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Emerging technologies, organizational change, and financial innovation: A multi-country study from the Arab region

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Abstract

This study evaluates digital transformation in the Arab region, examining how advanced financial technologies, driven by COVID-19 and global conflicts, impact business organizational structures, adoption challenges, and economic performance. Using a quantitative cross-sectional design, primary data were gathered via simple random sampling from 2,168 investors, fintech users, and financial professionals across the UAE, Saudi Arabia, Egypt, Bahrain, Qatar, Jordan, and Morocco. Data were analyzed using multiple linear regression and other statistical methods. Results reveal varied adoption rates across countries. AI, blockchain, and big data analytics significantly enhanced efficiency, decision-making quality, and customer service innovation. Bank-fintech partnerships enabled digital transformation, while neobanks and mobile payment systems intensified market competition, driving businesses toward more agile, customer-centric strategies. The insights offer policymakers and regulatory authorities actionable guidance to strengthen digital infrastructure, governance, and institutional flexibility across the region. Offering evidence from multiple countries, this study adds to the literature on financial innovation and organizational change in emerging Arab economies during more uncertain times.

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1. Introduction

The evolution of new technologies is reshaping the world's economy, finance, and business sectors. Technologies like blockchain, AI, digital banking, and cryptocurrency are transforming the world of finance with new approaches in transactions, investment, risks, and even business practices. Although developed economies have been the earliest adopters of these technologies, Arab countries are also capitalizing on these innovations to improve operational efficiency, increase economic participation, and facilitate economic growth.

The global fintech market is projected to reach 608.35 billion in transaction volume by 2026. The key drivers behind this rapid expansion in the fintech market include increased digital banking adoption, the rise of blockchain and AI, and, most importantly, the COVID-19 pandemic. It's estimated that the fintech industry will

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surpass $1.5 trillion by 2028, with an increase in sandboxes and policies that allow for innovation, as well as the growth of traditional financial models. The growth will be led by 30,000 startups and over 2.5 billion digital banking users expected by the end of 2025. The Arab world is also expected to contribute to this growth; MENA is estimated to surpass $3.45 billion in transaction fintech volume by the end of 2025, led by the UAE, Saudi Arabia, and Egypt, which lead in payments, blockchain, and AI-powered financial services [1]–[4].

The Arab region comprises 22 countries, located in the Middle East and North Africa (MENA) regions, each having distinct levels of economic activity, regulatory expectations, and technology adoption. Traditionally, Arab economies have relied on oil revenues, trade, and tourism, but there's been a notable shift towards economic diversification and digital transformation. Today, governments and financial institutions across the region are increasingly adopting new technologies such as AI, blockchain, fintech, and digital banking to upgrade financial services, increase business development, and promote financial inclusiveness [5]. While some Arab countries like the United Arab Emirates (UAE) and Saudi Arabia have positioned themselves as global financial technology (fintech) hubs, others like Egypt and Morocco are experiencing rapid digitization through mobile banking and financial inclusion strategies. This effect is further compounded by the varying levels of technology integration, government regulations, and market conditions across Arab countries, which present a very interesting scenario for the development and application of new technologies in finance, economics, and business [6]–[9].

Therefore, this study focuses on seven popular Arab countries: the UAE, Saudi Arabia, Egypt, Bahrain, Qatar, Jordan, and Morocco. They were selected because of their rapid growth in fintech innovation, digital transformation, and economic policies. Thus, these seven countries capture all the Arab economies with varying degrees of technological schism. Such countries were selected based on the following three criteria:

1. Pioneering in fintech and digital transformation: The United Arab Emirates and Bahrain are well-known for being easily accessible fintech hubs for startups and investors. Saudi Arabia and Qatar have national visions that push for digital transformation on a much larger scale.
2. Regional diversity and market size: Egypt and Morocco are large emerging markets with tremendous prospects for financial inclusion and digital banking. Jordan is growing as a startup center with government-supported programs for financial technology businesses.
3. Innovative and pro-entrepreneurial economic and regulatory policies: These countries have crypto sandboxes and AI-finance initiatives that position them as progressive in terms of regulation. The use of blockchain, AI, and open banking subscriptions is evidence of the customer demand for increased monetization in the finance industry.

The primary objective of the study is to evaluate how new technologies are adopted, the difficulties encountered, and the influence on the finance, economy, and business in seven Arab nations: UAE, Saudi Arabia, Egypt, Bahrain, Qatar, Jordan, and Morocco. More specifically, the study seeks to achieve the following objectives: (1) Determine the level of adoption of new technology in Arab countries; (2) Determine the major factors that promote or inhibit technological adoption and integration; (3) Investigate the possible economic and financial consequences of these technologies; (4) Formulate policies that will promote technological innovation and adoption. By fulfilling these objectives, the research fills the gap in how Arab economies can utilize emerging technologies for digital transformation and economic sustainability.

Limited studies have been done on the application of financial and business technologies in Arab countries. The overwhelming majority of research has been done on Western and Asian economies such as [10]–[18], while ignoring the Arab world’s specific socio-economic and cultural contexts. This study attempts to cover this gap by providing evidence on the trends regarding technology adoption in the Arab financial and business sectors. It identifies factors and regulatory constraints within a country that hinder the adoption of emergent technologies. It assesses cross-country differences and variations in the Arab region in policies and strategies of technology adoption.

This study is important not only because it tries to fill the research gap, but also because of the increasing focus on Arab Vision 2030 strategies, especially in the UAE, Bahrain, Saudi Arabia, and Qatar. It provides ample information to help financial institutions and business leaders, policymakers, and researchers understand the change in technology.

The structure of this study will proceed in the following manner: Section 2: Literature review analyzes some important issues from the emerging technologies in finance and business regarding the theoretical literature. Section 3: Methodology defines the research approach, including data collection and statistical analysis techniques. Section 4: Findings and discussion explains the main results and discusses what they mean. Section 5: Conclusion and recommendations discusses major results of the study and gives implications for policy and management. This work seeks to accomplish two goals. One is to advance scholarly literature, and the second is to outline the ways in which financial innovation, digital transformation, and economic diversification can be harnessed in Arab countries.

2. Literature review

This section provides an overview of existing literature on the adoption and impact of emerging technologies in finance, economics, and business in general and particularly in Arab countries. It explores key studies, theories, and trends related to technology integration in the Arab region and identifies gaps in previous studies that will be filled in the current research.

2.1. Artificial intelligence (AI) and machine learning in finance and business

The incorporation of AI and ML technologies into the financial services sector is changing positively by improving decision-making, enhancing customer satisfaction, and perfecting risk assessment [19]–[21]. The impact of artificial intelligence and machine learning on areas like business intelligence, finance, and e-commerce is seemingly unmatched. Organizations heavily invest in technologies to help them better analyze data, make informed business decisions, optimize operations, and improve the overall experience for their customers. Figure 1 illustrates that in business intelligence, AI and ML help automate the processes of data collection, analysis, and interpretation at a large scale [22].

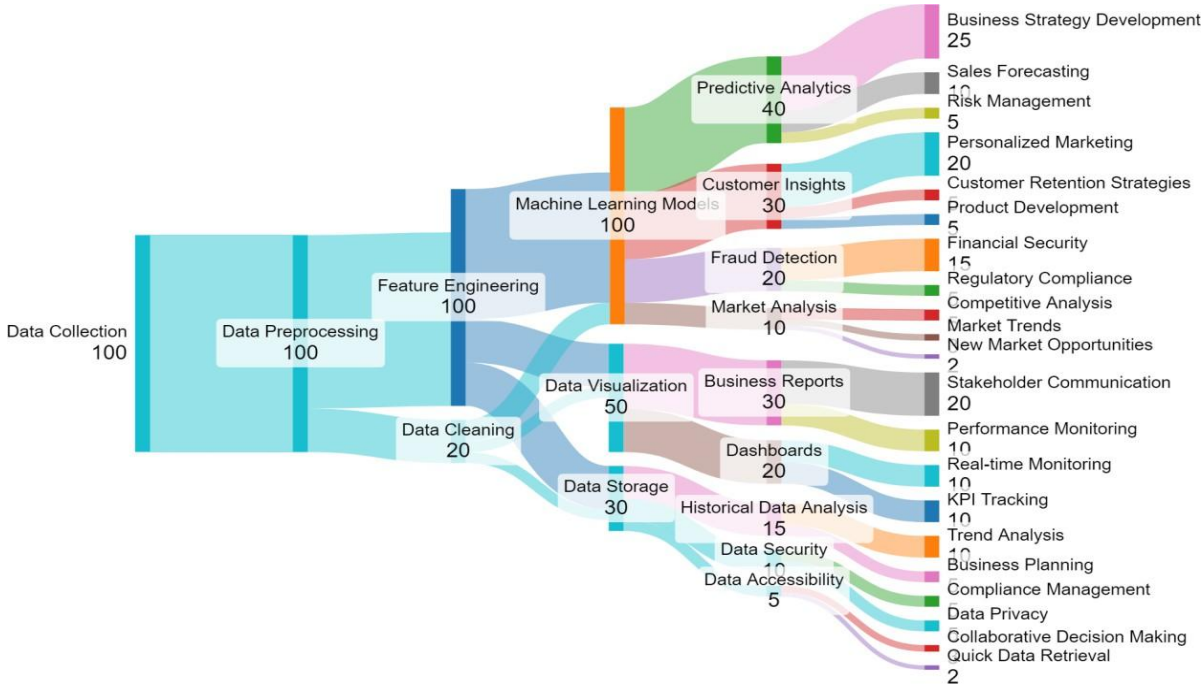


Figure 1. The application of AI and ML in business intelligence

Integrations within Arab markets: In Saudi Arabia and the UEA, robotic advisors and chatbots are designed to assist customers, such as the Emirates NBD 'Eva' chatbot. Automated credit scoring and fraud detection systems

are applied in the Saudi Central Bank's fintech sandbox. Trading and asset management in the Dubai International Financial Centre (DIFC) are done using AI-optimized equipment. In Morocco and Egypt, Microfinancing systems are used to better integrate the unbanked population into the economy, powered by artificial intelligence. AI-based analytic software for SMEs and startups. In Bahrain and Qatar, AI-powered risk modeling tools in banking and insurance. A financial institution's customer service digital assistant powered by AI [16], [23].

2.2. Blockchain and cryptocurrency in finance and trade

The impact of blockchain technology is seen in the changes in financial transactions, supply chain digital assets, and capital in Arab economies [13]. A blockchain is a distributed ledger that records numerous transactions at the same time and keeps them safe. It is the technology that made Bitcoin successful. Its primary goal is to maintain trust between parties without needing the intervention of any third party, unleashing their full potential. The blockchain revolutionized our digital world by transforming contracts, transactions, and records – the building blocks of any economic, political, social, or legal framework in any nation [24].

The term "blockchain" became more popular when cryptocurrency, Bitcoin, was established in 2008, but the underlying concepts have existed since the 1980s. Blockchain is described at its simplest as a digital distributed ledger that links and stores records in 'blocks', and a collection of these blocks gains notoriety as a chain. In 1983, David Chaum proposed blind signatures, a method that automated payments while keeping the identity of the payer hidden. In 1991, a new innovative way for protecting digital documents emerged; timestamped documents became the way to secure files within a specified date [14], [18], [25].

In 2004, Hal Finney unveiled the RPOW, or Reusable Proof of Work, concept, which enabled the transfer of tokens from one centralized authority to another. However, blockchain became public in 2008 during the publication of the paper "Bitcoin: A Peer-to-Peer Electronic Cash System" by Nakamoto [26]. This study described the design of a decentralized and trustless system of value storage and transfer using coins as a form of currency. The first transaction using Bitcoin was conducted in 2009, which was the beginning of the first era of blockchain technology [27], [28].

2.3. Digital banking and open banking ecosystems

In Arab markets, financial inclusion is rising along with competition because of accelerated digital banking and open banking services. Recently, new digital technologies like machine learning, the Internet of Things, big data, and blockchain have brought significant changes in numerous economic sectors globally [29]. Such drive for change stimulates innovation in innovation management [30], [31], thus giving rise to the notion of 'digital innovation ecosystem,' which highlights the importance of diverse elements for the development of such networks [32]. This evolutionary trend, which involves many actors at different levels, has pivoted on the essential role of big data and analytics, which are considered disruptive and transformative elements for innovation [33]. They have indeed been shown to be costly to economic activity, resulting in a shift towards investment in big data capabilities and assets [34].

2.4. Fintech and mobile payments revolution

The introduction of mobile payments and digital wallets has made it easier for many people to participate in the economy without the need for cash [35], [36]. The way customers dealt with finance-related matters has shifted dramatically in the past few years due to technological innovation and growing business expectations. Some of the emerging development sectors in finance, such as online payments, peer-to-peer (P2P) lending, and the incorporation of artificial intelligence and blockchain technology, are expected to change the dynamics of how financial services are offered [9]. Development and expansion of online payment systems have enabled people and companies to buy and sell through the internet without the use of cash in a timely manner. With the advent of P2P lending, borrowers can get money from groups of people willing to invest in their business as opposed to getting it from a bank. A wide range of industries can benefit from artificial intelligence technology, including

financial services for tasks as sophisticated as risk assessment to as simple as frontline customer support. Blockchain, which is a form of decentralized cryptocurrency change records, provides a fast and reliable method for documenting transactions, and could greatly improve the overall quality of financial services [37]–[39].

Across the Arab region, digital payment adoption is growing through diverse regional strategies: the UAE and Saudi Arabia lead in mobile wallet usage (such as Apple Pay, STC Pay, and Pay By) as governments champion cashless transactions under initiatives like Vision 2030; Egypt and Morocco are expanding financial inclusion through mobile money platforms like Vodafone Cash and Orange Money; and Jordan and Qatar are increasingly utilizing fintech digital remittance services to streamline cross-border payments.

The blend of social, economic, and cultural elements is fascinatingly diverse within the Arab region. It includes some of the wealthiest and most impoverished countries in the world. It is vital to examine a wide variety of economic development metrics for these centers, such as technology, digital infrastructure, and most importantly, fintech. When evaluating the Arab region's fintech hubs, it is possible to classify them into three tiers as shown in Figure 2, depending on the economic development and the prominence of fintech in that area.

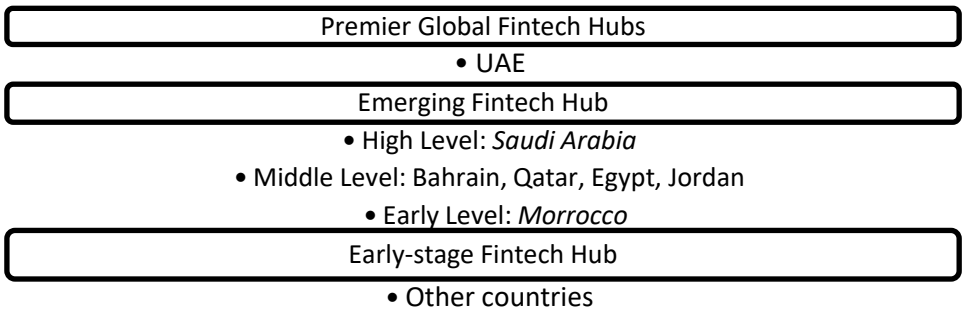


Figure 2. Three tiers of fintech hubs in the Arab region

According to Figure 3, the analysis sheds light on the prospective future of the seven Arab countries being studied, focusing on a specific feature: digital advancement in these countries, which is relatively high and increasing continuously as well. These nations have better overall infrastructure, although Jordan and Morocco lag to some extent. Even with differing levels of economic hardship, the countries in the group face bleak economic expectations. The analysis seems to suggest that Jordan is set to capture low growth relative to the region, while the UAE is bound to achieve the most growth, even if it is limited.

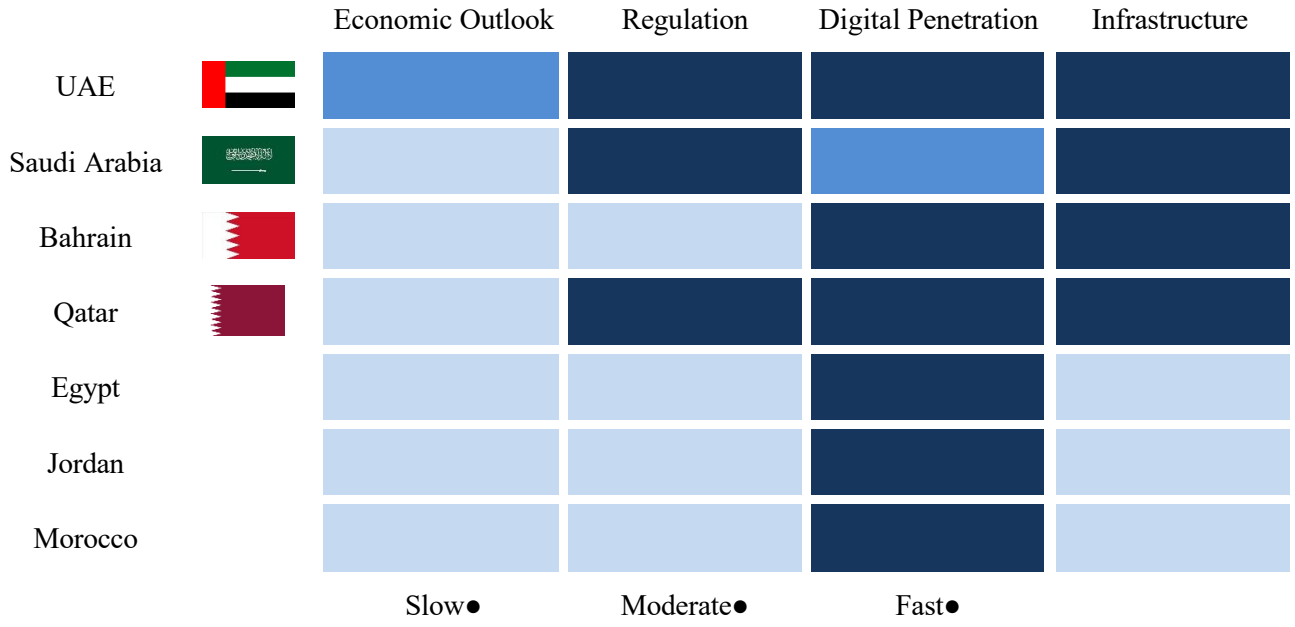


Figure 3. Assessment of fintech growth potential across Arab countries

2.5. Internet of Things (IoT) and smart financial services

The IoT sector is consolidating with the fintech industry to improve safety, automate transactions, and enable self-executing agreements. The ever-changing nature of modern finance is exhibited in cryptocurrency transaction history, virtual trading, and crypto/QR payment methods. These innovations are made possible by advanced technologies such as AI, data visualization, blockchain, and its corresponding smart workflows. Alongside the metaverse is a new world of virtual banking and fintech that enables users to automatically collect data and seamlessly manage their finances. Financial planning and investing in the metaverse have now been optimized [40]–[43], as well as transaction systems and investment decision-making [44]–[46].

By using business intelligence tools for data visualization and reporting quality assessment, we strive to fill the gap in the existing literature by demonstrating how fintech provides easier, instantaneous, inexpensive, and convenient digital payments [47]–[50], AI-enabled transaction screening and monitoring [51]–[54], as well as cloud computing-based instant payment processing via digital wallets, virtual cards, automated credit decisions, P2P payment networks, and money transfer software [55]–[57].

Usage in Arab Regions in UAE & Saudi Arabia: Connected ATMs and self-service banking kiosks with access to IoT. Insurance models based on IoT data received from devices in use. Qatar & Bahrain: Financing in real estate operated by IoT and AI.

The literature review reveals that emerging technologies are being adopted at lightning speed in the Arab region, enabling its rise to prominence in digital finance and economic changes. The amalgamation of AI, blockchain, digital banking, mobile payments, and IoT is modifying the concept of trade and financial services, as well as business models. Moreover, regulatory issues, cybersecurity, and inadequate digital literacy are some of the challenges that continue to persist.

2.6. Recent developments in emerging technologies, organizational change, and financial innovation

Publications in 2025 and 2026 strengthen the theoretical case for viewing emerging technologies as vehicles for organizational and strategic restructuring and transformation, especially in the context of the rapidly growing adoption of AI, fintech, blockchain, and advanced analytics and other digital technologies. Therefore, more recent literature supports the integration of organizational change and financial outcomes with the implications of technology adoption and offers reasons to view these phenomena as connected.

Research [13] investigates the relationship between AI technology, financial innovation, and corporate digital transformation in Chinese listed firms. The authors find that AI facilitates corporate digital transformation and that financial innovation promotes corporate digital transformation. Of particular interest is the positive interaction effect between the two, suggesting that financial innovation enhances the transformation impact of AI. As such, the authors provide recent evidence for the integration of technology and finance in organizational transformation.

The organizational change dimension is also of renewed interest. Based on their systematic review of 90 empirical studies, [14] show that how AI is designed and integrated affects the reorganization of functions and decision-making authority. They find that, for some AI implementations, the organizational changes are constrained and remain embedded in tasks, while others lead to larger changes in the structure and coordination of work and the meaning attached to that work. It is theoretically important to show that the organizational changes from the adoption of emerging technologies may vary and are not necessarily automatic. The adoption of technologies becomes organizationally consequential when it leads to changes in the design, responsibilities, and mechanisms of control and coordination.

This perspective is also strengthened by recent financial services research [15]. In their systematic literature review on AI in banking and financial operations, they present evidence on how AI is continuously transforming financial functions and enhancing operational efficiency. While the reviewed literature highlights the challenges introduced by the pace of technological change, namely, the need for adequate management and governance

structures, [16] reveals, through integration of recent literature, that technological transformation in the financial services sector creates a vortex of challenges and requirements relating to integration, governance, ethics, transparency, and financial services transformation.

This research also considers emerging and Arab markets [17]. It highlights fintech adoption in Islamic finance in Jordan and provides evidence on the integration of various factors that affect the adoption of fintech, namely, the integration of new technologies, innovation and readiness, organizational culture, and the legal framework. Findings from this study strengthen the argument that integration of technologies in financial services is influenced by a variety of factors, including the regulatory environment and the organizational culture and readiness. Similarly, the authors of [18] demonstrate that in the case of Jordanian banks, the integration of new technologies, in conjunction with proper governance and the right regulatory framework, promoted the adoption of Blockchain. They conclude that Blockchain integration provides the banks with operational efficiency and financial transparency.

The GCC context provides an additional theoretical and institutional dimension. The IMF's 2025 report on digital transformation in GCC economies notes that their digital infrastructures, fintech, and digital financial services have advanced. The report finds that the implementation of digital financial systems and the use of regulatory sandboxes have a positive impact on financial inclusion, the resilience and effectiveness of the banking sector, and the government's response to economic downturns, including the efficiency with which corporations recover from economic recessions. These advances demonstrate that the interrelationship of fintech and digital financial systems, as well as emerging technologies and financial innovation in the Arab region, is mainly shaped by institutions and regulations, digital and electronic systems, and the organizational capability of countries in the region to embrace digital and financial innovations.

More recent studies show that it is important to analyze the consequences of fintech adoption on innovation. A study published in 2025 in the Finance Research Letters shows that fintech improves both breakthrough and incremental innovations and reports that the positive relationship between fintech and innovation is strengthened by organizational resilience.

This implies that financial technology may also affect organizational innovation by developing the organizational skills of firms to utilize and adapt to various technology changes. More recent data from 2026 indicates that fintech helps firms in varied ways, such as through various forms of organizational innovation, including breakthrough and incremental innovations, and helps firms overcome information frictions and improves financial and knowledge resource allocations.

Nevertheless, recent literature has focused on individual technologies, organizational changes, fintech, and financial services. Most of the existing research has focused on individual countries or financial institutions. As such, several comparative studies have not been done to analyze how emerging technologies, organizational changes, and financial innovations and services change in different Arab countries. This study attempts to address this research gap and focuses on relationships across borders in the Arab world. Given the region's broader institutional and organizational diversity, the study sheds light on some relatively uncharted territories

3. Methods and materials

3.1. Research design

In this study, we explore the adoption and effects of novel systems in financial and business technologies and economics used in seven Arab countries (UAE, Saudi Arabia, Egypt, Bahrain, Qatar, Jordan, and Morocco) using a cross-sectional research design. Data collection and analysis were conducted through a quantitative approach for a given time frame (from January to March 2025) and a specific set of respondents, which provided a controlled way of analyzing the adoption of technology and its effects.

3.2. Target population

The scope of the research is aimed at a population of 3,500, which consists of investors, consumers of different fintech services, and finance experts who actively participate in capital markets and e-financial services in the focus Arab countries. This sample is chosen to reflect the relevance of the technological changes in the economy and finance within the Arab region.

3.3. Sampling strategy and sample size

To decide on the sample size, Yamane's [58] formula was used, which guarantees that the sample is representative and significant. 2,168 respondents submitted complete online questionnaires. The study employed systematic random sampling. This type of sampling ensures that every member of the target population has an equal chance of being chosen to participate in the study. Using this type of sampling helps to achieve a high level of accuracy and helps to generalize the findings. In this study, the sample was distributed evenly among the selected seven countries to capture the adoption of the different levels of technology and the maturity of the financial ecosystem

3.4. Technique for identifying sample size for the study

The sample size for this study was determined using Yamane [58] sampling technique. This sampling technique is one of the popular sampling techniques used in quantitative research. In this study, systematic random sampling was used to collect a sample of investors and users of fintech and finance from the seven Arab countries (UAE, Saudi Arabia, Egypt, Bahrain, Qatar, Jordan, and Morocco).

3.5. Data collection and ethical issues

The study used self-administered questionnaires to measure the level of knowledge and perception of sample respondents to support research on emerging technologies such as Blockchain, artificial intelligence (AI), digital banking, and cryptocurrency in the finance and economic sector. The researcher personally administered the questionnaires to participants of interest in the selected countries during and after the finance-related conferences.

The study obtained academic or institutional approval to ensure that ethical standards for research were observed during the study. The participants of the study were informed about the purpose of the study and were granted the right to voluntarily participate and withdraw from the study at any time. The researcher ensured that informed consent was granted prior to data collection. When conducting the study, ethical considerations were followed to adhere to the necessary guidelines and employ confidentiality measures concerning the respondents' information. The demographic variables for survey respondents captured key personal and professional characteristics to ensure meaningful analysis, as shown in Table 1.

Table 1. Sample structure (demographic variables for survey respondents)

Item	Category	No.	%
Gender	Male	1410	65
	Female	758	35
Age	18–24	220	10.2
	25–34	456	21
	35–44	772	35.6
	45–54	430	19.8.
	55 and above	290	13,4
Country of Residence	UAE	272	12.5
	Saudi Arabia	374	17.2
	Egypt	350	16.1
	Bahrain	402	18.5
	Qatar	190	8.7

Item	Category	No.	%
	Jordan	275	12.6
	Morocco	305	14
Marital Statius	Single	985	45.4
	Married	1070	49.3
	Divorced/Widowed	117	5.3
Education Level	High School or Less	319	14.8
	Bachelor's Degree	1570	72.4
	Master's Degree	170	7.8
	Doctorate or Higher	65	3
	Professional Certifications (e.g., CFA, CPA)	44	2
Current Occupation	Academic/Researcher	413	19
	Finance Professional (e.g., Banking, Investment, FinTech)	570	26.2
	Economist	218	10
	Business Executive/Manager	310	14.2
	Entrepreneur/Startup Founder Government/Public Sector Employee	504	23.2
	Other (Please specify)	153	7
Income Level	Below $2,000	320	14,7
	$2,000–$5,000	472	21.7
	$5,001–$10,000	710	32.7
	Above $10,000	666	30.7
Years of Work Experience	Less than 1 year	119	5.4
	1–5 years	884	40.7
	6–10 years	612	28.2
	More than 10 years	562	25.9
Tech-Savviness	Low	335	15.4
	Moderate	1050	48.4
	High	783	36.1
Industry Sector	Banking & Financial Services	455	20.9
	Insurance	306	14.1
	Fintech	411	18.9
	Government & Regulatory Bodies	334	15.4
	Corporate Business	298	13.7
	Academia	172	7.9
	Other (Please specify)	192	8.8
Have you used or implemented emerging technologies (AI, Blockchain, Big Data, etc.) in your work?	Yes	1708	78.7
	No	305	14
	Planning to consider using soon	155	7.1
Familiarity with Emerging Technologies in Finance, Economics, and Business (Self-reported)	Not familiar	118	5.4
	Somewhat familiar	330	15.2
	Moderately familiar	523	24.1
	Very familiar	705	32.5
	Expert level	492	22.6

Table 1 indicates that the demographic profile of respondents is significant in determining the sonder capsule's depth, scope, and validation.

The approach taken here thoroughly assesses the peripheral integration and ramifications of modern technology in the domains of finance, economics, and business, specifically in the Arab world. Furthermore, as mentioned earlier, relationships between the variables were assessed using several statistical techniques such as multiple linear regression, hypothesis testing, and assumption testing, which were all performed by Stata 19. Hence, in modeling a random sample with a parametric function, quantile regression transforms a conditional distribution function into a conditional quantile function in the following ways to address the minimization problem in OLS:

$$\min \beta \in R \sum_{i=1}^{n} \left(y_i - \mu \left(x_i, \beta \right) \right) 2 \tag{1}$$

The conditional expectation function E [Y | xi] and the central feature ρτ can be used as check functions in quantile regression.

$$\rho_\tau = \begin{Bmatrix} \tau * x & if & x \geq 0 \\ (\tau - 1) * x & if & x < 0 \end{Bmatrix} \tag{2}$$

The following function is now minimized in quantile regression:

$$\min \beta \in \tau \sum_{i=1}^{n} \rho_\tau \left(y_i - \in \left(x_i, \beta \right) \right) \tag{3}$$

To find the optimal inflation threshold, the authors use the OLS method in contrast to ordinary least squares and the dummy approach:

$$\widehat{y_{GDP}} = \widehat{\beta_1} + \widehat{\beta_2} X_{Inf} + \widehat{\beta_3}\, D_{Inf} + \varepsilon_i \tag{4}$$

D indicates a dummy variable, where K is the ideal inflation threshold, and has the following definition:

$$D = \begin{cases} 1 \; if \; Inf \; > K \\ 0 \; if \; Inf \; \leq K \end{cases} \tag{5}$$

When D equals 1 and D equals 0, the models are written as follows.

$$\begin{cases} \widehat{Y_{GDP}} = \widehat{\beta_1} + \hat{\beta}_2 X_{Inf} + \widehat{\beta_3}(D = 1) + \varepsilon_i \\ \widehat{Y_{GDP}} = \widehat{\beta_1} + \hat{\beta}_2 X_{Inf} + \widehat{\beta_3}(D = 0) + \varepsilon_i \end{cases} \tag{6}$$

4. Empirical findings and analysis

When pursuing this research on emerging technologies and their applications in finance, economics, and business in the Arab World, uncovered variables may include those excluded within the scope of identified variables, for which bias and incompleteness could be plausible. Considering the study, at least four main variables (i.e., regulatory environment (X_1), digital infrastructure and connectivity (X_2), human capital and digital literacy (X_3), and cultural and societal factors (X_4)) pertinent to be analyzed for exclusion effect are presented as shown in Table 2 and Figure 4. The results presented in Table 2 reveal the significance of the level of variables, collinearity concern, and policy insight.

Table 2. Testing the effect of excluded variables

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics		
						Tolerance	VIF	Minimum Tolerance
1	Regulatory Environment (X_1)	.471[b]	1.250	.044	.317	.211	3.572	.055
	Digital Infrastructure and Connectivity (X_2)	-.227[b]	-1.670	.352	-.224	.117	4.559	.071
	Human Capital and Digital Literacy (X_3)	.334[b]	1.123	.297	.446	.610	1.789	.091
	Cultural and Societal Factors (X_4)	.078[b]	.512	.681	.088	.622	1.225	.081

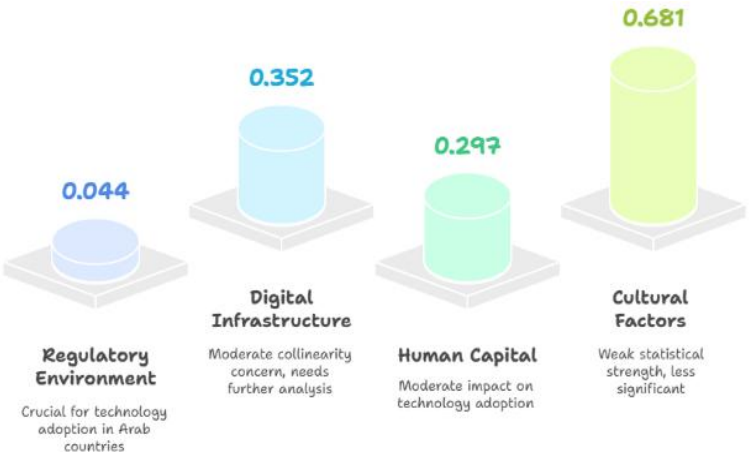


Figure 4. Impact of factors on emerging technology adoption in Arab countries

Significance levels: As noted in Table 2 and Figure 4, the only factor which seems to be important for the regression model at the 5% significance level is regulatory environment (X_1), which has a p-value of .044. The remaining factors are overall well above standard benchmarks ($p > .05$), especially X_2 and X_4, both of which have low t-values and high p-values indicative of weak statistical strength. Hence, regulations play a crucial role in the adoption of emerging technologies in Arab countries. The absence of this variable may overstate or understate the impact of technology on finance, economics, and business in Arab countries.

Collinearity concern: It can be seen from Table 2 and Figure 4 that the VI of digital infrastructure (X_2) equaling 4.559 raises concern about moderate collinearity. VIF's above 5 are considered problematic, indicating that X_2 may need further analysis or splitting into smaller parts. Therefore, the availability and quality of digital infrastructure, such as internet penetration, cloud computing, and cybersecurity, significantly impact the adoption of emerging technologies in Arab countries.

Policy Insight: Table 2 also reveals that the impact of the regulatory environment emphasizes that without protective and explicit laws guiding the sector, adoption of emerging technologies is highly stifled in Arab countries. Nevertheless, the disappointing responsiveness to the digital infrastructure's advanced frameworks is noteworthy for its presumed significance. Such a gap may suggest that the implementation in question was of inadequate quality, or not reliably available to users.

It should be noted that the lack of consideration of any of the above-listed factors in the model could lead to misleading conclusions regarding the impacts of emerging technologies because of omitted variable bias. Their analysis ensures that no aspect of the phenomenon of emerging technologies in relation to finance, economics, and business in the Arab world is left out, ensuring the study remains complete.

4.1. Evaluation of the model

Regression models are positioned at a higher level in comparison to other investigation models because they aid in reasoning concerning the relevance of multiple influences and their forecasting ability. Table 3 shows how the independent variables "play" with one another to give rise to the changes that take place in the dependent variable.

Table 3. Regression model evaluation (Initial)

Model	R	R Square	Adjusted R Square	Change Statistics	
				R Square Change	Sig. F Change
1	.655a	.550	.071	.502	.211
2	.771b	.668	.250	.177	.290

As per the previous analysis in Table 3, an excessive gap between R^2 (.550) and Adjusted R^2 (.071) indicates overfitting or inclusion of unnecessary predictors in Model 1. The model may appear stronger than its actual performance because it is capturing the noise in the data. In terms of F Change Significance, neither model shows any statistically significant (p = .211, p = .290) enhancements. This suggests that additional predictors do not meaningfully increase explanatory power. Hence, preliminary models are not robust, as illustrated in Figure 5. This raises concerns about the chosen approach to variable selection and possible model misspecification.

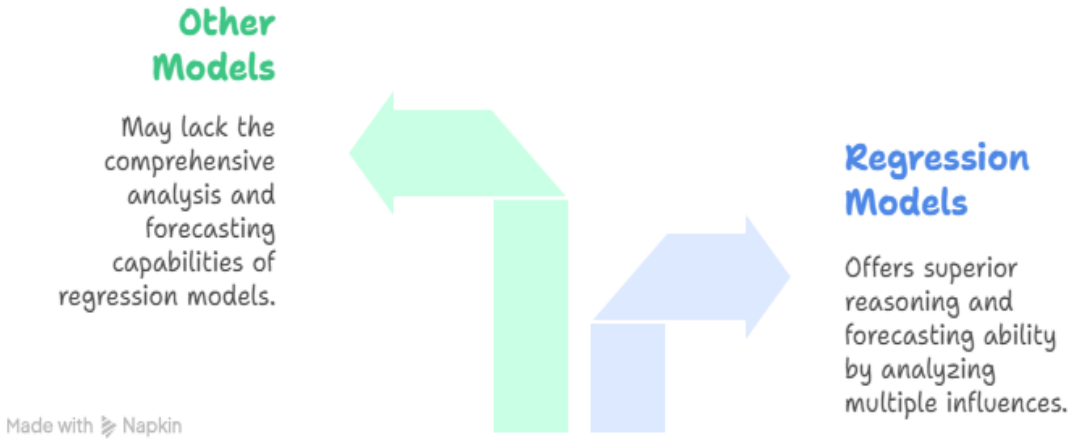


Figure 5. Which forecasting model should be used for forecasting emerging technology adoption in Arab countries

4.2. Evaluation of the refined model

Table 4 and Figure 6 capture the results of the latest analysis, which integrates advanced predictor variables and elucidates model performance before and after their incorporation.

Table 4. Regression model evaluation (Refined)

Model	R	R Square	Adjusted R Square	Change Statistics	
				R Square Change	Sig. F Change
1	.715[a]	.444	.350	.443	.032**
2	.866[b]	.767	.579	.222	.006*

*Significant at 99%confidence interval
**Significant at 95% confidence interval

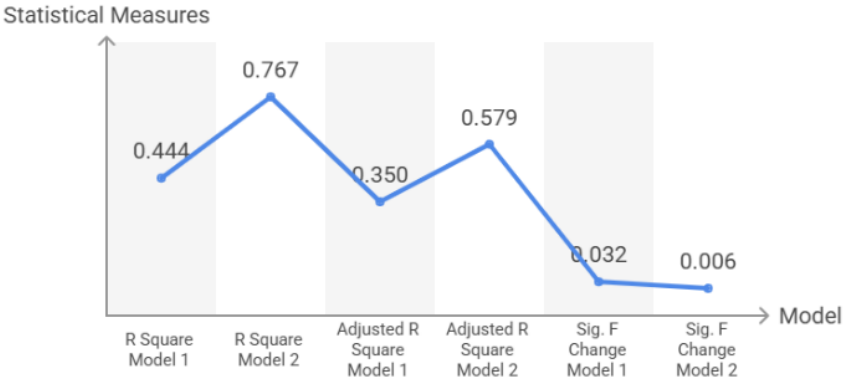


Figure 6. Comparison of model statistics

Enhanced validity: It can be concluded from Table 4 and Figure 6 that adjusted R^2 significantly increases and is substantially higher for the refined model, indicating enhanced validity due to variable refinement in the model.

Statistical significance: The significance levels of .032** and .006* in Table 4 (respectively, 95% and 99% confidence) strongly argue for model improvement. The model is closer to actual data and hence serves as a better base for policy evaluation.

Predictive strength: It can be seen from Table 4 and Figure 6 that the model with refined variables possesses $R^2 = 0.767$, meaning that almost 77% of the change in the adoption or success of emerging financial technologies in the socio-technical model is explained by the refined variables, which is a good result.

This study provides an extensive cross-national analysis of technology use, integration, and effects in seven strategically chosen Arab states: United Arab Emirates (UAE), Saudi Arabia, Qatar, Bahrain, Egypt, Jordan, and Morocco. These countries were selected as they possess varying degrees of economic sophistication, technology adoption, and policy frameworks in the Arab world. The seven Arab countries included in the study were ranked according to their position in the digital infrastructure, regulatory and fintech split, private-public cooperation, and economic impact perception. The results are as follows: United Arab Emirates (UAE), Saudi Arabia, Qatar, Bahrain, Egypt, Jordan, and Morocco, as illustrated in Figure 6.

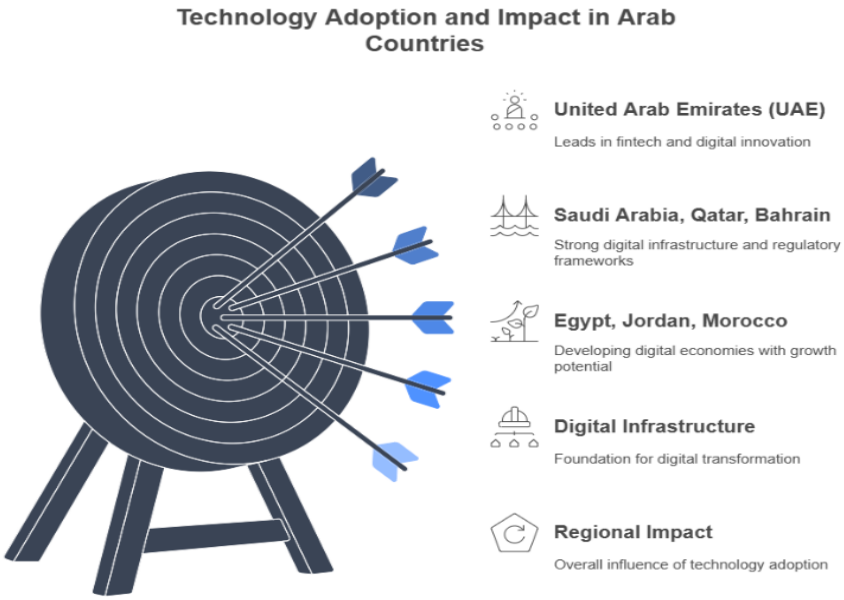


Figure 7. Technology adoption and impact in Arab countries

4. United Arab Emirates (UAE): It can be seen from Figure 7 that the UAE leads the region in fintech services, blockchain incorporation in banks, digital banking, and smart city financial services.

Respondents highlighted the shell regulator and simplicity of doing business digitally. UAE must further its leadership in advanced financial data analysis using AI, DeFi, and green fintech in the region.

5. Saudi Arabia: Figure 7 also indicates that a substantial improvement has been made in the adoption of digital payments and AI-enabled financial applications under the Saudi Vision 2030 framework. Fostering innovation bridges gaps between fintech startups and legacy banks while expanding initiatives targeting digital literacy in rural areas.
6. Qatar: Qatar has an impressive evolution of digital banking and has developed an enabling fintech hub (refer to Figure 7). However, the pace of regulatory adjustment is slightly slower. The study reveals that Qatar should further develop the relationships between academia and the financial sector to cultivate innovation while easing the processes for licensing fintech companies.
7. Bahrain: Bahrain is famous for its early development of a fintech regulatory sandbox. It has a small but agile financial system that is relatively open to blockchain and crypto solutions. This study suggests that Bahrain could assume the role of a regional integration leader and a testing ground for new technologies, whilst continuing to build its cybersecurity capacities.
8. Egypt: Egypt has a young population and is seeing the impact of financial inclusion efforts with rapid growth of mobile banking and peer-to-peer fintech solutions. The findings of this study suggest that Egypt should further enhance broadband and develop micro fintech solutions for the informal and rural sectors.
9. Jordan: There is an expanding fintech ecosystem in Jordan with digital wallets and cross-border payment services, yet expansion is the challenge. The findings suggest that Jordan should create a national fintech growth strategy, as well as provide public venture funding and tax incentives for technology firms.
10. Morocco: Emerging adoption of fintech services is seen in Morocco; however, the digital infrastructure is inconsistent and regulatory frameworks are inadequate. The results suggest that Morocco should focus on regulatory frameworks and modernization, as well as increasing acceptance of mobile payments across sectors and public digital finance literacy campaigns.

The results demonstrate innovative technologies' broad potential in the financial and business sectors in the Arab world. The Gulf states of the UAE and Saudi Arabia have the highest value advanced high-income economies compared to the rest of the Middle East, whereas Egypt and Jordan are making strong progress as populist middle-income countries. The varying rates of technology adoption are as much a function of economic standing as they are a strategic regulatory consideration. Thus, the study suggests a region-wide collaboration framework for the leveling of cross-border fintech regulatory, investment, and digital infrastructure sharing frameworks. This aims to boost the Arab world's collective strength and competitiveness in the digital economy.

4.3. Linking the empirical findings to the research objectives

The empirical findings provide evidence directly related to the study objectives. For Objective 2, which identifies the major factors promoting or inhibiting the adoption and integration of emerging technologies, the analysis considers four key explanatory variables, namely the regulatory environment (X_1), digital infrastructure and connectivity (X_2), human capital and digital literacy (X_3), and cultural and social factors (X_4). Findings indicate that the regulatory environment is statistically significant and positively correlated with the dependent variable ($\beta = .471$, $t = 1.250$, $p = .044$). This shows that the environment within which the legal and regulatory frameworks are established influences the conditions under which emerging technologies are adopted and integrated.

Digital infrastructure and connectivity ($\beta = -.227$, $p = .352$), human capital and digital literacy ($\beta = .334$, $p = .297$), and cultural and social factors ($\beta = .078$, $p = .681$) do not achieve statistical significance in the reported model. Thus, in this model specification, these variables cannot be interpreted as established determinants.

The evaluation of the model shows that the first model explains 55.0% of the variance of the dependent variable ($R^2 = .550$). The second model shows an improved R^2 of .668. This shows an increase in the model's ability to explain the combined role of the explanatory factors in light of the outcomes and impacts of emerging technologies.

The information in this chapter also meets Objective 4, which is to create policies that stimulate technological innovation and adoption. As mentioned, if there is a strong positive relationship between a variable and a policy instrument, this suggests that policy efforts should focus on the regulatory and institutional environment shaping emerging technologies. In this regard, the results suggest an empirical basis for progressing beyond broad calls for greater emphasis on the adoption of technology and mobilizing the means for its implementation.

With regard to Objective 1, regarding the assessment of the level of adoption of emerging technologies in the seven Arab countries, this should be primarily understood by the descriptive country-level data presented elsewhere in this study. Likewise, with regard to Objective 3 on the economic and financial implications of emerging technologies, these should be primarily understood through the analyses of the relevant economic, financial, and business impacts. The regression analysis in this chapter primarily serves Objectives 2 and 4, and together with the other empirical findings in this study, gives a reasonably integrated basis for addressing the overall objective regarding how emerging technologies enable digital transformation and help achieve the goals of economic and social development in the Arab region.

5. Discussion, conclusions and recommendations

The aim of the study was to evaluate how new technologies are adopted, the difficulties encountered, and the influence on finance, economy, and business in the Arab world. Since the Arab world includes a blend of high-income economies and developing economies, seven Arab countries were carefully selected (i.e., UAE, Saudi Arabia, Egypt, Bahrain, Qatar, Jordan, and Morocco) to represent the entire Arab world. They were selected because of their rapid growth in fintech innovation, digital transformation, and economic policies. Thus, these seven countries capture all the Arab economies with varying degrees of technological advancement. This research seeks to investigate how the adoption of technology in financial ecosystems is operationalized and provides insights into what drives and hampers the increase in the digital transformation of the Arab region.

This study uses a cross-sectional research design to analyze the adoption and effects of modern technologies in Finance, Economics, and Business in Arab countries. The study employed a quantitative research approach in data collection and analysis from a particular group of respondents at a single point in time to construct conceptual frameworks based on the examination of the adoption of technology systems and their impact.

The study encompassed a sample of 3,500 participants, made up of both investors and consumers of various fintech services, as well as finance professionals from capital markets and digital financial services across selected Arab countries. This combined sample was designed to yield a holistic view of how technology affects the economics and finance of the Arab countries. To achieve a valid and representative sample, the researcher used Yamane's sample size calculation [58]. Of the 7,000 possible respondents, the researcher received a total of 2,168 complete questionnaires. The sampling method used was systematic random sampling, which ensures an equal opportunity for selection to each member of the target population. This sampling method significantly improves the reliability and generalizability of the research and minimizes selection bias. To achieve the varying levels of the adoption of technology and the sophistication of the financial ecosystems, the sample was distributed across the seven countries in the study.

A survey was designed to capture pertinent information regarding technology and the economy and finance. The survey was made available online and was administered to finance professionals and investors at financial centers and conferences across the countries of interest.

For this research, an institutional or academic review board provided ethical authorization before and throughout the data collection period. All participants were notified in advance of data collection and provided both verbal

and written consent. Participants were informed about the objective of the study and were provided with protection of their data by way of an assurance of anonymity and confidentiality of their responses. Participants were informed that their responses would be used for research and/or academic purposes only. The ethical considerations that were undertaken were in alignment with the academic research integrity standards in the governance and management of the data provided by research participants.

By observing these patterns, we can measure the impact of innovative technologies in finance, economics, and business in the Arab World. Identifying the Arab World's progress in the digital era as a consumer of innovative financial technologies gives a valuable perspective for analyzing the digital economy, spotting the opportunities, and anticipating the disruptive challenges.

From the examination of digital banking, cryptocurrency, and the trifecta of AI and blockchain, services within the finance industry will be provided in a framework that is faster, cheaper, and more secure. Enhanced AI algorithms have proved less harmful and more robust to the volatility of the financial services offered by fintech applications. Furthermore, a new generation of fintech services has diminished the chronic undercapitalization of many firms, reducing their reliance on traditional forms of debt financing in the Arab World.

In a comparison of the findings with previous studies, the results partly confirm previous studies and point to considerable context differences. A notable positive effect of the regulatory environment confirms and reinforces previous studies where the emphasis was placed on the role of regulatory and institutional environments on technology adoption. The results contradict previous findings on the role of digital infrastructure and digital connectivity, human capital and digital literacy, and cultural and social factors. These differences may be attributed to differing levels of technological and institutional readiness of countries, as well as other country-specific differences. Overall, the findings suggest that the level of adaptation of emerging technologies by the Arab economies is strongly contextual and, in the absence of enabling institutional, legal, and regulatory regimes, will not occur.

Policy-wise, increased legislation becomes necessary to ensure protection of digital finance infrastructure from threats to cybersecurity, data privacy, and the financial stability of the economy. Additionally, regulations should ensure, to the greatest extent possible, that these technologies, especially those with AI systems, are used when making decisions regarding credit allocation in Arab countries.

As the Arab region moves towards a more digital landscape, there will need to be partnerships between the governments, financial institutions, and technology companies to ensure sustainable growth. Further analysis should investigate the implications of advanced fintech technology and government digital intervention; in addition, the impacts of new technologies on economic and financial market resilience should also be studied. With the proper implementation of these technologies, Arab economies can improve financial access, increase competitiveness, and aid in the integration of a globally digital economy.

Results show that the integration of AI, blockchain, and big data analytics is improving financial service delivery, payment processing, and investment activity. There is better collaboration between legacy financial institutions and fintech firms, which is driving the development of digital and customer-oriented financial products that are making finance easy and efficient. In addition, the emergence of neo-banks and mobile payment banking has made it more competitive, thereby transforming the financial services industry into more responsive and innovative [59]–[62].

The results highlight the impact of fintech on the region's economy. Some differences in the digital economy show a need for more collaboration on cross-regulatory digital compliance, infrastructure, investments, and increased cross-border cooperation in the Arab region to improve its place in the digital economy.

Declaration of competing interest

The authors declare no conflict of interest.

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Author contribution

Marwan Abdeldayem: Conceptualization, research design, methodology, literature review, interpretation of findings, manuscript preparation, critical revision, and overall supervision of the study. Saeed Aldulaimi: Methodology, data collection, data analysis, interpretation of results, literature review, and critical revision of the manuscript. Omar Al-Boridi: Literature review, data collection and verification, analysis and interpretation of findings, manuscript preparation, and critical revision of the manuscript. All authors contributed to the development of the manuscript, reviewed and approved the final version, and agreed to be accountable for the accuracy and integrity of the work.

Ethical approval statement

The study was reviewed and approved by the research scientific committee at Applied Science University Bahrain, under approval/reference number ASU_22/2026.

Informed consent

Informed consent was obtained from all participants before their participation in the study. Participants were informed about the purpose and nature of the research, the voluntary nature of participation, and the use of the collected information for research purposes. Participation was based on the participants' informed and voluntary agreement. No personally identifiable information is reported in this manuscript, and the findings are presented in aggregate form.

Declaration of use of AI in the writing process

During the preparation of this manuscript, the authors used an artificial intelligence-assisted language tool solely to support language editing, grammatical refinement, clarity, and improvement of the presentation of the authors' original text. The tool was not used to generate or determine the study's research design, methodology, data, statistical results, interpretations, conclusions, or scientific claims. All AI-assisted text was reviewed, edited, and verified by the authors, who retain full responsibility for the accuracy, originality, integrity, and final content of the manuscript.

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