

REGULATING DIGITAL BANKING IN TURKEY AND THE EU: LEGAL DIVERGENCES AND PATHS TO ALIGNMENT

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Abstract

This study conducts a comparative legal analysis of digital banking regulations in Turkey and the European Union (EU), intending to identify structural divergences and opportunities for regulatory alignment. Focusing on three key legislative pillars in the EU, PSD2 (Second Payment Services Directive), GDPR (General Data Protection Regulation), and DORA (Digital Operational Resilience Act), this research conducts a comparative evaluation of digital banking regulations. It assesses how Turkey's framework, primarily shaped by Law No. 6493 and the Regulation on Digital Banks, aligns in terms of legal scope, implementation, and institutional preparedness. The analysis finds that although Turkey has made significant regulatory progress in establishing a legal basis for digital banking, significant gaps remain. Open banking practices are underdeveloped, with limited API integration and insufficient legal clarity for third-party providers. Personal data protection, governed by Turkey's Personal Data Protection Law (Law No. 6698, hereinafter KVKK), lacks full alignment with GDPR standards, particularly in terms of user consent, data portability, and supervisory authority. Moreover, unlike the EU, Turkey does not yet have a comprehensive legal framework similar to DORA to address digital operational risks and ensure ICT resilience in the financial sector. Based on these findings, the study concludes that Turkey's current framework does not fully support the creation of a resilient, secure, and innovation-driven digital banking environment. It recommends targeted reforms, including the adoption of cybersecurity legislation, the strengthening of regulatory agencies' technical capacity, and the promotion of fintech-bank collaboration. Enhancing consumer trust and legal certainty through EU-compatible data protection and open banking standards is also critical. These steps are essential not only to improve financial inclusion and innovation domestically but also to enhance Turkey's alignment with the EU digital finance ecosystem.

Keywords: Digital Banking, Open Banking, Cybersecurity Regulation, PSD2, GDPR, DORA, Turkey-EU Comparison

TÜRKİYE VE AVRUPA BİRLİĞİ'NDE DİJİTAL BANKACILIĞIN DÜZENLENMESİ: HUKUKİ FARKLILIKLAR VE UYUM YOLLARI

Özet

Bu çalışma, Türkiye ve Avrupa Birliği'ndeki (AB) dijital bankacılık düzenlemelerini karşılaştırmalı hukuk çerçevesinde inceleyerek, yapısal farklılıkları ortaya koymayı ve düzenleyici uyum için fırsatları belirlemeyi amaçlamaktadır. AB'nin üç temel düzenleyici metni, PSD2 (Ödeme Hizmetleri Direktifi 2), GDPR (Genel Veri Koruma Tüzüğü) ve DORA (Dijital Operasyonel Dayanıklılık Yasası), merkezinde yürütülen analiz, Türkiye'nin dijital bankacılık alanındaki yasal çerçevesini incelemektedir. Bu değerlendirme, özellikle 6493 sayılı Kanun ve Dijital Bankalar Yönetmeliği bağlamında; yasal kapsam, uygulama düzeyi ve kurumsal hazırlık bakımından gerçekleştirilmektedir. Analiz sonucunda, Türkiye'nin dijital bankacılığın yasal temellerini oluşturma konusunda önemli ilerleme kaydettiği; ancak hâlen ciddi düzenleyici açıkların bulunduğu tespit edilmiştir. Açık bankacılık uygulamaları sınırlı düzeydedir; API entegrasyonu zayıf kalmakta ve üçüncü taraf sağlayıcılara ilişkin yasal netlik yeterince sağlanmamaktadır. Öte yandan, KVKK kapsamında yürütülen kişisel veri koruma rejimi, özellikle kullanıcı onayı, veri taşınabilirliği ve denetleyici otorite açısından GDPR ile tam uyumlu değildir. Ayrıca Türkiye'de, AB'deki DORA benzeri dijital operasyonel riskleri kapsayan kapsamlı bir yasal çerçeve de bulunmamaktadır. Bu bulgular ışığında çalışma, Türkiye'nin mevcut düzenlemelerinin dirençli, güvenli ve yenilikçi bir dijital bankacılık ortamı yaratmada yetersiz kaldığı sonucuna varmaktadır. Siber güvenlik yasalarının kabulü, düzenleyici kurumların teknik kapasitesinin güçlendirilmesi ve fintech-banka iş birliklerinin desteklenmesi gibi hedefe yönelik reform önerilmektedir. AB uyumlu veri koruma ve açık bankacılık standartları yoluyla tüketici güveninin artırılması da kritik önemdedir. Bu adımlar, hem finansal kapsayıcılığı ve yeniliği artırmak hem de Türkiye'nin AB dijital finans ekosistemiyle uyumunu güçlendirmek için gereklidir.

Anahtar Kelimeler: Dijital Bankacılık, Açık Bankacılık, Siber Güvenlik Düzenlemeleri, PSD2, GDPR, DORA, Türkiye-AB Karşılaştırması

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Introduction

The growing integration of digital technologies into the financial sector has catalyzed a global shift in banking models, replacing traditional branch-based systems with more flexible, low-cost, and accessible platforms. Digital banking, defined by its capacity to deliver financial services through electronic channels, has significantly improved operational efficiency and customer experience, especially in the wake of rising demands for faster and more secure transactions (Gomber et al., 2018: 503). These developments have not only expanded financial inclusion but also challenged existing legal and regulatory structures, particularly in emerging economies seeking to balance innovation with financial stability.

In the European Union (EU), regulatory instruments such as the Second Payment Services Directive (PSD2), the General Data Protection Regulation (GDPR), and the Digital Operational Resilience Act (DORA) have established a comprehensive legal environment that supports open banking, data protection, and cybersecurity. In contrast, Turkey's legal framework has been evolving through instruments like Law No. 6493 and the 2021 Regulation on Digital Banks issued by the Banking Regulation and Supervision Agency (BDDK), aiming to modernize the sector and facilitate fintech integration (Hanten et al., 2022: 47; Deloitte, 2022: 9). While these regulatory developments represent significant steps forward, there remain notable differences in legal structure, implementation, and sectoral outcomes between the EU and Turkey.

This study conducts a comparative analysis of digital banking regulations in Turkey and the EU, focusing on legislative content and practical implications. It reviews major regulatory frameworks, including PSD2, GDPR, and DORA in the EU, and Law No. 6493 and the Turkish Regulation on Digital Banks, and evaluates their impact on sectoral practices in areas such as open banking, electronic payments, cybersecurity, and customer authentication. The study also examines how these regulations affect consumer trust, operational risk management, and the digitalization of financial services. In doing so, the research aims to highlight the legal strengths and deficiencies of Turkey's current framework and offer policy recommendations based on EU practices to support a more resilient and innovation-driven digital banking environment.

This study aims to examine and compare the legal frameworks governing digital banking in Turkey and the European Union (EU), with a specific focus on their practical applications and implications for regulatory alignment. The analysis covers core legislative instruments such as PSD2, GDPR, and the Digital Operational Resilience Act (DORA) in the EU, and Law No. 6493, along with the Regulation on Digital Banks in Turkey. The scope includes both statutory regulations and sectoral practices, particularly in relation to open banking, cybersecurity, and financial inclusion. Methodologically, the research employs a normative comparative analysis based on document review, incorporating primary legislation, regulatory guidelines, academic studies, and policy reports. The study adopts a structured normative-comparative methodology consisting of three analytical layers: (1) a doctrinal analysis that identifies the conceptual and normative foundations of PSD2, GDPR, and DORA and their Turkish counterparts; (2) a functional comparison that evaluates how these regulatory frameworks operate in practice across dimensions such as scope, supervisory authority, implementation mechanisms, and institutional capacity; and (3) a gap analysis that systematically maps areas of divergence between the EU *acquis* and Turkey's digital banking legislation, particularly Law No. 6493 and the Regulation on Digital Banks. This multi-layered methodological design ensures a coherent and systematic assessment of the alignment, inconsistencies, and regulatory implications of EU and Turkish digital banking frameworks.

For purposes of ensuring methodological clarity within the comparative legal analysis, this study uses predetermined criteria for analysis. In this study, for purposes of ensuring

methodological clarity within the comparative legal analysis, this study uses predetermined criteria for analysis. The comparison is based on six regulatory dimensions, including (1) scope of regulation/definitions, (2) regulation of supervisory authority and capacity, (3) data protection and user rights, (4) cybersecurity duties, including ICT resilience, (5) open banking and API standardization, and (6) competition dynamics and market access for fintechs. These dimensions were considered for their relevance within PSD2, GDPR, and DORA, while at the same time being applicable to Law No. 6493 and Regulation on Digital Banks.

The selection of documents was limited to primary legislation, secondary regulation, and regulatory guidance in Turkey and the EU. This selection strategy focuses on regulatory sources that establish binding obligations rather than soft law. Other regulatory sources, such as academic papers and industry studies, served a non-analytical purpose in interpreting the research. This selection strategy in itself ensures that the regulatory comparison in the legal research focuses on similar regulatory sources, inhibiting issues of regulatory discrepancies that could originate from disparities in the regulatory source hierarchical structure.

1. Literature Review

Demirel (2017: 45) observes that, despite the steady growth in its number of consumers, the type of user in traditional banking has basically remained the same. This represents the proportional structural change where the systems of digital banking are on the brink of becoming the dominant ones owing to the efficiencies that will offer the adopter a competitive advantage. It is, however, essential, according to Demirel, that the legal frameworks and the technological infrastructure, specifically the e-Government systems, be supportive of the integration of the digital banking systems.

According to Sezal (2021: 77), the European Union has developed a well-structured open banking regime using the Revised Payment Services Directive (PSD2), where banks are obligated to share their customers' data with third-party service providers upon customers' consent. Though the European Banking Authority regulates the process, Turkey's progress on the issue is comparatively less. The law, No. 6493, passed in 2013, initially formed the structure but is less specific about sharing data with fintech startups. In the European Union, the wide use of Application Programming Interfaces (APIs) with the help of the Open Banking Implementation Entity (OBIE) is distinct compared to the primitive stage of Turkey, where APIs are institution-by-institution, and the legal structure about their use is less developed. For customers, the European Union offers joined services relying on the rigid data privacy requirements of the General Data Protection Regulation (GDPR) compared to the emerging adaptability of the Turkish Data Protection Law on a global scale. This highlights that the European Union's open banking system is well-established and widely accepted, but Turkey's system needs more accurate legal structuring and greater consumer interaction to reach the same level of maturity.

Hanten et al. (2022: 47) highlight that, as of January 2022, the legislative structure of Turkey introduced a centralized and separate legal framework for digital banks and BaaS services through the Regulation on the Principles of Activity of Digital Banks. It also contains a set of operating rules with particular focus on frameworks for customer segmentation, capital adequacy, and obligations. However, it should be noted that it differs from the set of rules applicable for traditional banking operations. On a separate note, the set of rules applicable for the European Union contains a central strategy with large documents such as CR-D-IV and PSD2, and hence it becomes unnecessary to include specific rules applicable for purely digital banks. However, there does exist a set of specific rules within the framework of Digital Operational Resilience Act (DORA), which contains specific risks pertaining within the scope of digital financial services and adopts resilience approaches as methods and means for

reducing risks pertaining within Information and Communication Technology (ICT). Although it emphasizes customer-centric rules with a specific ban on serving small and medium enterprises and retail customers within digital banking services, it misses incorporating a holistic approach on technological risk management. However, it still fosters competition as compared to its Turkish equivalent due to open banking requirements under PSD2 as well as data governance within GDPR.

According to Deloitte (2022: 9), the legal system of Turkey regulates the operating sphere of BaaS companies and digital banks, requiring them to meet capital adequacy standards of a minimum of 1 billion TL, internal control systems, and the compulsory presence of these businesses despite their online business activity. It also highlights that the study reveals the existence of a regulatory gap concerning the regulation of cyber threats. According to Tok and Sinan (2022: 133), it should also be realized that the specificities of the definitions of digital banks operating in Turkey, the operating restrictions, and the categorization of services focusing on SMEs and individuals are noteworthy. The European Union, on the other hand, allows several types of digital banks, including licensed virtual banks and e-money institutions.

Akbaş (2023) finds that the regulatory environment for fintech and digital banking in the Turkish system has seen a tremendous evolution, mainly as a result of the formalization of the regulation of 2021. This state of affairs has provided a very essential platform for the development of the digital finance environment of Turkey, though it hasn't reached the level of maturity that a PSD2-supported regulatory structure provides for the European Union. Öner and Lökçe argue that the approach of the Turkish system regarding digital banking and artificial intelligence is merely at the inception level when compared to the European system (2024: 92). Technological innovation will maintain the trend created within digital transformation; therefore, there will be a need for ethical considerations within frameworks set by governments, including but not limited to, frameworks for artificial intelligence.

Nevertheless, as cited in a research article by Alzoubi et al. (2022: 119), the legal framework set within Europe, based on PSD2, GDPR, AML Directive rules, and made more specific with DORA, aims at reaching a resilience level within technological progress. This viewpoint is supported by Gounari et al. (2024: 34), who assert that additional legislation such as NIS2 and Cybersecurity Acts strengthens the preparedness status within financial actors. Overall, the Turkish situation concerning the administration of digital risks continues to differ considerably compared to the legal environment.

Ganić (2023: 87) examines the relationship between digitalization and the profitability of banks within the European Union, concluding that the positive effects are comparatively stronger within the older member states, mainly because of their well-structured regulatory and technological frameworks. However, the researcher also suggests that for the benefits of profitability to be realized, it is essential that investments in safe systems, effective risk management, and adaptability of the rules and regulations are pursued. According to Donnelly et al. (2024: 21), the role of new frameworks, including MiCA and the DLT Pilot Regime, cannot be ruled out, since it helps promote integrity, stability, and the regulation of crypto-assets. However, the fact that the EU still lacks completely harmonized digital banking rules remains a cause of structural imbalances.

Gounari et al. (2024: 34) examine the last two decades of European Union regulation and emphasize that the Payment Services Directive 2 (PSD2) has increased competitiveness, and consumer empowerment gained a boost through the use of secure API connectivity for third-party service providers. The General Data Protection Regulation (GDPR) gives them a stronger platform by requiring rigid standards for consent and the sovereignty of data. The Network and Information Security (NIS2) Directive and the Cybersecurity Act of the European Union, along

with other policies, help to strengthen the existing standards for a resilient network infrastructure. They make the following points: innovation should remain a fundamental ambition, but it needs to be achieved through the prism of a well-integrated approach of policies that ensure the integrity of data, the protection of the consumer, and the resilience of the system.

Overall, there are two paths outlined in the literature that define the dynamic process and changes within internet banking regulation. It could be clearly understood that there have been advancements achieved by the country of Turkey with regards to Law No. 6493 and Regulation on Digital Banks adopted in 2021. At the same time, there are challenges still being experienced, and they include open banking, cyber security, and telco regulatory issues. The European Union moves ahead with a multi-tier system made possible with PSD2, GDPR, and DORA.. This shapes the recommendations formulated in the following sections of this analysis.

2. Banking And Electronic Distribution Channels

Banks, being financial organizations, are formed for the purpose of protecting precious assets of individuals, meeting the increasing demands for consumption, providing capital, and undertaking new investment services. By advancing loans at interest, they play a very important role in the contemporary economy. Some of the earliest organizations, operating on modern lines, that started their services are the Amsterdam Bank (1609), the Bank of England (1694), and the Federal Reserve Bank (1907) (Yetiz, 2016: 107-117). Regarding the Turkish banking system, the services started with the opening of Bank-1 Dersaadet in 1847 (Parasız, 2000: 21). Even the basic purposes of the early banks were not very grand, but technological development has brought about a considerable increase in the services provided by these organizations, allowing them to provide services to customers through various electronic means.

2.1. Traditional Banking (Branch Banking)

Traditional banks provide security for their customers' accounts, offer loans for a fee or charge interest, and facilitate payments mainly through face-to-face transactions at their outlets. Even though the approach allows for easy interaction with customers, it is characterized by high operating expenses, which are mainly brought about by the need for a large number of outlets and staff. This limits the industry's competitiveness given the fast-changing environment (DeYoung, 2005: 896-898; Casu & Girardone, 2006: 457).

2.2. Mobile Banking, Internet Banking, and Telephone Banking

Internet banking has improved customer satisfaction and lowered transaction costs by offering services that were once only available at bank branches (Coşkun, 2012: 42). As for recent technological developments, smartphone use has greatly accelerated the rapid growth of m-banking. Mobile banking services have improved the efficiency of financial transactions, which entail the receipt of informational messages, performing transactions on WAP-enabled phones, and performing banking tasks on a palmtop computer (Yurttadur & Süzen, 2016: 97).

2.3. Open Banking

Open banking, which is supported by the enhancement of digitalization and security technology, allows customers to perform financial transactions using third-party apps with their express consent. This architecture allows customers to view data from various accounts, including those of different banks, on the same platform, along with access to customized services that come through the collected data of users (Fintech Istanbul, 2019: 7-8). This use of the Application Program Interface (API) among banks has developed a technological environment that helps build innovative services for the financial industry, including the expansion of fintech players' involvement in banking-related services. In the Turkish environment, the existence of the following initiatives, including Vomsis, Finmaks, and

Finstant, explains the early adoption of open banking platforms (Medium, 2023). International experience also suggests that the use of API-based services gives the following benefits to fintech businesses, leading to the transformation of the existing structure of banking systems (Gozman, Liebenau, & Mangan, 2018: 147-149; Zetzsche, Buckley, Arner, & Barberis, 2020: 185-186).

2.4. Service Model Banking

Service model banking signifies the delivery of banking services through the online presence of non-banking organizations, organized through contractual terms that facilitate the connection between the banking infrastructure and service software providers. Through this model, customers are given the ability to make payments, installment payments, and credit payments on e-commerce platforms, hence integrating banking services with customers' online practices (Fintech Istanbul, 2022). Along with other deeply integrated services like mobile banking, internet banking, and the like, service model banking has played a significant role in the digitization of these banking services. There exists empirical support that these technology-based banking channels have significantly raised the level of customers' satisfaction of these services through innovation, access, and user-friendly services (Laukkanen, 2007: 790-792; Pousttchi & Dehnert, 2018: 271-273).

3. Digital Banking Regulations In Turkey And Europe: A Comparative Analysis In Terms Of Laws And Practices

The regulatory framework of digital banking for the European Union and Turkey shares both similarities and differences at the structural level, which also affect the distinct differences identified at the level of specific provisions. It is for this reason that the comparison of the differences between the two legal systems, along with their effects on the evolution of fintech, will serve not only for purposes of focusing on the differences but will also allow the identification of the level of compatibility between the respective legal systems on the supranational level, with a specific view on PSD2, the GDPR, and the DORA. This study will use the comparative approach for the critical assessment of the level of regulation of digital banking for the two legal systems. This comparison of the respective frameworks offers very valuable data on how digital banking can progress within the well-balanced environment of innovation, on the one hand, and regulation, on the other.

To facilitate the comparison between the legislative regime of digital banking in the Turkish environment and the European Framework, the study performed a functional analysis, focusing on coverage, implementation dynamics, level of control, and market results. In Table 1, the main differences between the PSD2 Framework and the Turkish Law No. 6493 are illustrated, covering the legislative differences that were mentioned in sections 4 and 4.2.

As shown in Table 1, the European Union has a better-regulated environment that promotes competition, compared to the situation in Turkey, where the structure of API management, licensing of Payment Service Providers, and supervisory strength is not streamlined. Such differences provide a direct basis for the gap analysis shown in Table 2, which identifies the areas of e-banking regulation where the structure of Turkey differs from that of the European Union, specifically on open banking infrastructure, data privacy, cyber security, and supervisory strength. The essential areas of regulation are identified briefly in Table 2.

Table 1. Functional Comparison of PSD2 and Turkey’s Law No. 6493

Functional Dimension	PSD2 (EU)	Law No. 6493 (Turkey)	Evaluation
Open Banking / API Standardization	Mandatory API access with standardized technical specifications under EBA RTS; interoperability is enforced.	API opening exists but is not mandatory; no unified technical standard; implementation varies across banks.	Turkey exhibits a limited and fragmented open banking structure; PSD2-level standardization is absent.
Third-Party Providers (AISPs / PISPs)	Clearly defined TPP roles, licensing, and supervision mechanisms; strong competitive impact.	TPP framework is emerging and lacks clarity; authorization processes remain ambiguous.	Competitive dynamics supported under PSD2 are not yet fully developed in Turkey.
Strong Customer Authentication (SCA)	Mandatory SCA requirements; widespread adoption of 2FA and biometric protocols.	SCA mechanisms exist but are not uniformly mandated at PSD2 levels.	Turkey has strong authentication practices but no harmonized enforcement.
Consumer Rights and Transparency	Extensive rights on data access, liability, transparency, and dispute mechanisms.	Provides basic protection but lacks GDPR-level data rights, especially in data portability.	Absence of GDPR-level rights limits consumer empowerment.
Regulatory Oversight	Multi-layered system involving EBA and national regulators; high technical capacity.	Supervisory authority transferred to CBRT in 2019; institutional capacity still developing.	Regulatory capacity gap persists compared to EU institutions.
Impact on Fintech Ecosystem	Strongly promotes competition and innovation; mature fintech integration.	Fintech ecosystem is growing but regulatory environment does not incentivize competition as strongly as PSD2.	Legal uncertainty restrains fintech–bank collaboration potential.

Note: This functional comparison evaluates the clarity of regulation, the feasibility of interoperation, the management of supervision, and innovation achievement, based on the legislative material and the empirical implications addressed in Sections 4 and 4.1. This analysis is the current state of implementation, not a comprehensive assessment, prioritizing the differences that matter for the level of alignment. **Source:** Author’s own compilation.

Table 2. Turkey–EU Digital Banking Gap Analysis

Regulatory Area	EU Framework (PSD2 – GDPR – DORA)	Turkey’s Framework (Law No. 6493 – KVKK – Digital Banks Regulation)	Identified Gaps
Open Banking / API Requirements	Mandatory APIs with unified technical standards; secure data-sharing protocols enforced.	API usage not mandatory; differing technical infrastructures across banks.	Lack of mandatory API standardization and interoperability.
Third-Party Provider Regulation	Detailed TPP roles (AISP/PISP), licensing regimes, liability rules, and supervision mechanisms.	TPP provisions are emerging and partially defined; limited regulatory clarity.	Absence of a robust TPP licensing and supervision regime.
Data Protection and User Rights	GDPR ensures data portability, explicit consent mechanisms, and strong supervisory powers.	KVKK lacks data portability; supervisory capacity is limited.	GDPR-level user rights missing, especially data portability.
Cyber Resilience / ICT Risk Management	DORA mandates ICT testing, incident reporting, outsourcing risk controls, and resilience frameworks.	Turkey has Basel-based operational risk rules but no DORA-equivalent legal framework.	Lack of a comprehensive cyber resilience law.
Regulatory Capacity and Institutional Preparedness	EU regulators possess significant technical expertise and layered supervisory structures.	CBRT and KVKK have more limited technical and institutional capacity.	Institutional capacity gap.
Fintech Competition and Market Access	PSD2/GDPR foster strong fintech integration and competitive market dynamics.	Competition is improving but inhibited by legal uncertainty and limited standardization.	Insufficient legal incentives for fintech-driven innovation.

Note: The results of the gap analysis show the differences that structurally hinder the alignment of Turkey and the European Union's digital finance framework. This analysis is based on the legal mandates, capacities, and practices that are defined by the PSD2, DORA, and Law No. 6493, and the regulation for digital banks. **Source:** Author’s own compilation.

The results of the gap analysis reveal that the digital banking regulatory framework of Turkey is partially congruent with the EU's PSD2-GDPR-DORA framework, specifically with regard to areas that require technological standardization and better institutional capacities. The fact that the regulation of API interoperability, data rights fulfilling the standards of the GDPR, and the implementation of a cyber resilience framework consistent with DORA are not obligatory hinders the competitiveness of the market. The identified deficiencies imply that, instead of creating a supportive framework for innovation, the current legal structure of the Turkish financial market can provide a basis for digitalization but not for a highly integrated financial environment. The following sections will discuss the findings of the gap analysis.

3.1. Comparison in Terms of Legislation

Legally, the rules for online banking in the European Union and Turkey have been fashioned to reduce sector-related risks and promote innovative solutions. Detailed analysis of the core frameworks of these rules and their influence on the practice of online banking is presented in the following section.

Basel Criteria and Turkey-EU Compliance

The Basel criterias are the basic international regulatory standards that ensure the promotion of financial stability and the upgrade of risk management practices. The Basel I standards, formulated in 1988, for the first time provided priority to capital adequacy, which acted as a safeguard against insolvency risks during financial crises (Aras, 2006: 11). But following the financial crisis of 2001, there was significant progress on the implementation of the Basel I standards, which promoted the transparency of risk measurement practices using the Regulation on the Measurement and Assessment of Capital Adequacy (BDDK, 2010).

Basel II introduced various improvements within the existing structure and added operational risk as a factor within the risk management framework. Consequently, the issue emerged as a result of an increasing complexity level occasioned by online banking. The adoption of the standards for the capital ratio and operational risk is intended to mitigate challenges related to online security threats, system failure, and data integrity in a digitized financial service sector (Barikat Siber Güvenlik, 2024: 3). This approach is consistent with the view that the core of the Basel II accord is the comprehensive management of operational risks that remain essential for financial integrity (Basel Committee on Banking Supervision, 2004: 149-150; Nicoletti, 2017: 195-197). Among the initial signatories of the Basel II regime were member countries of the EU, which strengthened the safeguarding of digitized operations, ensuring that the inclusion of supervision of operational risk helped to reinforce institutional resilience within the new technology-related risk environment (Quaglia, 2010: 564-566; Ayadi, Arbak, & De Groen, 2012: 33-35).

However, following the worldwide financial crisis of 2008, Basel III introduced new prudential measures, which included the conservation of capital and higher standards of liquidity risk (TCMB, 2010, p. 5). However, the Turkish model very much targeted the aims of Basel III, which sought a capital adequacy of 16.5 percent, thus contributing to the stability of the banking system (BDDK, 2012, p. 9). Meanwhile, the European Union member countries incorporated the provisions of Basel III, tailoring them to adapt to the online banking environment and the new technological forces shaping the liquidity requirements of the financial systems.

To make the reforms complete, the Risk Management Principles for Electronic Banking, published by the Basel Committee in 2003, provide the best practices with regard to management oversight, security, and the management of reputational risks. Agrawal and Singh (2016: 96) write that, although the principles do not identify new risks, they emphasize the need for dynamic risk management policies. The principles' flexible structure allows countries to adapt risk management practices according to their local settings, especially when dealing with growing markets like Turkey and India..

The Basel regime and the risk management frameworks that come with it have, in effect, improved the robustness of banking sectors by providing their capital and risk requirements, and at the same time, made their integration into the worldwide financial environment easier through regulatory harmonization and alignment of the jurisdictions (Van Greuning & Bratanovic, 2009: 45-47, Tarullo, 2008: 103-105). Alongside the growth of the use of electronic banking, the associated risks, specifically the operation and technological risks, have risen, pushing the European Union and the Turkish governments toward adopting the Basel regime architecture (Cull, Kunt, Klapper, & Singer, 2020: 22-24).

Payment Services and Electronic Money Regulations

The Payment Services Directive (PSD1), introduced by the European Union in 2007, sought to promote the speed, reliability, and ease of use of payments. Besides removing barriers for cross-border payments, PSD1 also sought to promote competitiveness by increasing access for non-

bank payment service providers, although their overall level of penetration of the market was, nonetheless, limited by the regulatory framework and the problem of consumer trust (Zetzsche et al., 2017: 44–45). This directive also enabled the operation of electronic money institutions on a less rigid regulatory environment, hence increasing access to financial services for member countries of the European Union. By providing security standards for the operation of the European Payment Systems, the directive made a huge contribution toward increasing the level of security for payments systems and the security of consumers. Broadly, it provided a homogeneous legal framework for payments, hence increasing transparency, efficiency, and security for payments (European Commission, 2007).

In the case of Turkey, the law that oversees the business of electronic money and payment systems is Law No. 6493. However, initially, the authority for the oversight of these businesses belonged to the Banking Regulation and Supervision Agency, but afterwards, in 2019, the authority shifted to the Central Bank of the Republic of Turkey. This was for the purpose of ensuring better coordination of oversight, reliability of institutions, and efficient processes of oversight (GSG Law, 2019; Cantekin, 2019).

The regulatory framework of e-money helped the development of online payment systems, increasing consumer confidence. However, there is also a need for the evolution of the regulatory framework of e-money for the capabilities of e-money institutions operating in Turkey to be comparable to those existing within the European Union. Of particular importance is building the legal framework in order to adopt technological innovations like mobile payment systems and digital wallets at a faster pace. The European Electronic Money Directive is adaptable to be modified so that Turkish electronic payment systems can provide innovative solutions.

PSD2 and Open Banking in Turkey

The PSD2 was created as an effort by the European Union in 2016 to improve competitiveness in online banking and promote fintech business adoption. It describes an open regulatory framework that allows data on account holders to be shared with third-party service providers on a consensual basis, thus opening up banking. It promotes innovation in financial services with new services added, including Account Information Service Providers and Payment Initiation Service Providers, among others (Medium, 2024).

Within the Turkish framework, it should be pointed out that it introduced changes within Law No. 6493 that were consistent with PSD2 and thus facilitated an open banking service. This would mean the creation of an alignment that would cause the extension of services in the sector. On the other hand, there would be an innovation that would come about through open banking. Open banking has various benefits to the customers. One of these benefits is that open banking allows a customer to view all their accounts at once.

It is an absolute necessity that Turkish standards in relation to data security and customer rights be made compatible to those in the European Union. There will also be improved efficiency in relation to high standards in authentication and data security in open banking. Looking ahead to more ambitious aims will bring in customer confidence and will become an additional catalyst in fintech.

It is recommended that Turkey align its data security and consumer rights framework with the standards used in Europe. Adoption and implementation of the best practices of sound authentication procedures and data protection policies are necessary for enhancing resilience within the open banking market. It is expected that the proposed initiatives will not only serve to enhance consumer trust but also help promote the growth of the fintech industry.

Digital Operational Resilience Act (DORA)

DORA, which was introduced by the European Union in the year 2022, provides a wide-ranging legislative framework that aims at reducing the risks of digital business activities and boosting the resilience of the concerned systems against cyber threats. This measure strictly defines the rules for the resilience of digital systems and the risks involved in the use of information and communication technologies (ICT) (Yalçın, 2023: 12). Therefore, it has helped ensure the security of the digital banking processes.

For Turkey, the standards for the management of operating risks have been developed on the basis of the Basel criteria, although the specific demands of DORA on the issue of cybersecurity have not yet been integrated into the legal system. Such policies play a pivotal role regarding the issue of digital infrastructure, the continuity of the services of the digital banking environment, and consumer confidence. The creation of a DORA-like framework will offer benefits for digital banks operating in Turkey.

Besides PSD2, GDPR, and DORA, the European Union's dynamic architecture for digital finance also favors the use of other regulatory frameworks that complement the supervision, cybersecurity, and innovation aspects covered by the acquis. Researchers demonstrate the fact that the EU's digital finance framework encompasses various tools aiming for the regulation and prevention of any possible fragmentation of fintech regulations (Aben and Etti, 2022). Moreover, the Markets in Crypto-Assets Regulation (MiCA) succeeds in creating a regime for crypto-assets that aims for a balance concerning the aforementioned aspects (Divissenko, 2023). Lastly, the Digital Ledger Technology (DLT) Pilot Regime succeeds in facilitating the favorable use and adaptation of tokenized financial products and distributed systems, thus expanding the favorable adaptation and operation according to emerging technological patterns (Maume and Kesper, 2023). Furthermore, the latest digital finance legislative frameworks being discussed on the EU level, including PSD3, the Payment Services Regulation (PSR), and the revised eIDAS framework, fit into an overarching strategy aiming for the optimization and enhancement of digital financial infrastructure resilience and security concerning its operational features and adaptation (Hallak, 2024). In relation to the aforementioned integrated framework, the lack of its corresponding frameworks in the Turkish system causes a disconnected and fragmented process concerning the issue and resulting aspects of digital finance resilience and its institutional favorability. A process aiming for a step-by-step march toward the optimization and enhancement facilitated through the EU's dynamic frameworks is likely to favorably affect and facilitate the promotion of the Turkish system's digital finance framework adaptation and optimization.

This research does not use performance metrics or quantifiable indicators, since its research methodology does not seek to determine digital banking performance but rather analyze the normative legal framework that either enforces or hinders performance. Therefore, the lack of empirical metrics can be classified under research methodology limitations but rather boundaries. Future studies may choose to carry forward the analysis in the context of empirical validation for alignment issues through operational resilience metrics, API standardization performance, or market penetration in the fintech industry.

3.2. Discussion in Terms of Applications

When analyzed on the applications front, the role of digital banking regulation policies between Turkey and the European Union remains a topic of interest on the spectrum that includes consumer satisfaction, cybersecurity, open banking, and innovative payment systems. The following discussion will elaborate on the various applications of these policies.

Cyber Security and Operational Risk Management

Cybersecurity practices and risk management for operations have been strengthened by the regulation of online banking. It is important to note that the Basel-based practices, which take into consideration the effects of data breaches and system downtimes when assessing the adequacy of capital, have improved banks' readiness for these risks (BRSA, 2010). In the European Union, the Digital Operational Resilience Act (DORA) has strengthened the resilience of financial services by requiring specific measures for reducing the effects of cyber-attacks and for maintaining the continuity of critical business operations. DORA, which promotes the availability of services and enhances the management of incidents, has become a major force behind the growing level of consumer satisfaction regarding business continuity for online banking services (European Commission, 2020).

The feasibility of online banking services within the Turkish market would remain ensured because of a new law, Law No. 6493, with necessary best practices as per Basel II norms. To tackle the rising challenges due to cyber attacks, there would be an active strategy adopted with better security approaches and high computing capabilities. All these emerging technologies would promise a considerable boost to online banking services competencies (Deloitte, 2024; E&Y Türkiye, 2024). However, with developments taking place within technologies, there would have to be some shifts within the prevailing structure. To tackle threats effectively, it would be necessary that banks undertake cyber stress testing and make use of modern technologies.

The implementation of Basel III guidelines on liquidity risk has made digital banks more risk-resilient. Nevertheless, with the ever-increasing complexity of operational risk triggered by the implementation of digital technologies, there arises a need for an integrated risk management system. The adoption of emerging technologies, including artificial intelligence and blockchain, in operational risk management presents innovative solutions that improve cyber resilience within the financial sector. The technologies allow for immediate risk detection, automatic security procedures, and verification for confidential information. As a result, there is greater capacity for identifying new cyber risks among financial institutions (OECD, 2019; World Economic Forum, 2016).

Customer Trust and Strong Identity Verification

Today, the processes used by financial organizations for identity checks and the submission of suspicious transactions (AML and KYC practices) have been harmonized by identity verification systems (KnowYourX, 2024: 6). On that basis, the new identity verification technology requirements for PSD2, and the new rules on the new PSD3 regime, have become a new essential tool for improving fraud prevention. With the implementation of new and improved authentication processes, the new rules for PSD3 will ensure the minimization of unauthorized access, which will, in return, reduce the risk of fraud for transactions (European Banking Authority, 2022). Additionally, the technological implementation of the processes will promote faster and successful transactions, which will ensure a smooth user experience.

The existing rules of the Open Banking of Turkey include secure authentication processes that protect the sensitive data of customers, thus increasing the level of security of financial transactions for individuals and organizations. To make the level of security even higher, the use of biometric authentication and two-factor authentication should also be promoted because these not only make the lives of users easier, but they also make the system secure against attacks (Dhingra, Agarwal, & Ashok, 2021, p. 325-327; ENISA, 2016). Financial institutions may be interested in using artificial intelligence systems for fraud analysis because such systems assist in quickly identifying any fraudulent threat.

There has been advancement in authentication technology, resulting in enhanced levels of security and optimization of customer services. Biometric authentication technology, which has been implemented in smartphone applications, has resulted in a superior user experience with minimized risks of fraud. Increased use of these systems could also enhance the competitiveness of Turkey among the online banking service providers on the global stage. Continued efforts toward the development of biometric systems and AI-based authentication processes, coordinated with the international framework of trust, innovation, and cyber security, will enhance the authenticity and efficiency of the online financial services of Turkey. This will also help enhance the country's status on the international level for online financial services (Dhingra, Agarwal, & Ashok, 2021: 340-343; ENISA, 2016).

Open Banking and Competition

Open banking allows for better cooperation between banks and technological companies, as well as other financial organizations, and hence the promotion of innovative services (Günen, 2018: 1). As a consequence of the open banking platform, the competitiveness between financial organizations has enhanced, hence the early development of user-focused services. In the European environment, open banking allows for the entry of fintech organizations and hence the enhancement of the range of accessible financial services. As a consequence, customers have access to a variety of services for the management of financial transactions.

Law No. 6493 provides the legal basis for open banking in Turkey, allowing fintechs to operate within the financial system. However, for innovation in this arena to continue, much greater definition is needed concerning the sharing of user data security and the use of data. Such definition will reduce consumer wariness about the use of their financial data, hence facilitating the rapid adoption of open banking.

The development of open banking provides benefits not only for individuals but also for small and medium-sized businesses. Because it offers a system that helps make the management of financial data efficient and provides better access to personalized financial services, the benefits that it provides for SMEs are substantial. Additionally, it is anticipated that the flexible open banking system will help the initiatives of Turkey to create a dynamic fintech industry because it will allow startups to access diverse innovative services of the financial industry.

Electronic Money and New Payment Systems

Electronic money and new payment systems are essential parts of the financial environment that is undergoing a process of digitization. According to Kahraman, "the existence of new payment systems, as well as the use of electronic money, offer a significant advantage to consumers because it develops a secure environment for money transactions." The European Union's Electronic Money Directive, together with the Republic of Turkey's Law No. 6493, provides the necessary frameworks for the regulation of these institutions to ensure that the payment systems are secure. It can, therefore, be noted that the regulatory systems of digital payment systems have boosted the confidence of users of these systems, thus facilitating the use of mobile money.

Payment technologies have greatly influenced the usage of financial services among small and medium-sized enterprises (SMEs), and they have tackled problems linked with financial transactions. Together with complementary incentives, payment technologies will tackle problems within mobile money services, among other issues. These innovations will be vital as they will bring about financial inclusion due to the efficiency and sustainability offered by financial services. Financial services will be widely and reliably accessible due to these innovations.

Apart from being regulated based on widely recognized e-money standards, the merging process among blockchain payment systems will hasten the financial change within the Turkish financial sector. The implementation of blockchain technology within payment systems will improve transparency and security and thus improve the efficiency of digital banking systems. Moreover, there will be great benefits within the Turkish financial sector due to the implementation of blockchain technology.

Conclusion

Digitalization is driving a paradigm shift within the banking industry, necessitating the adoption of comprehensive regulatory policies by both Turkey and the member states of the European Union. The digital banking rules also have differences that emerge because of the dynamics of the specific industry and the implementation dynamics on the sides of Turkey and the European Union (Hanten et al., 2022). However, the rules that have been developed on both sides have significantly helped promote the progress of digital banking.

The development of a strong legal framework is a critical requirement for speeding up the alignment of the Turkish system with the PSD2 and the GDPR. On that basis, the legal framework for open banking needs to have additional coverage, and Law No. 6493 needs to be perfectly harmonized with the PSD2 directive. Legal system adjustments could also be needed for addressing the challenges raised within the discourse of policies, specifically concerning the problem of handing the API keys freely to the fintech industry (Babina et al., 2025).

At the same time, a formal harmonization procedure with the GDPR should also be incorporated into the Personal Data Protection Law of Turkey, adopting provisions on data processing and sharing on a wider scale. Some of the key provisions of the GDPR, including data portability, should also be incorporated into the KVKK.

Nevertheless, for the successful implementation of these reforms, it is necessary that the Banking Regulation and Supervision Agency, along with the Personal Data Protection Authority, be provided with sufficient capability and qualified personnel that can keep surveillance on the implementation of PSD2 and the GDPR. Moreover, a specific regulatory authority with the intention of licensing fintech businesses within a PSD2 framework would encourage harmonized regulation and result in a competitive and innovation-driven financial sector.

The main legal tools for digital banking within the Turkish jurisdiction include Law No. 6493 and The Regulation on the Principles of Operation of Digital Banks and Banking Services Model, which were introduced by the Banking Regulation and Supervision Agency (BRSA). The abovementioned tools facilitated the entry of fintech businesses into the market and can be viewed as a first step within proceedings aimed at improving financial inclusion. However, if these tools and rules are compared with the sophisticated frameworks that exist in Turkish jurisdiction and the jurisdiction of Europe, taking into account tools from sources with divergent views, it can be argued that Turkish law on digital banking is at a developing stage. The two most prominent tools that are applicable under the Turkish jurisdiction are General Data Protection Regulation, Digital Operational Resilience Regulation, and PSD2 - The Revised Payment Services Directive.

Along with meeting regulatory requirements, offering financial support, grants, and training sessions can help more people and organizations adopt open banking. Empirical studies also reveal that cooperation between financial service providers and fintech companies can allow for innovation through the implementation of APIs, hence contributing to the development of a collaborative regulatory environment (Feyen et al., 2021). Additionally, awareness campaigns that highlight data privacy and digital financial services are also predicted to contribute to the

amplification of consumer awareness, hence increasing consumer confidence regarding innovative digital financial services. This can also contribute to increasing consumer confidence, hence the important role of legal frameworks that facilitate the development of trust dynamics (Gupta & Shukla, 2024).

Technological cooperation on the international level will play a significant role for Turkey in harmonization efforts for fulfilling the European Union norms, especially regarding the implementation of PSD2 and the GDPR. By analyzing the successful supervisory environment of the European Union and how it can be adapted for the Turkish environment, it is believed that the harmonization will get a boost in the sense that the competitiveness of digital banks will increase on the global platform.

The European Union has gradually created a highly integrated and strong e-banking system that promotes innovation and competitiveness, as well as enhances customer safeguards, which are relatively less advanced within emerging economies (Polasik et al., 2024). PSD2 and DORA, among other efforts, have significantly reinforced the integrity of online financial services, with a focus on open banking and risk management. Specifically within the Turkish economy, implementing a similar strategy would be set to drive advancements toward increasingly better levels of open banking and risk management. All these will eventually demand strengthening trust-based authentication methods, strict enforcement of data safeguards, and advancements within interoperable API technologies.

The implementation of a structure similar to DORA in Turkey requires the establishment of a broad legal framework. In this context, a Cyber Resilience Law can be enacted that includes regulations to ensure that banks and other financial institutions are prepared against cyber risks. According to the Basel criteria, the DORA-provided cybersecurity risk management approaches can supplement operational risk management standards. It would therefore be desirable to adopt mandatory security guidelines for the ICT infrastructure of financial institutions, in agreement with the European Banking Authority's Guidelines on ICT and Security Risk Management, imposing sound governance, efficient incident response, as well as periodic auditing procedures (EBA, 2019/2025). In the system resilience interest, fixed timetables for the performance of stress tests, as well as of cybersecurity audits, could also be established within the statute book. Finally, the banks could receive operational risk management guidelines, with specific recommendations. They could develop training programs on operational risk, as well as on cybersecurity, with the specific objective of improving awareness of personnel.

The use of digital banking creates a number of benefits, which include improved financial inclusion, lower transaction costs, and faster service delivery. Additionally, the use of digital banking also poses current challenges, which include vulnerabilities of data security, increasing threats of cyber attacks, and the existence of technology infrastructure gaps. The need for the elderly population to be compatible with the digital banking technology is also looming large. It is imperative that Turkey improves the way it ensures regulation compliance, along with its overall infrastructure development. There also arises the need for spreading awareness regarding trust-building by customers regarding the usage of digital banking facilities.

The other crucial step is to establish efficient processes for these agencies to collaborate. There should also be improved cooperation between the Banking Regulation and Supervision Agency (BRSA) and the Central Bank. The role of the Presidency of the Information Technologies and Communications Authority (KVKK) in doing so cannot also be over-emphasized. The international collaboration, including participation in international bodies on cybersecurity, is also very important. This is because the country must follow the recommendations made by the international organizations for the level of required standards to comply with the Digital

Operational Resilience Act (DORA). This might entail offering incentives to banks with the objective of improving their cyber security systems as well as developing local software solutions for operating risk management.

Enhancement of capabilities on technologies within the relevant authorities becomes an imperative. The regulatory authority should develop skills within the area of technology with the objective of monitoring properly cyber resilience and risk management within financial institutions. It would be recommended to form expert committees on matters relating to DORA on cyber resilience.

To sum up, it can be seen that there are learning opportunities offered by the regulatory environments surrounding digital banking among the European Union and Turkey. And it would appear that there are promising developments taking place within the European Union with regards to an appropriate framework that would be necessary for marrying compliance with global best practices and adaptability. It can be hoped that there would be advancements with regards to assisting the digital banking sector.

Furthermore, the banking sector should be required to make submissions on general risk management regarding information and communication technologies. By doing so, it will be simple for the monitoring entity to analyze these submissions and develop risk maps based on risk associated with information and communication technologies. By doing so, risk management will be achieved (Sylos Labini, 2023). All these will make attacks and risk posed by cyber threats insignificant for the Turkish financial system.

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