factors. Understanding these differences is key for developing services that are both innovative and trusted. By focusing on local needs, improving user education, ensuring low costs, and maintaining a balance between technology and human interaction, banks and fintech providers can continue to grow and meet customer expectations in a sustainable way.

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APPENDICES

ANNEX-1: SURVEY FORM

This survey is being conducted for the master's thesis study on "**Digital Banking**", which is being carried out at Marmara University Social Sciences Institute. The information obtained from you will be used entirely for scientific purposes. Your valuable contributions are important to us. Thank you.

Ümitcan ÜNAL / Marmara University-Institute of Social Sciences-Accounting and Finance (English) Master's Student with Thesis

Assoc. Prof. Dr. Mehtap ÖNER (Thesis Advisor) / Marmara University-Department of Business Administration-Accounting and Finance Department Lecturer

Descriptions:

Financial Technologies (Fintech): Mobile Banking Applications, Digital Payment Platforms, Online Investment Platforms, Cryptocurrency Wallets etc.

Alternative Distribution Channels: ATM, Internet Banking, Mobile Banking, Telephone Banking etc.

1. What is your gender?
   a) Male
   b) Woman
   c) I prefer not to say.

2. What is your age range?
   a) 18-24
   b) 25-34
   c) 35-44
   d) 45-54
   e) 55+

3. Are you in professional business life? (Full time/Part time/Freelance)
   a) Yes
   b) No

4. Which of the following describes you most accurately?
   a) I am an undergraduate student.
   b) I am a Master's/PhD student.

c) I am not a student.

5. If you are in professional business life, which sector do you work in?
   a) Health and Social Services (Example: Doctor, Nurse, Social Worker)
   b) Education (Example: Teacher, Academician)
   c) Information Technologies and Software (Example: Software Engineer, IT Support)
   d) Engineering and Manufacturing (Example: Engineer, Technician)
   e) Commerce, Finance and Management (Example: Accountant, Banker, Business Manager)
   f) I am not working.
   g) Other (Please specify)

6. Which country do you live in?
   a) Türkiye
   b) Germany
   c) United States of Amerika (USA)

7. Which of the following best describes your monthly net income?
   a) 17.002 TL and below
   b) 17.003 TL – 34.000 TL
   c) 34.001 TL – 68.000 TL
   d) 68.001 TL – 136.000 TL
   e) 136.001 TL and above

   a) 2,080 EUR and below
   b) 2,081 EUR-5,160 EUR
   c) 5,161 EUR-10,320 EUR
   d) 10,321 EUR and above

   a) 2,050 USD and below
   b) 2,051 USD-5,000 USD
   c) 5,001 USD-10,000 USD
   d) 10,001 USD-15,000 USD
   e) 15,001 USD and above

8. In what periods do you receive your income?
   a) Daily
   b) Weekly
   c) Monthly
   d) for 3 months
   e) for 6 months
   f) Yearly
   g) It does not have a specific period.

9. What is the source of your income?

a) I am a full/part time employee and the institution I work for pays me.
b) employed or freelancer
c) I get pocket money from my parents.

10. How often do you use financial technology applications?
a) Every day
b) Several times a week
c) Several times a month
d) Rarely
e) I don't use it at all.

11. Which financial technology products do you use?
a) Mobile banking applications
b) Digital payment platforms
c) Cryptocurrency wallets
d) Financial planning and budget applications
e) Online investment platforms
f) I don't use.
g) Other

12. What types of digital payment systems do you use most often?
a) Mobile/online payment platforms (Amazon Pay, ininal, papara, fastpay, Hepsipay, Istanbul Card, N26, PayPal, etc.)
b) Payment with QR code
c) Contactless card payments
d) I don't use.

13. What is your purpose(s) for using financial technology applications?
a) Pay the bills
b) Transfer money
c) To invest
d) Doing budget and financial planning
e) I don't use.

14. Do you have privacy concerns when using financial technology applications?
a) Yes, I have big concerns
b) I have some concerns.
c) I have no worries.
d) No idea.
e) I do not use financial technology applications.

15. What do you think about the ease of use of financial technology applications?
a) Very easy and understandable

b) Usually easy
c) Confused and difficult to understand
d) Very complicated and not understandable
e) I do not use financial technology applications.

16. How comfortable are you using financial technology applications?
a) I am very comfortable, I have no problems.
b) I am generally relaxed.
c) I am having some difficulties.
d) I am having difficulty using it.
e) I do not use financial technology applications.

17. How would you rate yourself in terms of adapting to new financial technologies?
a) I adapt very quickly.
b) I usually adapt easily.
c) I am struggling a bit.
d) I am having a hard time, and getting help.

18. How do financial technology applications affect your personal finance management?
a) It improves greatly.
b) It usually has a positive effect.
c) It has little or no effect.
d) It affects negatively and creates complexity.
e) No idea.

19. How often do you invest using financial technology applications?
a) Regularly
b) Now and again
c) Rarely
d) I don't do it at all

20. How often do you use cryptocurrencies?
a) Regularly
b) Now and again
c) Rarely
d) I don't use it at all

21. How would you rate your digital literacy level?
a) I can adapt very quickly to new technologies.
b) Adequate, I can easily use most financial technologies.
c) Medium, I need help with some technologies.
d) Low, I have difficulty with digital technologies.

22. How would you rate your financial literacy level?
    a) Very high, I am confident in financial matters and can make complex financial decisions.
    b) Proficient, I understand basic financial matters and can manage my own financial transactions.
    c) Medium, I understand some financial topics, but I need more information.
    d) Low, I don't feel very comfortable with financial matters and I need to learn.

23. What factors are most important to you when choosing financial technology applications?
    a) Security and privacy
    b) Ease of Use
    c) Multiple functionality
    d) Costs and fees
    e) Customer service

24. Which factors play the most important role in your bank selection?
    a) Security
    b) Ease of Use
    c) Service quality
    d) Fees and expenses
    e) Finding a branch
    f) Customer service

25. What is the biggest challenge you face when using digital banking services?
    a) Technical problems (such as connection problems, application crashes)
    b) User interface complexity
    c) Difficulty reaching customer service
    d) Security concerns
    e) Existence of high fees/expenses
    f) I haven't encountered any challenges so far.

26. What is the feature you are most satisfied with about digital banking services?
    a) Easy accessibility
    b) Saving time
    c) Comprehensive services
    d) Low transaction fees
    e) Personalized services

27. With the spread of digital banking, how do you see the future of physical bank branches?
    a) Physical branches will decrease over time
    b) Physical branches will remain important

c) Physical and digital banking will exist side by side
d) No idea.

28. Do you think it is important to have physical branches alongside digital banking services?
a) Yes, because face-to-face service is important.
b) No, because digital services are sufficient.
c) Maybe it depends on the situation.
d) No idea.

29. Evaluate the following statements on the scale on the side.
a) The attention shown to me by the branch staff is important to me.
b) It is important for me not to wait too long when I queue at the branch.
c) The knowledge level and performance of the bank staff are important to me.
d) Having a large number of branches is important to me.
e) I prefer to work with the bank from which I receive my salary.
f) Advertisements affect my bank choice.
g) Credit card campaigns (installment options, etc.) that I use.
h) Having more ATMs is important to me.
i) Easy and quick access to the call center is important to me.
j) The importance that the bank I work for attaches to alternative distribution channels is important to me.
k) It is important that the bank fulfills its promises.
l) The public image of the bank is important to me.
m) It is important to me that transaction costs are low or absent.
n) Bank type (Deposit, Participation (Interest-free), etc.) is effective in my bank choice.

Likert Scale:

1. I strongly disagree
2. I do not agree
3. I somewhat disagree
4. I somewhat agree
5. I agree
6. Absolutely I agree

30. Evaluate the following statements on the scale on the side.
a) Fintech is easy to use and comfortable to use.
b) Fintech is visually interesting.
c) Fintech provides me with accurate and sufficient information.
d) Fintech provides me with information tailored to my needs.
e) Fintech provides me with up-to-date information.
f) Fintech provides reliable services.
g) Fintech provides fast services.

h) Fintech provides professional services.
i) Fintech offers personalized services.
j) Fintech services meet my needs.
k) Fintech will benefit its users now and in the future.
l) Generally trust fintech sites and applications.
m) At Fintech will be handled within the scope of appropriate processes.
n) I am confident that my saved private information will be safe.
o) I believe that the private information I save can only be viewed by legitimate parties.
p) I am aware of parties collecting my personal information while using Fintech.
q) In Fintech may be misused.
r) I have positive thoughts towards fintech in general.
s) Fintech would be a good idea.
t) I am considering using fintech in the future.
u) I visit fintech sites/apps whenever possible.
v) I will continue to use fintech in the future.

Likert Scale:

1. I strongly disagree
2. I do not agree
3. I somewhat disagree
4. I somewhat agree
5. I agree
6. Absolutely I agree