

Digital Transformation in Greek Banking: Historical Insights, User Behavior, and Technological Prospects

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Abstract

This paper investigates the progression, current dynamics, and future trajectory of electronic banking (e-banking) in Greece, emphasizing both historical developments and contemporary challenges.

Beginning with foundational advancements such as the introduction of ATMs and credit cards in the 1970s, the study traces the sector's evolution through pivotal milestones like the advent of internet and mobile banking in the late 1990s. Using a quantitative survey of 243 Greek e-banking users, it explores customer preferences, transaction patterns, and attitudes toward security.

Results indicate a significant shift from branch-dependent banking to digital platforms, driven by convenience, efficiency, and accessibility, although security concerns persist. The analysis also evaluates the influence of regulatory frameworks and emerging technologies like blockchain and artificial intelligence on the sector. While Greek banks have made substantial progress in digital transformation, the study underscores the need for sustained innovation and enhanced security measures to align with global trends.

This research provides valuable insights into customer behavior, operational efficiencies, and strategic opportunities for the future of e-banking in Greece.

Keywords: e-banking, digital transformation, customer behavior, technological innovation, Greek Banking Sector

1. Historical Development of E-Banking in Greece

Significant technological, regulatory, and societal factors have shaped the development of e-banking in Greece. Initially constrained by high costs and limited internet penetration, the adoption of e-banking has accelerated over the decades, transforming how customers interact with financial institutions. This paper examines the historical milestones, technological innovations, and customer trends that have defined e-banking in Greece. It also evaluates the implications of these changes on the banking sector and customer behavior.

Early Developments (1970s–1980s)

The foundation of e-banking in Greece was laid in 1971 with the issuance of the first credit card by the National Bank of Greece (NBG). By 1980, the same institution introduced the first automated teller machine (ATM). In the same year, Alpha Bank achieved a milestone by conducting all banking transactions online.

Pioneering Innovations (1989–1992)

Alpha Bank emerged as a leader in e-banking during this period by introducing:

- 1989: Alpha Phone, enabling transactions via landline.
- 1990: Alphalink, a POS-based payment and credit card transaction approval system.
- 1992: Alphaline, the first computer-based banking service in Greece.

Expansion of Services (1996–2001)

The mid-to-late 1990s saw significant developments:

- 1996: EFG Bank launched Phone Banking, allowing account updates and customer instructions via phone.
- 1998: Egnatia Bank introduced Web Teller, the first e-banking platform for internal transfers and online transactions. Alpha Bank also began offering internet banking services.
- 1999: EFG Bank extended its offerings to include comprehensive Internet Banking services.
- 2000: Piraeus Bank introduced *winbank*, the first integrated e-banking platform covering Internet, Phone, Mobile, and ATM channels. Alpha Bank launched mobile banking services.

- 2001: EFG Bank provided a full suite of e-payment services, including mobile banking for both banking and stock market transactions.

Limited Adoption and Technological Familiarization (2003–2006)

Despite these advancements, e-banking penetration remained low, with only 2%-3% of internet users adopting these services by 2003. Factors included limited technological familiarity and concerns about internet security. However, e-banking services gradually expanded, including account updates, transfers, bill payments, payroll processing, and tax payments.

Modernization and Integration (2006–2016)

The mid-2000s marked a turning point in e-banking with the introduction of 24/7 access to banking services:

- 2006: Banks began offering phone instructions via mobile and landline, automated transactions, and secure online banking with personal security codes.
- 2008: NBG provided Internet Banking, Phone Banking, Mobile Banking, and ATM services with dedicated spaces for alternative networks in branches.
- 2010: EFG Bank launched Live Banking, enabling integration across banking channels. NBG opened its first *i-bank* store focused on online services.
- 2014: NBG upgraded its digital platforms, and Piraeus Bank launched mobile payment services for OECD ticketing.
- 2016: NBG introduced the *i-bank Pay* mobile wallet, while Piraeus Bank opened fully automated branches.

Recent Innovations (2019–Present)

Recent years have seen further technological advancements:

- 2019: Alpha Bank introduced Garmin Pay, facilitating smartwatch payments, and EFG Bank enabled online credit card applications without branch visits. Piraeus Bank opened its 10th e-branch, offering advanced services.
- The COVID-19 pandemic accelerated the adoption of e-banking, highlighting its importance in ensuring financial services' continuity during crises.

The landscape of e-banking in Greece continues to evolve, driven by advancements in technology, customer expectations, and regulatory frameworks. Current services include Internet Banking, Mobile Banking, POS transactions, and ATM operations. While security remains a key concern, the advantages of convenience, accessibility, and efficiency have significantly increased customer adoption rates.

The future of e-banking in Greece is promising, with potential developments in blockchain, artificial intelligence, and contactless payment technologies.

2. Literature Review

In the 21st century, technology and communication have become integral to individuals' economic and social lives. Their proliferation has significantly increased the volume of transactions conducted via the internet (Saravanan & Leelavathi, 2020). The banking sector, directly influenced by these advancements, has integrated new technologies into its service offerings (Strugar et al., 2015).

Electronic banking (e-banking) is not a monolithic technology but a composite of diverse systems, each evolving independently (Taiwo & Agwu, 2017). Broadly, e-banking is categorized as:

- Retail Banking, when services target individual customers.
- Wholesale Banking, when aimed at businesses.

2.1 Medium of Service Delivery

The medium of service delivery can further subdivide E-banking into:

- Internet Banking
- Mobile Banking
- Phone Banking (Strugar et al., 2015).

Internet Banking

Internet banking, also called online banking or web banking, enables customers with internet-connected devices (e.g., computers, tablets) to conduct financial transactions securely via the bank's website. It is a flexible platform that allows access to products, services, and fund management without requiring customers to visit a branch (Lishomwa & Phiri, 2019). Access typically requires a bank account and a unique personal password.

To ensure security, banks implement digital certificates or tokens to safeguard customers against cyber threats. The key types of online banking include:

1. Informational Services: Providing details about products and services.
2. Communication Services: Facilitating direct interaction between the bank and the customer.
3. Transactional Services: Enabling financial activities via secure servers.

Mobile Banking

Mobile banking leverages mobile devices to facilitate real-time financial transactions, offering flexibility and independence from physical location (Barnes & Corbitt, 2003). Features such as PIN codes, biometric authentication, and confirmation messages enhance security (Board of Governors of the Federal Reserve System, 2015). The main forms of mobile banking include:

- SMS Banking: Customers receive account updates via SMS (Taiwo & Agwu, 2017).
- Mobile Apps: Dedicated applications provide secure and convenient access to banking services.
- Mobile Wallets: These enable contactless payments at POS terminals using smartphones equipped with compatible software (Piraeus Bank, 2020).

Phone Banking

Phone banking, the simplest form of e-banking, allows customers to perform transactions by calling a bank's customer service center (Chovanova, 2006). Services can be provided either by human operators for complex transactions or automated systems (Interactive Voice Response, IVR) for 24-hour support. Effective phone banking requires robust transaction security protocols and customer-friendly service mechanism.

Alternative Electronic Banking Networks

Alternative e-banking networks, such as ATMs and EFT/POS systems, play a crucial role in enhancing customer convenience and broadening access (Arya, 2019). Other innovations include easy pay machines, Pay Spot kiosks, and passbook updating machines.

ATMs

Introduced in 1968, ATMs have evolved from cash dispensers to multifunctional systems offering a variety of services. Modern ATMs provide enhanced security, cost efficiency, and accessibility at strategic locations, such as supermarkets and airports.

EFT/POS Systems

POS terminals facilitate secure and swift card-based transactions at retail locations. These systems also aid in inventory management, sales reporting, and customer data handling. However, POS systems can be misused for tax evasion through unauthorized software installations.

Services in Electronic Banking

E-banking services are categorized into:

1. Financial Transactions: Payments, transfers, and standing orders. These services cover routine banking activities such as loan repayments, bill payments, and business transactions. Security codes sent to mobile devices ensure transaction confirmation.
2. Informational Transactions: Account inquiries and updates. Banks use e-banking platforms to provide account details, loan updates, and portfolio performance, fostering customer loyalty.
3. Requests: Remote submissions for account services.
4. Other Services: Investment, e-commerce, and P2P payment solutions.

2.2 Advantages and Disadvantages of E-Banking

The main advantages and disadvantages for customers and banks from literature review can be summarized below:

Advantages for Customers

1. Time Savings: 24/7 accessibility eliminates reliance on branch hours.
2. Convenience: Transactions can be completed anytime, anywhere.
3. Cost Efficiency: Minimal transaction fees and efficient fund management tools.
4. Enhanced Competitiveness for Businesses: Improved liquidity management and productivity.

Advantages for Banks

1. Reduced Operational Costs: Transitioning from branch to digital services optimizes resource utilization.
2. Expanded Customer Base: Geographical and temporal barriers are eliminated.
3. Improved Service Quality: Employees can focus on higher-value tasks.

Disadvantages for Customers

1. Security Concerns: Cyber threats and potential data breaches are ongoing risks.
2. Technical Issues: Dependence on reliable internet and system functionality.
3. Reduced Social Interaction: The transition to digital reduces interpersonal banking relationships.

Disadvantages for Banks

1. High Implementation Costs: Establishing and maintaining e-banking systems require significant investment.
2. Intense Competition: Banks face pressures to innovate continuously.
3. Transaction Security: Ongoing investments in cybersecurity are critical to maintaining customer trust (Sanli & Hobikoglu, 2015).

E-banking represents a transformative innovation in the financial services sector, offering immense benefits while posing certain challenges. Its continuous evolution, driven by technological advances and customer needs, underscores the importance of strategic investment and robust security measures. Future research should focus on enhancing user accessibility, improving security protocols, and exploring innovative e-banking solutions.

3. Risks and Security in E-Banking

The banking sector is exposed to a wide array of risks, the most prominent being credit, operational, and market risks. Operational risks encompass subcategories such as reputation

risks and technological risks (Saunders & Cornett, 2017). There is a need for banks to implement a code of conduct and a code of ethics for staff, staff training, signature verification, control over dormant accounts, asking employees about their opinions and the way they feel about their bank, conducting surprise audits, and using a hotline for whistleblowing (Repousis, Lois, Veli, 2019).

E-banking, a modern financial service enabling users to conduct transactions electronically, introduces additional risks, notably those arising from the interception of sensitive data and fraudulent schemes. The need for strategic improvements in e-banking services to enhance customer engagement has been emphasized (Sathiyavany and Shivany, 2018). The role of user experience and trust is an important factor influencing the adoption of e-banking services (Chauhan, et.al., 2022). Also, the importance of reliability, website design, and privacy in fostering loyalty, particularly during COVID-19 has been emphasized (Haq and Awan, 2020). Focusing on Islamic banks, research showed how customer intimacy enhances loyalty to e-banking and m-banking services (Mulia, et.al., 2021). It demonstrates that customer intimacy has both direct and indirect effects on loyalty through factors like trust and satisfaction in Islamic banks.

Also, e-banking could improve the performance of return on assets, and return on equity, as in the Chinese banking system (Yank, et.al., 2018).

About Greece a study evaluates digital transformation strategies within Greece's banking sector, focusing on employee acceptance of e-services (Kitsios, et.al., 2021). Technological advancements in payments will likely affect global cash usage, and the pandemic COVID-19 push for digital currencies issued by central banks while still supporting cash (Lois and Repousis, 2021).

Below, we detail the various security threats inherent in e-banking transactions and outline effective measures for their mitigation.

Risks in E-Banking Transactions

E-banking, by its nature, exposes users and institutions to multiple forms of cyberattacks aimed at compromising sensitive financial information. The following describes common security risks:

1. Password Breach
Attackers often use automated tools to perform dictionary or brute force attacks, attempting to steal usernames and passwords.
2. Viruses and Worms
Malicious software delivered through email or compromised websites can corrupt files and infect banking systems.

3. Vishing (Voice Phishing)
Fraudulent phone calls from individuals pretending to be financial institutions aim to trick users into divulging personal information by creating a false sense of urgency.
4. Smishing (SMS Fraud)
Similar to vishing, smishing involves fraudulent text messages to deceive recipients into revealing private information.
5. Skimming
Criminals attach devices to ATM or point-of-sale terminals to capture card details as users make transactions.
6. Phishing
Fraudulent emails prompt users to click on malicious links, often resulting in the theft of login credentials and other sensitive data.
7. Pharming
This type of attack redirects users to fake websites that closely resemble legitimate ones, misleading them into providing personal and financial information.
8. Social Engineering
Attackers manipulate individuals into providing confidential information by exploiting trust (Aldawood & Skinner, 2020).
9. Packet Sniffers
Software programs monitor data traffic to intercept and exploit private information as it traverses a network (Eneji et al., 2017).
10. Key Loggers
Malicious software records keystrokes and captures sensitive information, such as passwords and credit card numbers (Sagioglou & Canbek, 2009).
11. Fake Banks
Cybercriminals create fraudulent websites that mimic those of legitimate financial institutions to steal users' card details.
12. Trojan Horse (Digital Trojan Horse)
Programs masquerading as necessary software infect systems to collect personal data and install additional malicious programs (Eneji et al., 2017).

Safeguards in E-Banking Systems

To counteract the risks outlined above, banks implement a variety of security measures aimed at protecting the integrity, confidentiality, and authenticity of e-banking transactions. Key components of secure e-banking systems include:

1. Availability
Banks must ensure quick recovery of data in the event of a system error or temporary interruption.

2. Authentication and Transaction Authorization

A robust verification process ensures the legitimacy of transactions and the identity of the parties involved.

3. Integrity

Security mechanisms are implemented to prevent unauthorized access or tampering with transaction data.

4. Non-repudiation

A transaction's authenticity is secured by providing proof of transmission, preventing parties from denying their involvement in a transaction.

5. Confidentiality

Mechanisms like encryption ensure that banking transaction data remains private and secure from unauthorized access.

Encryption Protocols

Encryption serves as the cornerstone of secure e-banking, ensuring the confidentiality and integrity of transactions. There are two main types of encryption used in e-banking:

- Asymmetric Encryption

Utilizes two keys: a public key to encrypt the message and a private key to decrypt it. While this method ensures security and authentication, its processing speed is slower compared to symmetric encryption.

- Symmetric Encryption

Both parties use the same secret key for encryption and decryption, ensuring faster processing but requiring careful management of key exchanges.

Secure Socket Layer (SSL) and Transport Layer Security (TLS) are widely used protocols in e-banking to secure data transmissions between clients and servers. SSL, with 128-bit encryption, secures web traffic by converting HTTP to HTTPS, ensuring both confidentiality and authentication. TLS, the successor to SSL, provides improved security with unique keys for each client connection.

Other systems employed include SET (Security Electronic Transaction) for credit card transactions, PKI (Public Key Infrastructure) for digital certificates, and Digital Signatures, which ensure message authenticity (Eneji et al., 2017; EFG, 2023).

Multi-factor authentication and Device Security

Banks employ various multi-factor authentication (MFA) techniques to enhance the security of online transactions:

1. Electronic Tokens (e-tokens)

Devices that generate one-time passwords (OTPs) or store digital certificates to provide an additional layer of security.

2. Firewalls and Intrusion Detection Systems (IDS)

Firewalls prevent unauthorized access to bank systems, while IDS monitors for suspicious activity (HBA, 2023).

3. Virtual Keyboards and Secure Logins

Virtual keyboards reduce the risk of keylogging by preventing the interception of login credentials during user input (HBA, 2023).

4. Automatic Logout and Session Timeout

Limiting session timeouts and automatic logouts after a period of inactivity reduces the risk of unauthorized access.

Legislative and Regulatory Framework

E-banking activities are subject to stringent regulations designed to protect both consumers and financial institutions. In the European Union, directives such as 2013/36/EU, 2000/31/EC, and 910/2014/EU lay down guidelines for overseeing payment systems, preventing discrimination in cross-border payments, and ensuring refunds for fraudulent transactions. The General Data Protection Regulation (GDPR), effective since May 2018, governs the protection of personal data and mandates swift notification of data breaches within 72 hours.

In Greece, the Council of Monetary Policy Act 50/31.7.2002 and Law 4446/2016 establish the legal framework for e-banking, focusing on the prevention of tax evasion and terrorism financing through the prohibition of anonymous electronic payments.

Security Systems of Major Greek Banks

Major Greek banks have implemented advanced security systems to protect customer data. The security features employed by four systemic banks are summarized in Tables 1 and 2 below.

Table 1. Secure Usage Methods by the 4 Systemic Banks

Bank	Automatic Logout	Transaction Completion	Customer Identification	Login to Mobile App
Piraeus	After 10 minutes of inactivity	4-digit security code via SMS or Viber	Fingerprint, Recognition, or PIN	Face 4-digit 10 minutes of inactivity, 4-digit code
Alpha	After 15 minutes of inactivity	6-digit code via SMS or Viber	Fingerprint, Recognition, or PIN	Face 4-digit myalpha code from mobile app
National Bank of Greece (NBG)	of Set inactivity period	OTP sent to mobile	Fingerprint, Recognition, or PIN	Face 4-digit NBG Authenticator app
EFG Bank	After 10 minutes of inactivity	6-digit OTP via SMS	Fingerprint, Recognition, or PIN	Face 4-digit Debit/credit card, 2 out of 4 digits

Source: Data collected and processed by the authors

Table 2. Secure Usage Methods by the 4 Systemic Banks

Bank	Online Identity Verification	Access to Systems	Data Encryption	Encryption Protocol	Password Change	Password Recovery
Piraeus	Recognized organizations	Firewall	128-bit encryption (Verisign)	SSL	Every 3 months, with debit card, username, and mobile number	
Alpha	Recognized organizations	Firewall	Strong encryption practices	TLS	Every 6 months or user request	Registered email & mobile phone
National Bank of Greece (ETE)	Recognized organizations	Not specified	Strong encryption practices	Not specified	Regular intervals, debit card, mobile phone	
EFG	Entrust	Firewall	256-bit encryption	TLS	Not specified	OTP

Source: Data collected and processed by the authors

4. Methodology

For the research component of this study, a quantitative sampling approach was chosen, focusing on a sample of citizens to investigate:

- A) the current level of usage of online banking, and
- B) the trends and future prospects of online banking.

Research is defined as a logical and systematic search for new and useful information on a specific topic. It involves study, analysis, observation, comparison, evaluation, estimation, reasoning, and experimental activities. The term "quantitative sampling research" refers to research that gathers data through closed-ended questionnaires.

To facilitate efficient and rapid data collection, the questionnaire was administered via the Google Forms platform. The questions were designed to be clear, objective, and simple, ensuring that the estimated response time for participants would be between 2-3 minutes.

Data collection took place between November 17, 2022, and February 12, 2023. The data were then processed statistically and the results were interpreted using SPSS22, a software program that facilitates the extraction of statistical results through tables and charts.

The research concluded with the formulation of general conclusions and recommendations regarding the future use of online banking.

Research Aims, Objectives, and Questions

The primary goal of the original research conducted in this study is to examine customer transactional habits in online banking, both as they exist today and as they are expected to evolve in the coming years, considering technological advancements and increasing customer demands.

The specific objectives are to identify:

- The frequency with which customers visit a bank branch.
- The frequency of online banking usage.
- The trust levels and concerns customers have regarding online banking.
- Customer satisfaction with existing online banking services.
- The anticipated level of online banking usage in the future.

Based on the study's aim and objectives, the following research questions were formulated:

- What are the reasons for and frequency of customer visits to bank branches?
- How long have customers been using online banking?
- What are the most common types of transactions conducted via online banking?
- What are the main reasons customers use online banking?
- How satisfied are customers with the security provided in online banking transactions?
- What is the expected future usage of online banking services?

Research Tool

The questionnaire was selected as the research tool for several reasons:

- a) It enables efficient data collection from a large number of respondents,
- b) It requires relatively simple information from participants, and
- c) It generates meaningful results.

This research methodology, involving the use of a questionnaire, is widely regarded as the most popular in the social sciences.

The questionnaire was designed with an introductory section that provided information about the study's topic, the voluntary nature of participation, the anonymity of respondents, the confidentiality of their answers, and the exclusive use of the data for the purposes of this thesis (Roopa & Rani, 2012).

The questionnaire, included in the appendix of the study, contained 25 questions. Its structure was influenced by the findings of the literature review.

The questions were divided into two sections: demographic information (Questions 1-6) and questions related to the extent of online banking usage (Questions 7-25). The demographic section gathered information on the respondents' gender, age, education level, occupation, and family income, with responses provided via multiple-choice options.

Regarding online banking usage, responses were captured using a Likert scale or multiple-choice options. The Likert scale ranged from 1 = Not at all to 5 = Very much.

Specifically, Questions 7-9 inquired about the participant's primary bank, the reasons for, and the frequency of visits to bank branches. Questions 10-19, which formed the core of the questionnaire, focused on the reasons for using online banking, its frequency of use, and the types of online banking channels used. Questions 20 and 21 addressed concerns about the

security of personal data, while the last three questions (22-25) investigated future use of online banking services.

Sample

The sample for this research consisted of Greek citizens who use online banking for their financial transactions. This was a random sample, as it did not target a specific group of people. In total, 243 customers from various Greek banks participated, making the sample both representative and valid for the study.

The researcher obtained email addresses from a large number of potential participants and distributed the questionnaire via social media platforms to maximize response rates. Instructions were provided at the beginning of the survey to guide participants on how to access and complete the questionnaire.

A positive aspect of the study was the willingness of participants to engage, which significantly contributed to the success of the primary data collection.

The sample exhibited diverse demographic characteristics and varying perspectives on the use of online banking.

Although the sample was geographically limited to the region of Athens, this choice is methodologically justified. As the capital and financial hub of Greece, Athens hosts the headquarters of all systemic banks and represents the most active area in terms of digital banking adoption. The population of Athens is highly diverse, covering a wide range of socio-economic, professional, and educational backgrounds, which enhances the representativeness of the findings. Therefore, while geographically concentrated, the sample provides significant insights into national e-banking trends.

Data Analysis Method

The statistical package SPSS22 was used to analyze the results, enabling the extraction of tables with descriptive statistics (frequency, cumulative frequency, and percentage frequency) for the data collected from the quantitative sampling. Specifically, SPSS22 facilitated the creation of charts that displayed the percentage frequency for each response option.

Using the tables and frequency charts, the analysis provided answers to the research questions.

The analysis began with profiling the respondents, based on their demographic data, which was presented using frequency tables and pie charts. This was followed by the presentation of descriptive statistics for the questions related to online banking usage, displayed through frequency tables and bar charts.

Research Limitations

While efforts were made to ensure the reliability and validity of the results, the research is subject to certain limitations. The main limitations include:

- **Geographical:** The study was conducted in Athens and not nationwide. Therefore, the results may differ not only within Greece but also across other countries.
- **Sampling:** The sample size of 243 participants is relatively small and may not fully represent the views of the entire Greek population regarding online banking.
- **Temporal:** The research was conducted within a specific timeframe, which limited the ability to approach a larger number of potential participants for inclusion in the study.

One key limitation of this study is the concentration of the sample in the Athens metropolitan area. While this provides access to a technologically mature and demographically diverse population, the findings may not fully capture regional variations in e-banking usage, particularly in rural or less digitally connected areas of Greece. Future studies should consider broader geographical inclusion to validate the generalizability of these results.

5. Survey Results on Electronic Banking Usage

This section presents the main findings from the survey on electronic banking usage, focusing on channel preferences, user behavior, and perceptions regarding e-banking services. Some questions will be separately presented and discussed.

Question: Which electronic banking channels are used the most?

Table 3. Electronic Banking Channels

Channel	Frequency	Percent	Valid Percent	Cumulative Percent
ATM	18	7.4%	7.4%	7.4%
ATM, Internet Banking	39	16.0%	16.0%	23.5%
ATM, Internet Banking, Mobile Banking	31	12.8%	12.8%	36.2%
ATM, Mobile Banking, Phone Banking	29	11.9%	11.9%	48.1%
Internet Banking	43	17.7%	17.7%	65.8%
Internet Banking, Mobile Banking, Phone Banking	24	9.9%	9.9%	75.7%
Mobile Banking	40	16.5%	16.5%	92.2%
Mobile Banking, Phone Banking	8	3.3%	3.3%	95.5%
ATM, Internet Banking, Mobile Banking, Phone Banking	11	4.5%	4.5%	100.0%
Total	243	100.0%	100.0%	

The data above reflect multiple responses from respondents. It is observed that 43 users preferred Internet Banking (17.7%), 40 users preferred Mobile Banking (16.5%), and 39 users favored the combination of ATM and Internet Banking (16%). Overall, the sample predominantly consisted of users who utilized Internet, Mobile, and ATM banking channels.

Question: How long have you been using e-banking services for your banking transactions?_

Table 4. Duration of Electronic Banking Usage

Duration of Use	Frequency	Percent	Valid Percent	Cumulative Percent
0 - 1 year	25	10.3%	10.3%	10.3%
2 - 5 years	117	48.1%	48.1%	58.4%
6 - 10 years	59	24.3%	24.3%	82.7%
11 years or more	42	17.3%	17.3%	100.0%
Total	243	100.0%	100.0%	

The majority of respondents, 117 users (48.1%), had been using e-banking for 2-5 years, followed by 59 users (24.3%) who had been using e-banking for 6-10 years. Therefore, the sample was primarily composed of users who had been conducting electronic transactions for 2-8 years.

Question: Did the use of e-banking services arise due to the COVID-19 pandemic?

Table 5. E-Banking Adoption Due to COVID-19

Response	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	18	7.4%	7.4%	7.4%
No	224	92.2%	92.2%	99.6%
Other	1	0.4%	0.4%	100.0%
Total	243	100.0%	100.0%	

A significant majority of 224 users (92.2%) did not begin using e-banking services due to the COVID-19 pandemic, while only 18 users (7.4%) indicated that they did. This suggests that most respondents had already been engaging with electronic banking prior to the pandemic.

Question: Was there an increase in your electronic transactions due to the COVID-19 pandemic?

Table 6. Increase in Electronic Transactions Due to COVID-19

Response	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	166	68.3%	68.3%	68.3%
No	75	30.9%	30.9%	99.2%
Other	2	0.8%	0.8%	100.0%
Total	243	100.0%	100.0%	

A majority of respondents (68.3%) reported an increase in their electronic transactions during the pandemic. In contrast, 30.9% of users did not experience any increase in their electronic transactions.

Question: What are the most important reasons for using e-banking? (Multiple choices)

Table 7. Key Reasons for Using E-Banking

Reason for Use	Frequency	Percent	Valid Percent	Cumulative Percent
Convenience of transactions, Time-saving	26	10.7%	10.7%	10.7%
Convenience of transactions, Time-saving, 24/7 service	71	29.2%	29.2%	39.9%
Convenience of transactions, 24/7 service, Low cost	12	4.9%	4.9%	44.9%
Time-saving, 24/7 service, Low cost	13	5.3%	5.3%	50.2%
24/7 service	6	2.5%	2.5%	52.7%
All of the above	115	47.3%	47.3%	100.0%
Total	243	100.0%	100.0%	

The most common reason for using e-banking, reported by 115 users (47.3%), was the combination of convenience, time-saving, 24/7 service, and low cost. Following this, 71 respondents (29.2%) valued time-saving and 24/7 service as their primary reasons for usage.

Question: What types of transactions do you perform via e-banking? (Multiple choices)

Table 8. Types of Transactions via E-Banking

Transaction Type	Frequency	Percent	Valid Percent	Cumulative Percent
Money Transfers	13	3.8%	3.8%	3.8%
Money Transfers, Bill Payments	52	15.2%	15.2%	15.2%
Money Transfers, Bill Payments, Purchase & Sale of Banking Products, Purchase of Consumer Goods	23	6.7%	6.7%	21.9%
Money Transfers, Bill Payments, Purchase of Consumer Goods	105	30.6%	30.6%	52.5%
Money Transfers, Purchase of Banking Products, Purchase & Sale of Consumer Goods	22	6.4%	6.4%	58.9%
Bill Payments, Purchase of Consumer Goods	24	7.0%	7.0%	65.9%
Purchase of Consumer Goods	4	1.2%	1.2%	67.1%
Total	243	100.0%	100.0%	

The majority of respondents (105, 30.6%) used e-banking for money transfers, bill payments, and the purchase of consumer goods. This indicates that basic financial transactions were the most frequent forms of e-banking activity.

Question: How often do you use e-banking services?

Table 9. Frequency of E-Banking Usage

Frequency	Frequency	Percent	Valid Percent	Cumulative Percent
Every Day	55	22.6%	22.6%	22.6%
2 - 3 Times a Week	110	45.3%	45.3%	67.9%
2 - 3 Times a Month	63	25.9%	25.9%	93.8%
2 - 3 Times a Year, Occasionally	8	3.3%	3.3%	97.1%
Never	7	2.9%	2.9%	100.0%
Total	243	100.0%	100.0%	

Most respondents (110, 45.3%) used e-banking services 2-3 times a week. A significant proportion (22.6%) used it daily, while 25.9% used it 2-3 times a month. This suggests frequent engagement with e-banking among the majority of users.

6. The Role of Blockchain in Greek Banking

Blockchain technology, though still in its early stages within the Greek banking sector, holds transformative potential for enhancing transparency, reducing transaction costs, and increasing operational efficiency. While major Greek banks are monitoring international developments, practical implementation remains limited domestically.

Institutions such as Alpha Bank have participated in European blockchain consortia like we.trade and the European Blockchain Services Infrastructure (EBSI). These collaborations aim to pilot applications of blockchain in trade finance, digital identity, and interbank communication.

Potential use cases for blockchain in Greece include:

- **Digital Identity Verification:** Providing secure, tamper-proof methods for KYC procedures.
- **Smart Contracts:** Automating loan agreements and insurance claims with reduced administrative overhead.
- **Cross-border Payments:** Enabling near-instant and low-cost international transfers using tokenized fiat or stablecoins.

Despite its promise, blockchain adoption in Greece faces barriers such as regulatory uncertainty, the need for system modernization, and staff upskilling. Alignment with EU directives like MiCA (Markets in Crypto-Assets) and further strategic collaboration with fintech startups will be essential for broader adoption.

By integrating blockchain technologies strategically, Greek banks can future-proof their operations, enhance user trust, and align with global fintech trends.

7. Conclusions

The rapid evolution of technology in recent years has significantly transformed the financial sector, compelling financial institutions to adapt swiftly to new market conditions. As customer needs continue to evolve, these institutions must position themselves as leaders in providing innovative and efficient services.

Information technology has had a profound impact on the internal and external structures of banks, driving a transition toward electronic banking (e-banking). This shift is primarily motivated by the desire to leverage technological advancements to introduce innovative products and services that cater to the growing demand for efficiency, convenience, and cost-effectiveness.

Key drivers of this transformation include the widespread availability of the internet, the increasing use of computers, laptops, tablets, and smartphones, which provide customers with seamless access to online banking services. E-banking encompasses a wide range of services that address customers' financial needs, and it is characterized by various types and functionalities. Although e-banking offers numerous advantages, it also comes with some challenges. Among its key benefits are reduced transaction costs for both banks and customers, improved service speed, the elimination of geographical barriers, and the provision of high-quality financial products and services.

The capabilities enabled by e-banking are highly significant, necessitating its continuous development to enhance the efficiency of banking products and services. This expansion is also essential for increasing market share and adapting to the dynamic demands of consumers. It is increasingly recognized that traditional banking methods are being replaced by e-banking in many of the tasks previously handled in physical branches.

The global digital transformation and technological advances are reshaping every aspect of financial services. Financial institutions now collaborate with one another and with fintech companies to build robust infrastructures that support customer transactions through innovative, high-standard solutions. Customer satisfaction, which is essential to the growth and sustainability of the banking sector, is increasingly linked to the overall experience provided by these digital platforms. Institutions are pursuing optimal customer experiences through strategic, technology-driven initiatives.

Moreover, customers have embraced e-banking, utilizing the tools available to them to meet their financial needs while demanding high-quality service. This widespread adoption underscores the continuous nature of technological evolution in the banking sector. As banks invest more heavily in technology, the industry's transformation will accelerate, with the current state of banking institutions differing significantly from previous models.

The collaboration between banks and fintech companies has been pivotal in advancing the integration of technological innovations into banking systems. The adoption of digital services, open banking, artificial intelligence, blockchain, and cloud computing has revolutionized the

way banking operations are conducted, improving both customer and employee experiences. The speed and flexibility of banking services are now more pronounced than ever.

Several large banks have already embraced many of these innovations, with China taking a global lead in the adoption of artificial intelligence in banking. The European Union's introduction of the Payment Services Directive 2 (PSD2) further underscores the shift towards open banking, enabling third-party access to customer data with the institution's consent. This development highlights the increasing significance of open banking in the financial ecosystem.

The entry of tech giants, such as G.A.F.A. (Google, Apple, Facebook, Amazon), into real-time financing products and services marks another milestone in the industry's digital transformation. According to the "Banking in 2035: Global Banking Survey Report" by Economist Impact (2022), financial institutions have identified several key strategies to maintain competitiveness and capitalize on future trends in the sector. These strategies include:

- **Cybersecurity and data protection capabilities (49%)**
- **Improving customer experience through technology and data analysis (48%)**
- **Enhancing digital payment data operations and fraud prevention (44%)**

E-Banking in Greece

The introduction of electronic banking in Greece began in 1998, primarily aimed at enhancing the customer experience for users of credit institutions. Over the years, there have been numerous updates to these services, improving the efficiency of banking operations. The four major systemic banks in Greece have undergone significant transformations, especially following the global financial crisis. They have adapted to the evolving digital landscape, and their strategies are aligned with the ongoing trends in the banking sector. These banks now offer a comprehensive suite of e-banking services, with internet banking and mobile banking leading the way. Other channels, such as phone banking, ATMs, and point-of-sale (POS) terminals, complement the core digital services, enabling customers to carry out almost all banking operations efficiently, securely, and at low cost.

In line with their business strategies, the four systemic banks—National Bank, Piraeus Bank, Eurobank, and Alpha Bank—are progressively modernizing their services. They have adopted several innovations, including online account opening, electronic loan applications, and collaborations with fintech companies. These initiatives allow them to stay competitive and continually improve the banking experience for their customers.

However, while Greek banks are aligned with web banking and mobile banking, they have yet to fully embrace more revolutionary technologies such as blockchain, which they continue to monitor through the experiences of international banks. The development of open banking in Greece is still in its early stages, signaling that further efforts are required to fully leverage digital banking's potential.

In conclusion, while the digital transformation journey of Greek banks is commendable, there are still several milestones to be achieved before Europe, and Greece in particular, can transition to a fully digital banking model.

Limitations of the Study

While this study provides valuable insights into the state of e-banking in Greece, several limitations should be noted:

- The survey sample was limited to respondents from Athens, which may not be fully representative of the broader Greek population.
- The sample size of 243 participants is relatively small and may not capture the full diversity of banking customers in Greece.
- The timeframe of the study restricted the potential for greater participation from a more varied demographic.

The respondents in this study were predominantly women (55.97%) with an average age of over 41 years. Most participants had a high level of education and were employed in the private sector. Family incomes ranged from €15,000 to €30,000, and there was a balanced representation of married and single individuals.

In the second part of the study, it was observed that most respondents visited physical bank branches infrequently, typically less than once a month. The preference for digital banking channels, including internet banking, mobile banking, and ATMs, was evident. Respondents cited increased internet usage, the availability of 24-hour service, time savings, transaction ease, and low costs as the main reasons for choosing these digital banking services. This trend reflects a significant shift from traditional branch banking to more convenient, cost-effective online services.

Furthermore, many respondents expressed a preference for a bank without physical branches, provided it offered competitive benefits such as favorable interest rates and fees, along with excellent customer service.

Final Thoughts

The findings of this study indicate that Greek banks are on the right path to fully embracing digital transformation. With ongoing investments in technology and continuous adaptation to market needs, the banking sector in Greece is well-positioned to meet the demands of modern consumers. However, further progress is needed in adopting more cutting-edge innovations, and continued collaboration with fintech companies will be key to shaping the future of digital banking in Greece and beyond.

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Authors contributions

Mr. Michalis Boumpis was responsible for study design, data collection and data analysis. Professor Lois and Dr. Repousis were responsible for writing and revising the manuscript. All authors read and approved the final manuscript.

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