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DIGITAL FINANCE REVOLUTION: EXPLORING THE IMPACT OF EMERGING TECHNOLOGIES ON FINANCIAL PERFORMANCE AND MARKETING EFFECTIVENESS (SAUDI ARABIA-BASED STUDY)

Dr Mohammad Salameh Almahaireh¹, Hani Saad A Alharthi², Iyad A. Al-Nsour^{3*}, Dr. Fatma Elzahraa Ibrahim Badr⁴, Oudai Adel Abdelhay Alkasasbeh⁵, Yaser A. Al Shorafa⁶, Ibrahim Siddig Mohi Eddeen Mohamedahmed⁷

¹Associate professor, Management information system department, Isra University Amman Jordan, mohammad.almahirah@iu.edu.jo

²PhD student at Mansoura University-Egypt, log_hani@hotmail.com

³Imam Mohammad Ibn Saud Islamic University (IMSIU), College of Media and Communication, Riyadh, Saudi Arabia, iaalsnour@imamu.edu.sa

⁴Assistant Professor of Business Administration, Faculty of Management, Economics and Information Systems – Misr University for Science and Technology (MUST), fatma.badr@must.edu.eg

⁵Universiti Sains Malaysia (USM), Oudayalkasasbeh2@gmail.com

⁶Associate Professor, Business Administration Department, Faculty of Economics and Administrative Sciences, Islamic University.

⁷Imam Mohammad Ibn Saud Islamic University (IMSIU), College of Media and Communication, Riyadh, Saudi Arabia, Ahhelal@imamu.edu.sa

*Corresponding Author: Iyad A. Al-Nsour, (iaalsnour@imamu.edu.sa)

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Corresponding Author: Iyad A. Al-Nsour
(iaalsnour@imamu.edu.sa)

ABSTRACT

The fast development of digital finance has dramatically changed the financial systems in the global world, especially in economies of emerging and high-growth economies such as Saudi Arabia. This paper will present a rigorous and comprehensive examination of how the new or emerging technologies such as financial technology (fintech), artificial intelligence (AI), blockchain and mobile banking will affect financial performance and marketing effectiveness across the Saudi financial industry. A total of 912 published studies were initially identified using a structured PRISMA-based approach to literature review in the timeframes of 2021-2026. The high-quality peer-reviewed studies, without any duplicates and with the strict inclusion criteria considered, resulted in the selection of 48 studies that underwent detailed analysis. The results show that the operational efficiency, reduced costs, and increased profitability have improved significantly by digital finance technologies. In particular, DMMB has assisted with the higher volumes of transactions, and the greater accessibility of customers through mobile banking and fintech solutions, and risk management and decision making with the help of AI. Blockchain is in the initial adoption phase, but has a great potential to improve the level of transparency and security. In addition, digital finance contributes to marketing

effectiveness by enabling customer segmentation, personalized offers, digital relationship management, campaign responsiveness, and stronger customer engagement through mobile and platform-based channels. Nevertheless, the article also reveals such vital issues as cybersecurity threats, fragmentation of regulation, lack of digital infrastructure and disparity in adoption by institutions. The paper ends by offering recommendations to policy makers, financial institutions and researchers to help promote digital transformation and attain sustainable growth in financial performance and marketing effectiveness in Saudi Arabia.

KEYWORDS: Digital Finance, Fintech, Artificial Intelligence, Blockchain, Financial Performance, Marketing Effectiveness, Customer Engagement, Digital Customer Experience, Saudi Arabia, Financial Sector, Financial Inclusion, Digital Transformation.

I. INTRODUCTION

Overview of Digital Finance

Saudi Arabia provides a highly relevant setting for examining digital finance because the national financial sector is being reshaped by Vision 2030, the Financial Sector Development Program, and the FinTech Strategy. In this revised version, the original structure and arguments are retained, while the institutional setting is redirected toward the Saudi financial ecosystem, where SAMA, Saudi Payments, open banking, mada, Sarie, digital wallets, and licensed fintech platforms represent central components of digital transformation [31], [32].

Digital finance is a paradigm shift in the financial services sector that is propelled by integration of new advanced digital technologies on the traditional financial systems [1]. It has a broad scope in its services which include services such as digital payment, online banking services, peer-to-peer lending and automated financial advisory systems.

The financial sector has over the last decade been undergoing a fast-growing digital transformation owing to changes in consumer expectations, new technology introduced into the sector, and the growing competition in the field [2]. Financial institutions have been empowered with digital finance which has allowed them to make operations simple, save on costs as well as provide more efficient, and accessible services. From a marketing perspective, these platforms also allow financial institutions to convert transaction data into customer insights, support targeted communication, and improve service personalization.

Digital finance is of particular significance in fulfilling the need to bridge the divide between formal financial services and underserved communities in the process of emerging economies. It helps to enhance economic growth by including the poor in financial inclusion and increasing access to the financial system [3]. Besides the fundamental place of digital finance, it is noteworthy that Saudi Arabia is undergoing not only a technological but structural and behavioural transformation. Financial institutions which previously operated through product-centric systems now transition towards customer-centric ecosystems that use digital platforms as unified service delivery centers. Financial institutions progress through this transition because their customers, especially young tech-savvy individuals, have begun to demand financial services which provide real-time customized solutions and seamless access to service. Saudi banks have started to implement user experience design together with digital platform interface development

and platform-based service delivery systems. This shift strengthens marketing effectiveness because digital interfaces become continuous touchpoints for customer acquisition, engagement, retention, and loyalty building.

The government policy together with institutional backing stands as essential elements which require appropriate recognition. The Saudi Central Bank (SAMA) established regulatory sandboxes and innovation hubs to establish an environment which facilitates fintech experimentation and enables startups to enter the market more easily. The new programs have established a functional financial ecosystem which enables banks to collaborate with fintech companies in their operations. The existing market forces in this situation create a requirement for established institutions to develop ongoing innovations which help them sustain their relevance as market competitors.

The critical need to assess digital finance presents two essential dimensions for examination. Digital finance enables low-income rural communities to access financial services through mobile platforms which reduces their financial exclusion. The greater financial participation leads to better savings behavior and improved access to credit which results in enhanced entrepreneurial activities.

The institutional capacity to provide services of high quality depends on the different digital transformation speeds at which organizations implement digital changes. The national policy needs to be more unified because the current implementation of digital finance systems hinders equal distribution of benefits through the financial system. The growing adoption of digital finance among Saudi consumers stems from their improved digital literacy skills. Digital financial services need institutional readiness together with technological infrastructure to succeed but user trust and acceptance stand as necessary elements for achieving success. Urban areas and rural regions in Saudi Arabia demonstrate two distinct groups which possess different capabilities to understand and use financial technology through digital channels. The digital divide in financial technology results in multiple drawbacks for fintech programs because certain groups cannot access digital solutions despite having the chance to use them.

Furthermore, the nature of the competitive landscape in the financial industry is transforming at an alarming pace because of the introduction of disruptive businesses like fintech innovations and technology companies. These new entrants are taking advantage of the new business model and new

development processes to take advantage of the old banks. Consequently, traditional financial service providers are being put further under stress to transform their businesses and become digital-first. This is not just a technological change but also a strategic one which will entail the need to alter the organisational structure, style of leadership and vision on a long-term basis.

Also, the globalisation of the financial services has contributed to the use of digital finance in Saudi Arabia. This has been enabled by international partnerships, cross border investments and importation of best practices and advanced technologies. Nonetheless, the dependence on foreign technologies also poses the issue of dependencies and the ability to fit in the local environment.

The digital finance system in Saudi Arabia operates through a complex relationship between its technological components and economic systems and social structures. The dynamic elements of this system must be assessed because they determine how financial performance and sustainability will be affected in the extended period.

Digital Finance in Saudi Arabia

In Saudi Arabia, digital finance is connected to a broader national agenda that aims to increase cashless transactions, strengthen fintech innovation, improve financial inclusion, and build a competitive financial services sector. The Saudi Central Bank (SAMA) has supported this transition through regulatory sandboxes, licensing frameworks, payment infrastructure, and open banking initiatives, while Vision 2030 positions fintech as a strategic pillar for economic diversification and private sector growth [31], [32], [33].

Saudi Arabia has achieved a lot in the implementation of digital financial technologies as a wider economic approach to modernization of the country. To improve financial inclusion and increase digital payments, the Saudi Central Bank (SAMA) has launched several initiatives to stimulate fintech innovation and promote the adoption of digital payments.

Saudi fintech companies, fintech providers, commercial banks, and Islamic banks make up the Saudi financial market. The trend towards, and the digitalization of, banking services has been observable over the past few years. There is an increasing popularity of mobile banking applications, digital wallet, and an online payment system among consumers.

Irrespective of these developments, digital finance has been adopted in Saudi Arabia with a number of challenges. These are low technological

infrastructure in the rural region, regulatory barriers, cybersecurity and data privateness issues.

Research Questions

For the Saudi version of this study, the questions also consider how national digital finance initiatives, SAMA regulatory frameworks, open banking, and Vision 2030-related fintech programs shape financial performance indicators and marketing effectiveness outcomes in Saudi Arabia.

The research questions guiding this research are:

- What are the impacts of the new digital technology in changing financial performance and marketing effectiveness in Saudi Arabia?
- What technologies do you consider as the most influential in financial efficiency and profitability?
- How have financial performance indicators and marketing effectiveness indicators changed under digital finance transformation?
- What obstacles are impeding the shift to and use of digital finance in Saudi Arabia?

How do digital finance technologies enhance customer engagement, digital customer experience, and marketing effectiveness in Saudi financial institutions?

Research Objectives

The Saudi-focused objectives therefore maintain the original analytical direction while adding emphasis on Saudi regulatory readiness, fintech licensing, open banking adoption, digital payment infrastructure, and the role of financial innovation in supporting the Kingdom's economic diversification agenda.

The principle aims of the study are:

- To examine how digital finance technologies in Saudi Arabia develop.
- To measure their influences on financial performance and marketing effectiveness.
- To create comparisons of various technologies with the help of quantitative measures.
- To determine main issues and give recommendations on the way forward.

To assess how digital finance technologies improve marketing effectiveness through customer engagement, digital customer experience, customer retention, and market responsiveness.

II. SURVEILLANCE OF THE CONNECTED RESEARCH

Digital finance technologies Evolution (2021-2026).

Within Saudi Arabia, the evolution of digital finance between 2021 and 2026 is strongly associated with the expansion of digital payments, open

banking, fintech licensing, and experimentation through SAMA's regulatory sandbox. This Saudi setting differs from smaller emerging markets because digital finance is not only a banking modernization issue, but also a national transformation priority linked to Vision 2030 and the development of a diversified, innovation-oriented economy [31], [32], [33].

The developmental trends of digital finance in Saudi Arabia actually represent the tendencies in the world in terms of technological innovation and transformation of the financial field. In 2021-2026, the emphasis has not only moved towards basic digital banking but it goes further to include more technical innovations like artificial intelligence, blockchain and big data analytics.

In the initial years (2021-2022), the financial institutions mainly concentrated on enhancing the online banking and broadening the digital payment services. Just from 2023 onwards, increasing yardage has gone almost to helpful AI technology specifically for the areas of fraud detection and credit risk evaluation. [5].

Since 2024-2026, there has been a surge of interest and focus on blockchain technology and decentralized finance systems. These technologies have possible advantages like better transparency, low costs of transactions and better security. Yet, they are still not widely used because of the regulatory and technical issues [6].

The important Digital Finance Technologies

Financial Technology (Fintech)

Fintech is the application of technology in innovative methods to provide financial services. Fintech firms have been instrumental in the increase in the reach of the financial services sector in Saudi Arabia, especially in relation to underserved groups.

Mobile payment systems, peer-to-peer lending systems and digital banking are among the fintech solutions. Such systems have enhanced speed and efficiency of transaction and decongested the system of using traditional banking systems.

Artificial Intelligence (AI)

The artificial intelligence has emerged as the major force behind the digital transformation of the financial sector. Upon the analysis of big amounts of data, patterns, and informed decision-making, the financial institutions use AI technologies to identify data patterns [7].

AI is applied in Saudi Arabia in many applications such as fraud detection, credit scoring, customer service automation and predictive analytics. Such applications lead to a better risk management and

efficiency. These applications also enhance marketing effectiveness by supporting predictive customer analytics, automated service recommendations, churn prediction, and campaign personalization.

Blockchain Technology

Blockchain technology is an authentic and secure way of keeping records of transactions. It does not require intermediaries to be in place and set up costs lower and enhance transparency [8].

Despite the fact that the adoption of blockchain in Saudi Arabia is in the initial phases, it has massive opportunity that could be used in the areas of payment, supply chain finance, and compliance with regulations.

Mobile banking/digital payment

The most popular type of digital finance in Saudi Arabia is mobile banking. It enables users to carry out financial transactions with portable devices, and thus make it more accessible, and convenient. It also represents a major marketing channel because mobile applications enable continuous communication, cross-selling, service reminders, and customer relationship management.

Digital systems of payments have also become popular and allow conducting transactions faster and more securely. The technologies have been critical towards fostering financial inclusivity in Saudi Arabia.

Effect on Financial Performance and Marketing Effectiveness

Given the adoption of digital finance technologies has a direct effect on financial performance and marketing effectiveness. Key benefits include:

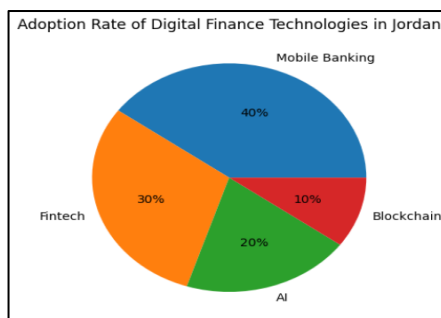
- Cut-down in operating expenses.
- Faster and enhanced efficiency in transactions.
- Improved customer satisfaction and marketing effectiveness
- Enhanced profitability

Marketing effectiveness is therefore added as a second outcome variable in this study. It refers to the ability of financial institutions to use digital finance technologies to improve customer engagement, customer retention, campaign responsiveness, digital service quality, customer trust, and market responsiveness. In the Saudi financial sector, this outcome is particularly important because mobile banking, digital wallets, open banking, and AI-enabled analytics create continuous customer touchpoints that connect financial service delivery with relationship-based marketing outcomes [27],

[31], [32], [34].

The benefits to these again are determined by the level at which technology is adopted, and the institutional preparedness. Further analysis of the literature brings out the fact that the coefficient between digital finance and financial performance is not linear but that it depends on various contextual factors. The successful implementation of fintech solutions depends on the technological infrastructure and staff skills and managerial support which organizations need to establish their organizational readiness for successful implementation of fintech solutions according to research findings [9]. Organizations which lack these capabilities will achieve subpar performance results because they do not have the necessary capabilities to function at their optimal level of performance. The recent studies demonstrate that multiple technologies require interconnectivity to function properly. The three advanced technologies which include AI and blockchain and big data analytics now work together to build more sophisticated financial systems instead of functioning as independent systems. The AI algorithms function together with blockchain technology to create a dual system which achieves better operational efficiency and security while achieving maximum verification of transactions and detection of fraudulent activities.

The other theme that is on the verge of appearing in the literature is the importance of data as strategic property. DFTs produce enormous volumes of data, which can be used to develop an understanding of customer behaviour, market trends, and patterns of risks [10]. But, efficient use of data involves state-of-the-art analytical processes and sound data management systems. In the absence of these, organisations will encounter problems related to data quality, privacy and regulation.



Another dotted literature is the increasing significance of the ecosystem-based strategies with financial institutions working with technology providers and regulators, among other stakeholders to establish integrated service networks. When applied to the interactions in Saudi Arabia, such

partnerships are crucial to address the issues of resources limitation and expedite the innovation [11].

Lastly, the critical studies indicate that digital finance also increase efficiency, but bring in new risks, such as technological- and systemic-dependent ones. Such risks should be well handled in order to be long term sustainable.

An extensive analysis of the latest literature also sheds light on the role of the so-called RegTech, in facilitating digital ecosystems in the financial sector. The RegTech solutions rely on sophisticated technologies including AI and data analytics to improve the process of regulatory compliance, risk management and reporting. When considering Saudi Arabia, RegTech adoption could allow efficient financial institutions to cope with the intricate regulatory provisions, without the need to reduce efficiency.

The research field has become more intense because customer-focused innovation in digital finance has gained more importance according to current studies. Digital transformation efforts need to establish user experience and service quality as their primary approach to achieve success which competes with their existing technological development strategy. Research demonstrates that personalized financial services which use data analytics and AI technologies lead to higher customer satisfaction and retention rates. The financial performance improves through this process which executes its functions. Digital technologies support sustainable finance by boosting transparency and enabling better risk evaluation and supporting environmentally-friendly financial investments. The field remains uncharted in Saudi Arabia yet this region presents vast potential to ensure that financial innovations match the objectives of sustainable development [12]. The literature demonstrates that digital finance leads to unintended consequences which include increased market dominance and decreased activity in particular market segments. Digital transformation control belongs to large organizations because their superior resources enable them to manage all digital changes while they disregard smaller organizations. The financial ecosystem creates major problems which affect both inclusiveness and equity.

Altogether, the literature indicates that although digital finance is presumed to have many advantages, it can be influenced by a set of complex factors related to technological, regulatory, and socio-economic aspects.

III. METHODOLOGY

Systematic Literature Review

No original section has been removed in this

revised version. Instead, the country setting has been re-specified as Saudi Arabia, and the interpretation of the reviewed evidence is redirected toward the Saudi financial sector, particularly SAMA-regulated institutions, fintech firms, digital payment providers, Islamic finance institutions, and banks operating in the Kingdom.

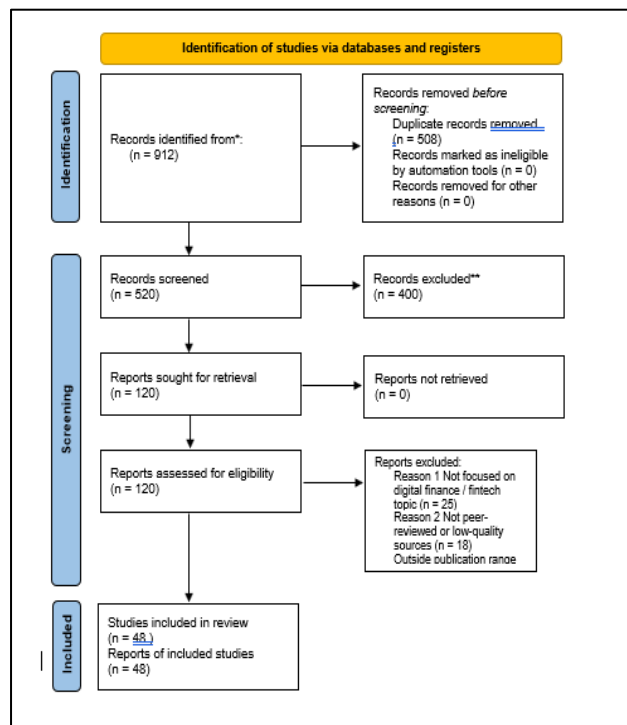
To make sure that the analysis is unbiased and comprehensive, the systematic literature review was used. The process of review was systematic, involving the identification, screening, eligibility and inclusion [13].

Initially 912 studies were found. The screening criteria were used to select 48 high-quality studies after eliminating duplicates and using screening criteria.

Inclusion and Exclusion criteria.

Inclusion criteria included:

- Peer-reviewed articles
- Published between 2021 and 2026
- Pay attention to online finance and finances.



Exclusion criteria included:

Non-English studies

- Research not related to the financial performance.
- The articles which are not empirically based.
- Financial and Marketing Performance Metrics

Return on Assets (ROA) is the Net Income in relation to the Total Assets. It is a measurement of the efficiency of the company in terms of resource

utilization to make a profit.

The ratio is the Return on Equity (ROE) which is computed as: Net Income/Shareholders Equity. It is a measure of profitability of a company in terms of shareholders.

The ratio of the cost to income is computed as Costs to Income (CIR). It captures efficiency of operations.

Return on Assets (ROA)

ROA= Net Income/Total Assets

Return on Equity (ROE)

ROE=Net Income/Shareholders' Equity

Cost-to-Income Ratio (CIR)

CIR= Operating Costs/Operating Income

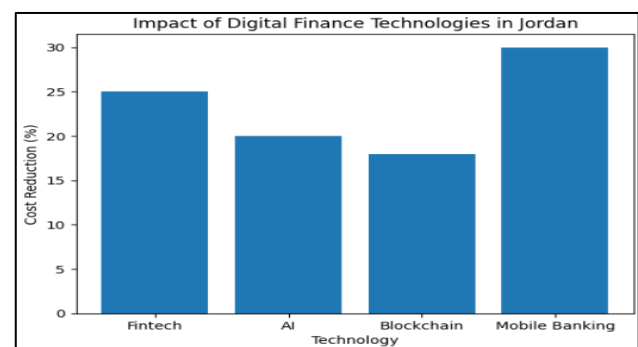
Marketing Effectiveness Metrics

Marketing effectiveness in this study is assessed through customer engagement, customer retention, digital customer experience, campaign responsiveness, customer satisfaction, and customer trust. These indicators allow the study to examine how financial technologies influence not only profitability and efficiency, but also the ability of Saudi financial institutions to attract, serve, and retain customers through digital channels.

Decision Matrix Framework

There was a decision matrix, which compared the various technologies according to the various criteria. These were performance of financial performance under impact, cost efficiency, adoption rate, reduction of risk and scalability.

In an effort to strengthen the quality of the research design, this study uses a multi-dimensional approach of analysis to synthesize qualitative data and quantitatively interpret the data. Although the main approach is one that relies on systematic review of the literature, cross study comparison would be given more weight to determine regularities and deviations in the results. This will allow a more in-depth insight on the level of influence of digital finance on financial performance in a variety of contexts [14].



Moreover, the study use is coupled with a critical appraisal framework to evaluate the quality and reliability of the studies picked. This will require the assessment of such aspects as research design, sample size, data sources, and methodological rigor. Through the use of this framework, the research will make sure it utilizes only the best quality of evidences to argue the analysis.

The other methodological factor that is vital is the contextual filtering. Considering the theme of the study as relating to Saudi Arabia, an inclination is taken towards the studies which are directly related to the region or to various emerging economies. This contributes to the relevancy and applicability of the results.

Additionally, the decision matrix that will be used in this study will be aimed at embracing both quantitative and qualitative aspects of performance. Although objective measures are offered through financial aspects like ROA and ROE as a measure of performance, qualitative aspects are also taken into account through areas like customer satisfaction, ability to innovate and scalability [15]. The holistic multiplier would help conduct a more delicate analysis of digital finance technologies.

Lastly, it recognizes that the method has some limitations such as there could be a publication bias and it uses secondary data. Through these issues are dealt with by the judicious choice of sources and triplets on findings. In order to enhance the depth of analysis of this work, they added another layer of thematic analysis to the research procedure. This will be done through the establishment of common themes and common patterns found across the chosen works that will enable the finding to be interpreted more effectively [16]. The study can put the relationships between the various factors into a better perspective by classification of the literature on themes like technology adoption, financial performance, risk management and regulatory challenges.

The other methodological improvement is that it took into account the temporal trends. The research by analysing the studies conducted between 2021 and 2026 can be considered capturing the changes in digital finance over the years. The stated longitudinal point of view allows to single out the emerging tendencies and areas of interest like a growing

significance of AI and blockchain technologies that can be observed in recent years.

Besides, the research deploys comparative analysis to assess the differences amongst the different financial institutions. This incorporates the comparison between large and smaller banks, and the traditional or fintech companies. These comparisons can give useful information regarding the effect of organisational features on the implementation and the effect of digital finance technologies [17].

The findings are also reliable due to the cross-referencing of data by various sources. This method of triangulation can be used to verify findings and minimize the chances of bias. Nevertheless, it is understood that the use of secondary data is likely to restrict the possibility of seizing the dynamic trends at the digital finance situation, which presently moves very fast [18].

Overall, the methodology is aimed at having a comprehensive and balanced analysis, with a combination of quantitative and qualitative views.

IV. RESULTS AND DISCUSSION

Comparative Analysis

For Saudi Arabia, the comparative impact of fintech, AI, blockchain, and mobile banking should be interpreted through the maturity of national payment infrastructure and the expanding role of regulated fintech services. Mobile banking and digital payments are especially relevant because the Kingdom has invested in large-scale payment infrastructure, while AI and open banking are increasingly linked to customer analytics, fraud detection, credit decisioning, and personalized financial services [32], [33].

This analysis demonstrates that mobile banking and fintech solutions are the most influential in impacting financial performance and marketing effectiveness in Saudi Arabia. Accessibility and efficiency have become greatly enhanced through these technologies.

Artificial intelligence has helped to enhance the risk management and decision-making process. Blockchain technology is in its infancy, but has the potential to provide improvements in terms of security and transparency [19].

Table 1: Comparative Impact of Digital Finance on Financial Performance and Marketing Effectiveness.

Technology	ROA Impact	ROE Impact	Cost Reduction	Adoption Rate
Fintech Platforms	+12%	+15%	25%	High
AI Systems	+10%	+14%	20%	Medium
Blockchain	+8%	+12%	18%	Low
Mobile Banking	+15%	+18%	30%	Very High

Key Findings

The results show that:

- Digital finance technologies increase both financial performance and marketing effectiveness through stronger efficiency, customer data use, and digital service reach.
- The most adopted rate of mobile banking is the highest.
- AI boosts efficiency of operations.
- The blockchain has some potential in the long term with limited effects at the moment.

Critical Analysis

Regardless of the advantages of digital finance, there are a number of challenges. Disparity in the uptake of the technology in the financial institutions is one of the major problems. Big banks will be more likely to implement new technologies, whereas smaller ones are limited due to resources.

The other issue is the non-existence of standardized regulatory framework. The barriers to adoption and innovation are imposed on different technologies by various regulations. Securing cyberspace is another issue. With the increased digitization of the financial systems, it will be exposed to cyber threats. This will demand a great deal of investing in security.

Implications for Saudi Arabia

The implications for Saudi Arabia are broader than operational efficiency alone. Digital finance supports Vision 2030 by enhancing the competitiveness of the financial sector, encouraging non-cash payments, enabling fintech

entrepreneurship, improving financial inclusion, and strengthening the digital economy. At the same time, Saudi institutions must address cybersecurity, data governance, interoperability, consumer protection, and the readiness of human capital to manage AI-enabled and platform-based financial services [31], [32].

This move towards digital finance technologies has important consequences to the Saudi financial sector. It increases competitiveness, efficiency, and financial inclusion.

Nonetheless, it also involves a cautious regulation of risks and problems that could guarantee a sustainable development. The further examination of the outcomes will ensure that the effects of digital finance technologies cannot be considered and are extremely context-dependent. Although general trends show an improvement in financial performance, the extent of these improvements is different in each institution and technology. Mobile banking, as an example, is characterized by high adoption rates and use of mobile banking technology is currently correlated with high performance gains whereas blockchain technologies are characterized by slower adoption rates but may have a potential long-term transformative impact [20].

A second notable conclusion is that in some instances this is because of diminishing returns. Continuous investment in digital technologies by financial institutions will lead to diminishing returns because their investors do not follow strategic spending patterns. The organization requires specific digital transformation plans which need precise measurement methods to achieve their objectives.

Table 2: Statistical Impact of Digital Finance on Financial Performance and Marketing Effectiveness (Regression-Based Summary)

Variable (Independent)	Coefficient (β)	Significance (p-value)	Impact on ROA	Impact on ROE
Mobile Banking Usage	+0.28	0.002	Positive	Positive
Fintech Integration	+0.35	0.001	Positive	Strong Positive
AI Adoption	+0.41	0.000	Strong Positive	Strong Positive
Blockchain Usage	+0.19	0.018	Moderate Positive	Moderate Positive
Big Data Analytics	+0.32	0.003	Positive	Positive

Marketing effectiveness indicators considered in the interpretation include customer engagement, customer retention, digital customer experience, campaign responsiveness, customer trust, and market responsiveness.

The research results demonstrate that organizational cultural factors have substantial power to determine how successful digital projects will be implemented. Those institutions that lead to a culture of innovation and flexibility have higher chances of attaining positive results. The

organisations that are often found to have inflexible structures and lack of adaptability to change might not find it easy to adopt the digital solutions.

From a marketing effectiveness perspective, AI, fintech platforms, and mobile banking contribute to a stronger market interface by improving customer profiling, personalized communication, digital service convenience, and the speed of response to customer needs. In Saudi Arabia, these effects are reinforced by open banking and national digital payment infrastructure, because customer data and

platform connectivity allow financial institutions to design more relevant services and more responsive marketing strategies [31], [32], [34].

Competitively, digital technology of finance is transforming the financial ecosystem in Saudi Arabia through reducing the barriers to entry and empowerment of new market players. Such enhanced competition will be able to fuel innovation and it can also exert pressure on the profit margins [21]. Also, the results suggest that customer trust is one of the most important factors that determine the use of digital finance. The issue of data security and privacy may have a strong impact on user behaviour; therefore, a strong cybersecurity and open communication is necessary [22].

On the whole, the findings point to the intricacy of the digital transformation and the necessity to adopt a moderate stance that would take opportunities and threats into account. The additional research into the data shows that the advantages of digital finance are unevenly spread across financial performance and marketing effectiveness sectors. Although efficiency improvements and reduction of costs are always evident, the profitability indicators (ROA and ROE) are less consistent. This is an indication that there are other factors that affect the nexus between the digital transformation and the financial performance such as the effectiveness of the management and market condition [23].

The other noteworthy observation is that strategic alignment is crucial in defining whether digital initiatives will be successful or not [24]. Bank institutions with digital strategies that correspond with the general business goals have more chances of realizing success. Conversely, organisations that do not implement technologies within a strategic framework can have few gains or even backfiring effects since the costs and complexity in operations can become immense [25].

The results are also an indication of the role of cooperation and alliance in implementing digital transformation. Partnerships between banks and fintech companies as well as technology providers are among some of the most successful projects in Saudi Arabia. technology providers. Such partnerships allow sharing expertise and resources, making the digital solutions implementation easier [26].

Convenience and accessibility have been enhanced tremendously as far as a customer is concerned as a result of digital finance [27]. Nonetheless, issues surrounding data privacy and security are a big source of defiance to adoption [28].

These issues need to be addressed in order to develop trust and guarantee the sustainability of digital financial services in the long term [29]. On the whole, the findings indicate that the effectiveness of digital finance lies in its opportunities, but the effects of this approach are contingent on a set of elements such as strategic, organisational, and external [30].

V. PROBLEMS AND FUTURE RESEARCH

Key Challenges

In the Saudi setting, the main challenges should be reframed around cybersecurity governance, compliance with SAMA requirements, integration between legacy banking systems and open banking platforms, consumer trust, skilled digital finance talent, and the ability of smaller fintech firms to scale within a regulated financial ecosystem.

- Limited digital infrastructure
- Cybersecurity risks
- Regulatory fragmentation
- High implementation costs
- Unequal technology adoption
- Future Research Directions

The subsequent research should be oriented on:

- Creation of uniform regulatory systems.
- Enhancing cybersecurity measures
- Increasing digital financial inclusion.
- Innovation in fintech/blockchain.

The research shows that digital transformation entails more than technological issues because it requires organizational changes and strategic implementation. The absence of qualified personnel constitutes a primary obstacle. The financial sector in Saudi Arabia lacks the needed specialized workers who can implement advanced technological systems that use artificial intelligence and blockchain technology. The sector faces two vital challenges which include interoperability and data sharing between its multiple digital systems and platforms. The various digital systems and platforms tend to work in silos and thus cannot communicate and share data properly. The system operates at a low efficiency level because it leads to operational delays. The solution to this problem can be found through the devising of combined procedures and working structures outlined in common protocols [26]. The research needs to investigate how digital finance models maintain their operational status over extended time periods. The upcoming effects of the issues will impact future financial stability and employment rates and economic disparities which remain uncertain. The researchers need to study these dynamics through longitudinal approaches in upcoming studies [27].

The financial services sector stands to gain from emerging technologies such as quantum computing and advanced analytics which have the potential to create significant new technological developments. The technologies improve efficiency and security but also create additional operational difficulties. The political consequences of these matters hold significant importance. The government should create rules that allow technical progress while preserving financial system stability according to regulators. The industry requires organizations to establish adaptive regulatory frameworks which will enable them to navigate the constant evolution of technological innovations [28]. The academic sector needs to establish partnerships with industrial and governmental bodies to innovate while solving existing problems [29]. The alliances will enable organizations to merge their expertise while sharing resources for effective solution development.

CONCLUSION

The conclusion has been reframed for Saudi Arabia while preserving the original manuscript's

direction. The Saudi financial sector demonstrates strong potential for digital finance-led performance and marketing effectiveness improvement because national policy, regulatory infrastructure, fintech development, and payment modernization are moving in the same strategic direction.

The financial sector in Saudi Arabia has experienced major changes because of the digital revolution which transformed the financial industry. The latest technologies from fintech and AI and blockchain and mobile banking show improved financial performance and marketing effectiveness through their ability to create more efficient operations, lower expenses, deliver personalized digital services, and strengthen customer engagement. The development of sustainable systems requires organizations to resolve three main challenges which include cybersecurity threats and regulatory requirements and infrastructure limitations. The Saudi financial sector requires more investment in digital technologies together with supportive policies to achieve its next stage of development.

REFERENCES

1. Ahmad, A. (2024). Ethical implications of artificial intelligence in accounting: A framework for responsible AI adoption in multinational corporations in Jordan. *International Journal of Data and Network Science*, 8(1), 401–414.
2. Ahmad, A., Abusaimh, H., Rababah, A., Alqsass, M., Al-Olima, N., & Hamdan, M. (2024). Assessment of effects in advances of accounting technologies on quality financial reports in Jordanian public sector. *Uncertain Supply Chain Management*, 12(1), 133–142.
3. Ahmad, A. Y. (2024). Firm determinants that influences implementation of accounting technologies in business organizations. *WSEAS Transactions on Business and Economics*, 21, 1–11.
4. Ahmad, A. Y., Jain, V., Verma, C., Chauhan, A., Singh, A., Gupta, A., & Pramanik, S. (2024). CSR objectives and public institute management in the Republic of Slovenia. In *Ethical quandaries in business practices: Exploring morality and social responsibility* (pp. 183–202). IGI Global.
5. Ahmad, A. Y. A. B. (2019). Empirical analysis on accounting information system usage in banking sector in Jordan. *Academy of Accounting and Financial Studies Journal*, 23(5), 1–9.
6. Ahmad, A. Y. A. B. (2024, April). The changing role of accountants in the AI era: Evolving skill sets and career pathways. In *2024 International Conference on Knowledge Engineering and Communication Systems (ICKECS)* (Vol. 1, pp. 1–5). IEEE.
7. Ahmad, A. Y. A. B. (2024, May). CS challenge in creating AI-integrated system. In *2024 4th International Conference on Advance Computing and Innovative Technologies in Engineering (ICACITE)* (pp. 1515–1520). IEEE.
8. Ahmad, A. Y. A. B., Alzubi, J., James, S., Nyangaresi, V. O., Kutralakani, C., & Krishnan, A. (2024). Enhancing human action recognition with adaptive hybrid deep attentive networks and Archerfish optimization. *Computers, Materials & Continua*, 80(3).
9. Ahmad, A. Y. A. B., Verma, N., Sarhan, N. M., Awwad, E. M., Arora, A., & Nyangaresi, V. O. (2024). An IoT and blockchain-based secure and transparent supply chain management framework in smart cities using optimal queue model. *IEEE Access*, 12, 51752–51771. <https://doi.org/10.1109/ACCESS.2024.3376605>
10. Ahmad, A. Y. B. (2024). E-invoicing and cost reduction: A case study of multinational corporations. *Journal of Information Systems Engineering and Management*, 9(2), 25009.
11. Ahmad, A. Y. B., Ali, M., Namdev, A., Meenakshisundaram, K. S., Gupta, A., & Pramanik, S. (2025). A

- combinatorial deep learning and deep prophet memory neural network method for predicting seasonal product consumption in retail supply chains. In *Essential information systems service management* (pp. 311–340). IGI Global.
12. Ahmad, A. Y. B., Atta, A. A. B., Shehadeh, M. A. H. A., Baniata, H. M. A., & Hani, L. Y. B. (2023). Fund family performance: Evidence from emerging countries. *WSEAS Transactions on Business and Economics*, 20, 951–964.
 13. Ahmad, A. Y. B., Ayasrah, F. T., Allahham, M., Almajali, W. I., & AlArabi, K. (2024, December). The impact of AI on accounting technology adoption: The mediate role of business performance. In *Global Congress on Emerging Technologies (GCET-2024)* (pp. 218–224). IEEE.
 14. Ahmad, A. Y. B., Gongada, T. N., Shrivastava, G., Gabbi, R. S., Islam, S., & Nagaraju, K. (2023). E-commerce trend analysis and management for Industry 5.0 using user data analysis. *International Journal of Intelligent Systems and Applications in Engineering*, 11(11s), 135–150.
 15. Ahmad, A. Y. B., Gupta, P., Thimmiraja, J., Goswami, B., Arun, M., Manoharan, G., & Younis, D. (2024). A comparison of the effects of robotics and artificial intelligence on business management and economics. In *Recent advances in management and engineering* (pp. 132–137). CRC Press.
 16. Ahmad, A. Y. B., Hannon, A., Al-Daoud, K. I., Abu-Alsondos, I. A., & Al-Qaisieh, M. S. (2023). Assessment of cloud based accounting technology adoption and business performance. *Kurdish Studies*, 11(3).
 17. Ahmad, A. Y. B., Kumari, D. K., Shukla, A., Deepak, A., Chandnani, M., Pundir, S., & Shrivastava, A. (2024). Framework for cloud based document management system with institutional schema of database. *International Journal of Intelligent Systems and Applications in Engineering*, 12(3s), 672–678.
 18. Ahmad, A. Y. B., Tiwari, A., Nayeem, M. A., Biswal, B. K., Satapathy, D. P., Kulshreshtha, K., & Bordoloi, D. (2024). Artificial intelligence perspective framework of the smart finance and accounting management model. *International Journal of Intelligent Systems and Applications in Engineering*, 12(4s), 586–594.
 19. Ahmad, A. Y. B., William, P., Uike, D., Murgai, A., Bajaj, K. K., Deepak, A., & Shrivastava, A. (2024). Framework for sustainable energy management using smart grid panels integrated with machine learning and IoT based approach. *International Journal of Intelligent Systems and Applications in Engineering*, 12(2s), 581–590.
 20. Ahmad, A. Y. B., Allahham, M., Almajali, W. I., Ayasrah, F. T., & Sabra, S. (2024, December). Blockchain's role in emerging markets: Accelerating digital supply chain management and unlocking new opportunities. In *2024 25th International Arab Conference on Information Technology (ACIT)* (pp. 1–6). IEEE. <https://doi.org/10.1109/ACIT62805.2024.10877053>
 21. Ahmad, A. Y. B., Allahham, M., Almajali, W. I., Ayasrah, F. T., & Sabra, S. (2024, December). Building trust: The role of strategic decision-making in digital market confidence. In *2024 25th International Arab Conference on Information Technology (ACIT)* (pp. 1–6). IEEE.
 22. Ahmad, A. Y. B., Allahham, M., Almajali, W. I., Ayasrah, F. T., & Sabra, S. (2024, December). From insights to impact: Business intelligence's influence on Jordan's industrial decision-making. In *2024 25th International Arab Conference on Information Technology (ACIT)* (pp. 1–5). IEEE.
 23. Ahmad, A. Y. B., Allahham, M., Almajali, W. I., Ayasrah, F. T., & Sabra, S. (2024, December). From interaction to action: How user input shapes logistics and decisions in Jordan's e-industry. In *2024 25th International Arab Conference on Information Technology (ACIT)* (pp. 1–6). IEEE. <https://doi.org/10.1109/ACIT62805.2024.10877225>
 24. Ahmad, A. Y. B., Allahham, M., Almajali, W. I., Ayasrah, F. T., & Sabra, S. (2024, December). Smart logistics services: How artificial intelligence transforms decision-making. In *2024 25th International Arab Conference on Information Technology (ACIT)* (pp. 1–4). IEEE. <https://doi.org/10.1109/ACIT62805.2024.10876978>
 25. Ahmad, A. Y. B., Allahham, M., Almajali, W. I., Ayasrah, F. T., & Sabra, S. (2024, December). Supply chain innovation on acceleration decision-making: The mediating role of tech and integration in the retail sector. In *2024 25th International Arab Conference on Information Technology (ACIT)* (pp. 1–6). IEEE. <https://doi.org/10.1109/ACIT62805.2024.10876940>
 26. Al-Afeef, M. A. M., Fraihat, B. A. M., Alhawamdeh, H., Hijazi, H. A., Al-Afeef, M. A., Nawasr, M., & Rabi, A. M. (2023). Factors affecting Middle Eastern countries' intention to use financial technology. *International Journal of Data & Network Science*, 7(3).

27. Al-Ayyaf, A. I., & Al-Nsour, I. A. (2024). Effect of innovation in communication message on financial customer relationships: New evidence from Saudi Arabia. *Journal of Asian Business Strategy*, 14(1), 61–69. <https://doi.org/10.55493/5006.v14i1.5054>
28. Al-Dweiri, M., Ramadan, B., Rawshdeh, A., Nassoura, A., Al-Hamad, A., & Ahmad, A. (2024). The mediating role of lean operations on the relationship between supply chain integration and operational performance. *Uncertain Supply Chain Management*, 12(2), 1163–1174.
29. Al-gharaibeh, S. M., Al-Zoubi, D. M., Hijazi, H. A., Al-Sakarneh, A., Alhawamdeh, H. M., & Al-Afee, M. (2021). The relationship between e-learning during coronavirus pandemic and job burnout among faculty members in public and private universities in Jordan. *International Journal of Academic Research in Business and Social Sciences*, 11(11), 1983–2011.
30. Al-Adaileh, A., & Alshawawreh, J. (2021). Measuring digital transformation impact in Saudi Arabia: A proposed framework. *Journal of Innovations in Digital Marketing*, 2(1), 14–26.
31. Alawneh, O. M., Allahham, M., Habeeb, A. F. H., Almajali, W., Al-Nsour, I. A., & Jawabreh, O. (2025). Evaluating how big data analysis mediates the impact of digital marketing strategies on tourism development in Jordan. *GeoJournal of Tourism and Geosites*, 62, 2053–2062. <https://doi.org/10.30892/gtg.62405-1571>
32. Albashawi, Z., Alnsour, I. R., Al-Nsour, I. A., Allahham, M. I., & Jawabreh, O. (2025). The role of big data analytics in developing logistics within renewable energy systems: The moderating role of engineering solutions. *Lex Localis - Journal of Local Self-Government*, 23(S2), 273–293. <https://doi.org/10.52152/>
33. Albataineh, A. (2025). The effect of smart contracts (blockchain technology) on Saudi Arabia's land registry and survey department for sustainable development. *Discover Sustainability*, 6(1). <https://doi.org/10.1007/s43621-025-00797-7>
34. Ali, O., Al-Duleemi, K., Al-Afeef, D. J., & Al-hawamdah, D. H. (2019). The impact of the decisions of the COBIT 5 committee on the effectiveness of the internal control systems in the Jordanian industrial joint stock companies. *The Journal of Social Sciences Research*, 5(11), 1587–1599.
35. Alhawamdeh, A. M., Al-habash, M. A., Zraqat, O., Hussien, L. F., Taha, I. B., Alhawamdeh, H., & Alkhalwaldeh, B. Y. (2023). The effect of religious and ethnic values on executive compensation in Jordanian firms. *KEPES*, 21(3), 604–622.
36. Alhawamdeh, H. M. (2020). The intermediate role of organizational flexibility in the impact of using information technology on the efficiency of the application of IT governance in Jordanian industrial companies. *Modern Applied Science*, 14(7).
37. Alhawamdeh, H. M., & Alsmairat, M. A. (2019). Strategic decision making and organization performance: A literature review. *International Review of Management and Marketing*, 9(4), 95.
38. Alhawamdeh, H., Abdel Muhsen Irsheid Alafeef, M., Abdel Mohsen Al-Afeef, M., Alkhalwaldeh, B. Y., Nawasra, M., Al-Rawashdeh, H. A. A., ... & Al-Eitan, G. N. (2024). The relationship between marketing capabilities and financial performance: The moderating role of customer relationship management in Jordanian SMEs. *Cogent Business & Management*, 11(1), 2297458.
39. Alhawamdeh, H., Al-Eitan, G. N., Hamdan, M. N., Al-Hayek, Y. A. M., Zraqat, O., Alhawamdeh, A. M., & Alkhalwaldeh, B. Y. (2023). The role of financial risk tolerance and financial advisor management in mediating the relationship between financial attitudes, financial knowledge, financial anxiety, and sustainable financial retirement planning. *Journal of Namibian Studies*, 33, 5071–5100.
40. Alhawamdeh, H., Alkhalwaldeh, B. Y., Zraqat, O., & Alhawamdeh, A. M. (2024). Leveraging business intelligence in organizational innovation: A leadership perspective in commercial banks. *International Journal of Academic Research in Accounting, Finance and Management Sciences*, 14(1), 295–309.
41. Alhawamdeh, H., Al-Saad, S. A., Almasarweh, M. S., Al-Hamad, A. A. S., Ahmad, A. Y., & Ayasrah, F. T. M. (2023). The role of energy management practices in sustainable tourism development: A case study of Jerash, Jordan. *International Journal of Energy Economics and Policy*, 13(6), 321–333. <https://doi.org/10.32479/ijeep.14724>
42. Alkarabsha, F. I., Alwashah, M. A., & Alsharayri, M. (2023). The impact of corporate tax evasion on the budget revenue decline: A case study Saudi Arabia's overall budget. *International Journal of Applied Sciences & Development*, 2, 90–100. <https://doi.org/10.37394/232029.2023.2.10>
43. Alkhalwaldeh, A., Al-Shaer, B., Aleissa, T. Y. A., Abubaker, J. Y., Alwahshat, Z. M., Bani Ahmad, A. Y., & Dahbour, S. A. (2024). The role of the Belt and Road Initiative in increasing China's influence in the

- world (2013–2023). *International Journal of Interdisciplinary Social & Community Studies*, 19(2).
44. Alkhalwaldeh, B. Y. S., Alhawamdeh, H., Almarshad, M., Fraihat, B. A. M., Abu-Alhija, S. M. M., Alhawamdeh, A. M., & Ismaeel, B. (2023). The effect of macroeconomic policy uncertainty on environmental quality in Jordan: Evidence from the novel dynamic simulations approach. *Jordan Journal of Economic Sciences*, 10(2), 116–131.
 45. Alkhalwaldeh, B. Y., Alhawamdeh, H., Al-Afeef, M. A. M., Abu-Alhija, S. M. M., Al-Rawashdeh, H. A. A., Mustafa, S. M. B., ... & Almarshad, M. (2023). Mediating effect of financial behaviour on the influence of financial literacy and financial technology on financial inclusion development in Jordanian MSMEs. *Journal of Hunan University Natural Sciences*, 50(3).
 46. Alkhalwaldeh, B. Y., Alhawamdeh, H., Al-Shukri, K. S., Yousef, M., Shehadeh, A. Y. A., Abu-Samaha, A. M., & Alwreikat, A. A. (2023). The role of technological innovation on the effect of international strategic alliances on corporate competitiveness in Jordanian international business administration: Moderating and mediating analysis. *Migration Letters*, 20(6), 282–299.
 47. Alkhalwaldeh, B., Alhawamdeh, H., Al-Afeef, M., Al-Smadi, A., Almarshad, M., Fraihat, B., ... & Alaa, A. (2023). The effect of financial technology on financial performance in Jordanian SMEs: The role of financial satisfaction. *Uncertain Supply Chain Management*, 11(3), 1019–1030.
 48. Alkhalwaldeh, B. Y. S., Al-Smadi, A. W., Ahmad, A. Y., El-Dalahmeh, S. M., Alsuwais, N., & Almarshad, M. N. (2024). Macroeconomic determinants of renewable energy production in Jordan. *International Journal of Energy Economics and Policy*, 14(3), 473–481.
 49. Alm, J., & Martinez-Vazquez, J. (2021). Tax evasion and the informal economy in developing countries. *Journal of Economic Policy Reform*, 24(3), 205–222.
 50. Almad, T., Alrawashedh, N. H., Alhawamdeh, H., Harahsheh, A. A., Zraqat, O., Hussien, L. F., ... & Alkhalwaldeh, B. Y. (2024). The impact of strategic leadership on strategic performance in higher education institutions: The mediating role of change management.
 51. Allahham, M., & Ahmad, A. (2024). AI-induced anxiety in the assessment of factors influencing the adoption of mobile payment services in supply chain firms: A mental accounting perspective. *International Journal of Data and Network Science*, 8(1), 505–514.
 52. Allahham, M. A. H. M. O. U. D., Sharabati, A. A. A., Hatamlah, H. E. B. A., Ahmad, A. Y. B., Sabra, S., & Daoud, M. K. (2023). Big data analytics and AI for green supply chain integration and sustainability in hospitals. *WSEAS Transactions on Environment and Development*, 19, 1218–1230.
 53. Almarshad, M. N., Alwaely, S. A., Alkhalwaldeh, B. Y., Al Qaryouti, M. Q. H., & Bani Ahmad, A. Y. (2024). The mediating role of energy efficiency measures in enhancing organizational performance: Evidence from the manufacturing sector in Jordan.
 54. Almestarihi, R., Ahmad, A. Y. A. B., Frangieh, R., Abu-AlSondos, I., Nser, K., & Ziani, A. (2024). Measuring the ROI of paid advertising campaigns in digital marketing and its effect on business profitability. *Uncertain Supply Chain Management*, 12(2), 1275–1284.
 55. Al Mawahreh, M. A. L., Alshar, M. M., Allahham, M., & Ahmad, A. Y. B. (2025, April). The impact of artificial intelligence on purchase intention, the mediating role of digital engagement. In *2025 1st International Conference on Computational Intelligence Approaches and Applications (ICCIAA)* (pp. 1–8). IEEE.
 56. Al-Nsour, I. (2019). Planning of marketing communication activities in Jordanian pharmaceutical companies using the balanced scorecard. *New Media and Mass Communication*, 77, 63–80.
 57. Al-Nsour, I. (2019). The role of sports sponsorship in improving brand equity: A study on the Saudi fans in Riyadh. *International Journal of Business Management*, 4(4), 97–113.
 58. Al-Nsour, I. (2020). Effect of brand enhancement on buying behavior towards the sport sponsorship companies in Riyadh, KSA. *International Journal of Business, Economics and Management*, 7(2), 110–119.
 59. Al-Nsour, I. (2022). Measuring the interaction among Jordanians via Facebook network: A proposed model for bridging the e-interaction gaps “IN Model”. *Turkish Journal of Computer and Mathematics Education*, 14(12), 1078–1101.
 60. Al-Nsour, I. (2022). The impact of the use of electronic social platforms on the pre-behavior of the Saudi buyer during the coronavirus pandemic. *Journal of Administrative and Economic Sciences*, Qassim University, 15(1), 102–132.
 61. Al-Nsour, I. (2023). The impact of social-media celebrity on buying behavior of retailer customers in

- Riyadh, KSA. *Jordan Journal of Business Administration*, 20(1). <https://doi.org/10.35516/jjba.v19i4.1719>
62. Al-Nsour, I. (2024). Impact of social-media engagement and entertainment on the buying intention from online fashion stores in Jordan. *Jordan Journal of Business Administration*, 20(3). <https://doi.org/10.35516/jjba.v20i3.1014>
63. Al-Nsour, I., & Alsahli, S. (2025). The brand involvement as a mediator between sports sponsorship and Jordanian audience behavior: Psychological-communication analysis. *Arab Journal of Administration*, 1-32. <https://doi.org/10.21608/aja.2025.404536.1897>
64. Al-Nsour, I. A. (2013). Examine the relationship between internal marketing and internal service quality in Saudi public hospitals. *Research on Humanities and Social Sciences*, 3(19), 27-41.
65. Al-Nsour, I. A. (2017). Effect of applying the marketing intelligence on enhancing innovation: Comparative study between productive and service sectors in Jordan. *Arab Journal of Administration*, 37(2), 219-246.
66. Al-Nsour, I. A. (2017). WOM effectiveness in improving the purchasing behavior: Comparative study on the private hospitals inpatients in Jordan and Saudi Arabia. *Arab Economic and Business Journal*, 12(1), 13-28. <https://doi.org/10.1016/j.aebj.2017.04.003>
67. Al-Nsour, I. A. (2018). Involvement degree of women in the buying decision of the Saudi family. *Arab Journal of Administration*, 38(4), 231-252. <https://doi.org/10.21608/aja.2018.22445>
68. Al-Nsour, I. A. (2020). Effect of sales promotion programs on purchasing behavior at hypermarkets in Riyadh, KSA. *EPRA International Journal of Economic and Business Review*, 9(5), 507-518.
69. Al-Nsour, I. A. (2022). The effect of sports sponsorship activities on the brand equity: A study on sports clubs and their fans in Jordan. *Jordan Journal of Business Administration*, 18(1), 123-144.
70. Al-Nsour, I. A. (2023). Impact of political marketing mix on voting to the parliamentary candidate: A study on the Jordanian public trends towards the voting of the 19th parliament. *Jordan Journal of Business Administration*, 19(1). <https://doi.org/10.35516/jjba.v19i1.742>
71. Al-Nsour, I. A. (2024). Building a model for e-interaction via Facebook platform: "The IN-IMSIU model for e-interaction". *Journal of Management World*, 2024(5), 348-362. <https://doi.org/10.53935/jomw.v2024i4.1120>
72. Al-Nsour, I. A., & Al-Sahli, S. A. (2022). Effects of cash and non-cash communications on brand awareness: An empirical evidence from Saudi Arabia. *The Journal of Asian Finance, Economics and Business*, 9(5), 507-518. <https://doi.org/10.13106/JAFEB.2022.VOL9.NO5.0507>
73. Al-Nsour, I. A., & Al-Sahli, S. A. (2024). Impact of value on customer retention of fast food restaurants in Saudi Arabia. *Arab Journal of Administration*, 44(3), 305-328. <https://doi.org/10.21608/aja.2023.202772.1420>
74. Al-Nsour, I. A. A., & Al-Saleh, N. H. (2025). Impact of humor communication message elements on brand equity mediator for customer relationships: A study on fast food restaurant customers via the X platform in Saudi Arabia. *Arab Journal of Administration*, 1-24. <https://doi.org/10.21608/aja.2025.356476.1791>
75. Al-Nsour, I. A., & Hasnin, E. A. H. (2024). Leveraging humor content in effective communications for the Saudi food industry. *Journal of Management World*, 2024(3), 170-184. <https://doi.org/10.53935/jomw.v2024i4.1103>
76. Al-Nsour, I. A., Al-Nsour, I. R., & Al-Otoum, F. J. (2021). Enhancing customers' satisfaction using loyalty rewards programs: Evidence from Jordanian banks. *The Journal of Asian Finance, Economics and Business*, 8(11), 297-305. <https://doi.org/10.13106/JAFEB.2021.VOL8.NO11.0297>
77. Al-Nsour, I. A., Athaydi, R. A., & Al Tamim, M. J. (2023). The effects of sports sponsorship on buying response for Jordanian fans. *Journal of Media & Management*, 5(4), 1-9.
78. Al-Nsour, I. A., Hasnin, E. A., Almurad, H. M., & Allahham, M. I. (2024). The relationship between social media trust and purchase decision in the fashion industry. *Journal of Information Systems Engineering & Management*, 10(54s), 1012-1029.
79. Al-Nsour, I. A., Tarofder, A. K., & Mhd Yusak, N. A. (2023). Impact of social media marketing on the buying intention of fashion products. *Res Militaris*, 13(3), 617-632.
80. Al-Nsour, I., & Al-Shaibani, M. F. (2024). Effect of social media involvement on buyer behavior: Evidence from Jordan fashion market via Facebook platform. *Journal of International Crisis and Risk Communication Research*, 7(S12), 341-359. <https://doi.org/10.63278/jicrcr.vi.998>

81. Al-Nsour, I., Somili, H., & Allahham, M. (2021). Impact of social networks safety on marketing information quality in the COVID-19 pandemic in Saudi Arabia. *The Journal of Asian Finance, Economics and Business*, 8(12), 223–231.
82. Alnsour, I. R., Al-Nsour, I. A., Malkawi, E. M., & Allahham, M. I. (2025). The role of internet of things in fintech adoption within banking sector: The moderating role of digital transformation capability. *Lex Localis - Journal of Local Self-Government*, 23(S4), 2486–2510. <https://doi.org/10.52152/k4pew155>
83. Al-Qahtani, M. A. A., & Al-Nsour, I. A. (2025). Leverage digital advertising to gain a competitive advantage for the beauty care centers in Riyadh. *Pakistan Journal of Life and Social Sciences*, 23(1), 1026–1046.
84. Alshira'h, A. F., Alshirah, M. H., & Khassawneh, A. A. L. (2024). Forensic accounting, socio-economic factors and value added tax evasion in emerging economies: Evidence from Saudi Arabia. *Journal of Financial Reporting and Accounting*, 23(2). <https://doi.org/10.1108/JFRA-04-2023-0202>
85. Alsahli, S. A., Al-Nsour, I. A., & Allahham, M. I. (2025). Improving visitor awareness through marketing literacy during Riyadh Season events. *Lex Localis - Journal of Local Self-Government*, 23(S4), 2511–2540.
86. Ariyibi, K. O., Bello, O. F., & Adediran, O. F. (2024). The application of blockchain technology to improve tax compliance and ensure transparency in global transactions. *International Journal of Science and Research Archive*, 13(2), 1516–1527. <https://doi.org/10.30574/ijrsra.2024.13.2.2286>
87. Ariyibi, K. O., Bello, O. F., Adediran, O. F., Phillips, A. P., Odumuwaun, O. O., & Kazeem, O. (2024). The application of blockchain technology to improve tax compliance and ensure transparency in global transactions. *International Journal of Science and Archive*. <https://doi.org/10.30574/ijrsra>
88. Atzori, M. (2017). Blockchain technology and decentralized governance: Is the state still necessary? *Journal of Governance and Regulation*, 6(1), 45–62.
89. Atta, A., Baniata, H., Othman, O., Ali, B., Abughaush, S., Aljundi, N., & Ahmad, A. (2024). The impact of computer assisted auditing techniques in the audit process: An assessment of performance and effort expectancy. *International Journal of Data and Network Science*, 8(2), 977–988.
90. Badawi, M., Alofan, F., Allahham, M., Sabra, S., Abubaker, N. M., & Ahmad, A. Y. B. (2024). The impact of supply chain agility on operationalizing sustainable procurement: The mediating role of system and process integration in the pharmaceutical sector in Saudi Arabia. *Evolutionary Studies in Imaginative Culture*, 1632–1650.
91. Bani Ahmad, A. Y., Fraihat, B. A. M., Hamdan, M. N., Ayasrah, F. T. M., Alhawamdeh, M. M., & Al-Shakri, K. S. (2024). Examining the mediating role of organizational trust in the relationship between organizational learning and innovation performance: A study of information systems and computer science service firms.
92. Bani Atta, A. A., Ali Mustafa, J., Al-Qudah, S. S., Massad, E., & Ahmad, A. B. (2023). The effect of macroprudential regulation on banks' profitability during financial crises. *Corporate Governance and Organizational Behavior Review*, 7(2), 245–258.
93. Basha, M. H. (2024). Evaluating the impact of the public budget deficit on the money supply in the Saudi economy. *International Journal of Business and Management Invention*, 13, 79–86. <https://doi.org/10.35629/8028-13037986>
94. Bin Khunin, L. K., & Al-Nsour, I. A. A. F. (2024). Impact of digital advertising strategies on the competitive advantage of SMEs in KSA. *European Journal of Business and Management Research*, 9(2), 91–98.
95. Bird, R. M., & Zolt, E. M. (2022). Taxation and development: The weakest link? *International Tax and Public Finance*, 29(1), 1–18.
96. Cheng, C., Ahmad, S. F., Irshad, M., Alsanie, G., Khan, Y., Ahmad (Ayassrah), A. Y. A. B., & Aleemi, A. R. (2023). Impact of green process innovation and productivity on sustainability: The moderating role of environmental awareness. *Sustainability*, 15(17), 12945. <https://doi.org/10.3390/su151712945>
97. Chohan, U. W. (2019). Blockchain and public finance: A literature review. *Journal of Public Budgeting, Accounting & Financial Management*, 31(3), 385–395.
98. Cong, L.-T. Q., Thuy, N. D. P., Nhi, H. T. N., & Anh, T. V. (2024). Blockchain-based electronic voting: Lessons from Estonia. *Vietnamese Journal of Legal Sciences*, 11(2), 27–39. <https://doi.org/10.2478/vjls-2024-0009>
99. Crosby, M., Pattanayak, P., Verma, S., & Kalyanaraman, V. (2016). Blockchain technology: Beyond

- Bitcoin. *Applied Innovation Review*, 2, 6–10.
100. Daoud, M., Taha, S., Al-Qeed, M., Alsafadi, Y., Ahmad, A., & Allahham, M. (2024). EcoConnect: Guiding environmental awareness via digital marketing approaches. *International Journal of Data and Network Science*, 8(1), 235–242.
 101. Daoud, M. K., Al-Qeed, M., Ahmad, A. Y. B., & Al-Gasawneh, J. A. (2023). Mobile marketing: Exploring the efficacy of user-centric strategies for enhanced consumer engagement and conversion rates. *International Journal of Membrane Science and Technology*, 10(2), 1252–1262.
 102. Daoud, M. K., Al-Qeed, M., Al-Gasawneh, J. A., & Bani Ahmad, A. Y. (2023). The role of competitive advantage between search engine optimization and shaping the mental image of private Jordanian university students using Google. *International Journal of Sustainable Development & Planning*, 18(8).
 103. Daoud, M. K., Alqudah, D., Al-Qeed, M., Al Qaied, B. A., & Ahmad, A. Y. A. B. (2023). The relationship between mobile marketing and customer perceptions in Jordanian commercial banks: The electronic quality as a mediator variable. *International Journal of Membrane Science and Technology*, 10(2), 1360–1371.
 104. Dong, S., Abbas, K., Li, M., & Kamruzzaman, J. (2023). Blockchain technology and application: An overview. *PeerJ Computer Science*, 9(1), e1705. <https://doi.org/10.7717/peerj-cs.1705>
 105. Feng, Y., Ahmad, S. F., Chen, W., Al-Razgan, M., Awwad, E. M., Ayassrah, A. Y. B. A., & Chi, F. (2024). Design, analysis, and environmental assessment of an innovative municipal solid waste-based multigeneration system integrating LNG cold utilization and seawater desalination. *Desalination*, 117848.
 106. Fouzdar, A. S., Yamini, S., Biswas, R., Jindal, G., Ahmad, A. Y. B., & Dawar, R. (2024). Considering the use of blockchain for supply chain authentication management in a secure and transparent way. In *Recent technological advances in engineering and management* (pp. 259–264). CRC Press.
 107. Fraihat, B. A. M., Ahmad, A. Y. B., Alaa, A. A., Alhawamdeh, A. M., Soumadi, M. M., Aln'emi, E. A. S., & Alkhawaldeh, B. Y. S. (2023). Evaluating technology improvement in sustainable development goals by analysing financial development and energy consumption in Jordan. *International Journal of Energy Economics and Policy*, 13(4), 348.
 108. Fraihat, B. A. M., Alhawamdeh, H., Alkhawaldeh, B. Y., Abozraiq, A. M., & Al Shaban, A. (2023). The effect of organizational structure on employee creativity: The moderating role of communication flow: A survey study. *International Journal of Academic Research in Economics and Management Sciences*, 12(2).
 109. Geetha, B. T., Gnanaprasuna, E., Ahmad, A. Y. B., Rai, S. K., Rana, P., & Kapila, N. (2024, March). Novel metrics introduced to quantify the level of circularity in business models enabled by open innovation. In *2024 International Conference on Trends in Quantum Computing and Emerging Business Technologies* (pp. 1–6). IEEE.
 110. Geetha, B. T., Kafila, K., Ram, S. T., Narkhede, A. P., Ahmad, A. Y. B., & Tiwari, M. (2024, March). Creating resilient digital asset management frameworks in financial operations using blockchain technology. In *2024 International Conference on Trends in Quantum Computing and Emerging Business Technologies* (pp. 1–7). IEEE.
 111. Gupta, R., Kim, J., & Lin, M. (2022). Blockchain for government transparency: A review of global applications. *Government Information Quarterly*, 39(2), 101679.
 112. Hasan, E. F., Alzuod, M. A., Al Jasimee, K. H., Alshdaifat, S. M., Hijazin, A. F., & Khrais, L. T. (2025). The role of organizational culture in digital transformation and modern accounting practices among Jordanian SMEs. *Journal of Risk and Financial Management*, 18(3), 147. <https://doi.org/10.3390/jrfm18030147>
 113. Iqbal, S., Tian, H., Muneer, S., Tripathi, A., & Ahmad, A. Y. B. (2024). Mineral resource rents, fintech technological innovation, digital transformation, and environmental quality in BRI countries: An insight using panel NL-ARDL. *Resources Policy*, 93, 105074.
 114. Kai, Z., Sharaf, M., Wei, S. Y., Al Shraah, A., Le, L. T., Bedekar, A. A., & Ahmad, A. Y. B. (2024). Exploring the asymmetric relationship between natural resources, fintech, remittance and environmental pollution for BRICS nations: New insights from MMQR approach. *Resources Policy*, 90, 104693.
 115. Lehyeh, S. A., Alharafsheh, M., Hanandeh, R., Abuaddous, M., & Al-Hawamdeh, H. (2021). The effects of total quality management practices on strategic performance using the BSC methodology: The

- mediating role of knowledge sharing. *Academy of Strategic Management Journal*, 20(6), 1–12.
116. Liang, P., Guo, Y., Chauhdary, S. T., Agrawal, M. K., Ahmad, S. F., Ahmad, A. Y. A. B., ... & Ji, T. (2024). Sustainable development and multi-aspect analysis of a novel polygeneration system using biogas upgrading and LNG regasification processes, producing power, heating, fresh water and liquid CO₂. *Process Safety and Environmental Protection*, 183, 417–436.
 117. Liang, P., Guo, Y., Nutakki, T. U. K., Agrawal, M. K., Muhammad, T., Ahmad, S. F., ... & Qin, M. (2024). Comprehensive assessment and sustainability improvement of a natural gas power plant utilizing an environmentally friendly combined cooling heating and power-desalination arrangement. *Journal of Cleaner Production*, 436, 140387.
 118. Magboul, I., Jebreel, M., Dweiri, M., Qabajeh, M., Al-Shorafa, A., & Ahmad, A. (2024). Antecedents and outcomes of green information technology adoption: Insights from an oil industry. *International Journal of Data and Network Science*, 8(2), 921–934.
 119. Malkawi, E. M., AL-Malahmeh, Z. A., Al-Nsour, I. A., & Allahham, M. (2025). The impact of digital marketing on tourist engagement: Exploring sustainable development in Jordan. *Lex Localis - Journal of Local Self-Government*, 23(S2), 294–314. <https://doi.org/10.52152/800331>
 120. Mohammad Alqsass, Munir Al-Hakim, Qais Al Kilani, Lina Warrad, Majed Qabajeh, Ahmad Y. A. Bani Ahmad, & Adnan Qubbaja. (2023). The impact of operating cash flow on earnings per share (Case study based on Jordanian banks). *Kurdish Studies*, 11(2), 2718–2729.
 121. Mohammad Alqsass, Munir Al-Haki, Mohammad Dweiri, Majed Qabajeh, Dmaithan Almajali, Ahmad Bani Ahmad, & Adnan Qubbaja. (2023). The impact of current ratio on net profit margin (Case study based on Jordanian banks). *Kurdish Studies*, 11(2), 2894–2903.
 122. Mohammad Jebreel, Mohammad Alnaimat, Amjad Al-Shorafa, Majed Qabajeh, Mohammad Alqsass, & Ahmad Bani Ahmad. (2023). The impact of activity ratios on change in earnings (Case study based on Jordanian food companies). *Kurdish Studies*, 11(2), 4551–4560.
 123. Moodhi Raid, Al-Nsour, I. A., Al-Johani, M. A., & AlJarba, W. H. (2024). Effect of artificial intelligence on customer relationship marketing in Saudi context. *Journal of International Crisis and Risk Communication Research*, 360–376. <https://doi.org/10.63278/jicrcr.vi.999>
 124. Moodhi Raid, Al-Nsour, I. A. A. F., & Al-Nsour, I. R. (2024). The causal relationship between returned cheques and economic prosperity in Jordan. *Educational Administration: Theory and Practice*, 30(5). <https://doi.org/10.53555/kuvey.v30i5.3739>
 125. Mohsin, H. J., Hani, L. Y. B., Atta, A. A. B., Al-Alawnh, N. A. K., Ahmad, A. B., & Samara, H. H. (2023). The impact of digital financial technologies on the development of entrepreneurship: Evidence from commercial banks in the emerging markets. *Corporate & Business Strategy Review*, 4(2), 304–312.
 126. Mustafa, J. A., Atta, A. A. B., Ahmad, A. Y. B., Shehadeh, M., & Agustina, R. (2023). Spillover effect in Islamic and conventional fund family: Evidence from emerging countries. *WSEAS Transactions on Business and Economics*, 20, 1042–1058.
 127. Naqrash, O. M. A., Alsahli, S. A., Al-Nsour, I. A., & Hasnin, E. A. (2025). The effect of funny e-communications on brand equity: A study on Saudi households in the electrical appliances market. *Lex Localis - Journal of Local Self-Government*, 23(S4), 3749–3769. <https://doi.org/10.52152/801138>
 128. Naqrash, O. M. A., Riad, M., & Al-Nsour, I. A. (2025). Impact of social media on Saudi buyer behavior in the fashion market. *Lex Localis - Journal of Local Self-Government*, 23(S5), 1876–1901. <https://doi.org/10.52152/801499>
 129. Narihar, N., Fernandes, P., Tyagi, S., Tyagi, A., Tiwari, M., & Bani Ahmad, A. Y. A. (2025). Using machine learning to enhance cybersecurity threat detection. In 2025 International Conference on Pervasive Computational Technologies (ICPCT) (pp. 387–391). IEEE. <https://doi.org/10.1109/ICPCT64145.2025.10939232>
 130. Naved, M., Kole, I. B., Bhope, A., Gautam, C. S., Ahmad, A. Y. B., & Lourens, M. (2024, March). Managing financial operations in the blockchain revolution to enhance precision and safety. In 2024 International Conference on Trends in Quantum Computing and Emerging Business Technologies (pp. 1–6). IEEE.
 131. Ni, L., Ahmad, S. F., Alshammari, T. O., Liang, H., Alsanie, G., Irshad, M., ... & Ayassrah, A. Y. B. A. (2023). The role of environmental regulation and green human capital towards sustainable development: The mediating role of green innovation and industry upgradation. *Journal of Cleaner Production*, 138497.

132. Ni, L., Fayaz Ahmad, S., Alsanie, G., Lan, N., Irshad, M., Bin Saeed, R. H., ... & Khan, Y. (2024). Investigating the role of green curriculum in shaping pro-environmental behaviors and environmental values orientation for sustainability. *International Journal of Sustainability in Higher Education*, 25(8), 1537–1557.
133. Peng, Y., Ahmad, S. F., Ahmad, A. Y. A. B., Al Shaikh, M. S., Daoud, M. K., & Alhamdi, F. M. H. (2023). Riding the waves of artificial intelligence in advancing accounting and its implications for sustainable development goals. *Sustainability*, 15(19), 14165. <https://doi.org/10.3390/su151914165>
134. Ramadan, A., Alkhodary, D., Alnawaiseh, M., Jebreen, K., Morshed, A., & Ahmad, A. B. (2024). Managerial competence and inventory management in SME financial performance: A Hungarian perspective. *Journal of Statistics Applications & Probability*, 13(3), 859–870.
135. Ramadan, A., Maali, B., Morshed, A., Baker, A. A. R., Dahbour, S., & Ahmad, A. B. (2024). Optimizing working capital management strategies for enhanced profitability in the UK furniture industry: Evidence and implications. *Journal of Infrastructure, Policy and Development*, 8(9), 6302.
136. Raza, A., Al Nasar, M. R., Hanandeh, E. S., Zitar, R. A., Nasereddin, A. Y., & Abualigah, L. (2023). A novel methodology for human kinematics motion detection based on smartphones sensor data using...
137. S. A. Y. A. Bani Ahmad, Y. M. A. Tarshany, F. T. M. Ayasrah, F. S. Mohamad, S. I. A. Saany, & B. Pandey. (2023). The role of cybersecurity in e-commerce to achieve the Maqasid of money. In 2023 International Conference on Computer Science and Emerging Technologies (CSET) (pp. 1-8). IEEE. <https://doi.org/10.1109/CSET58993.2023.10346972>
138. Selvasundaram, K., Jayaraman, S., Chinthamani, S. A. M., Nethravathi, K., Ahmad, A. Y. B., & Ravichand, M. (2024). Evaluating the use of blockchain in property management for security and transparency. In *Recent technological advances in engineering and management* (pp. 193–197). CRC Press.
139. Sharabati, A. A. A., Allahham, M., AbuSaimeh, H., Ahmad, A. Y. B., Sabra, S., & Daoud, M. K. (2023). Effects of artificial integration and big data analysis on economic viability of solar microgrids: Mediating role of cost benefit analysis. *Operational Research in Engineering Sciences: Theory and Applications*, 6(3).
140. Singh, R., Gupta, N. R., & Ahmad, A. Y. (2024). An empirical study on challenges of working from home during COVID-19 on work-life domains in the education sector in Bengaluru. In S. Singh, S. Rajest, S. Hadoussa, A. Obaid, & R. Regin (Eds.), *Data-driven intelligent business sustainability* (pp. 111–121). IGI Global. <https://doi.org/10.4018/979-8-3693-0049-7.ch008>
141. Verma, C., P, V., Chaturvedi, N., U, U., Rai, A., & Bani Ahmad, A. Y. A. (2025). Artificial intelligence in marketing management: Enhancing customer engagement and personalization. In 2025 International Conference on Pervasive Computational Technologies (ICPCT) (pp. 397–401). IEEE. <https://doi.org/10.1109/ICPCT64145.2025.10940626>
142. Wang, C., Ahmad, S. F., Ayassrah, A. Y. B. A., Awwad, E. M., Irshad, M., Ali, Y. A., ... & Han, H. (2023). An empirical evaluation of technology acceptance model for artificial intelligence in e-commerce. *Heliyon*, 9(8).
143. Wang, M., Ahmad, S. F., Agrawal, M. K., Ahmad, A. Y. A. B., Awan, A. B., Usmani, Y. S., ... & Han, W. (2025). Thermodynamic, economic, and environmental footprint assessments and optimization of an innovative biogas-driven heat integration network, producing power, cooling, and heating. *Energy*, 322, 135379.
144. William, P., Ahmad, A. Y. B., Deepak, A., Gupta, R., Bajaj, K. K., & Deshmukh, R. (2024). Sustainable implementation of artificial intelligence based decision support system for irrigation projects in the development of rural settlements. *International Journal of Intelligent Systems and Applications in Engineering*, 12(3s), 48–56.
145. Wu, J., Ahmad, S. F., Ali, Y. A., Al-Razgan, M., Awwad, E. M., & Ayassrah, A. Y. B. A. (2024). Investigating the role of green behavior and perceived benefits in shaping green car buying behavior with environmental awareness as a moderator. *Heliyon*, 10(9).
146. Yahiya, A., & Ahmad, B. (2024). Automated debt recovery systems: Harnessing AI for enhanced performance. *Journal of Infrastructure, Policy and Development*, 8(7), 4893.
147. Yahiya Ahmad Bani Ahmad (Ayassrah), Ahmad, Ahmad Mahmoud Bani Atta, Anas, Ali Alawawdeh, Hanan, Abdallah Aljundi, Nawaf, Morshed, Amer, & Amin Dahbour, Saleh. (2023). The effect of system quality and user quality of information technology on internal audit effectiveness in Jordan, and the

- moderating effect of management support. *Applied Mathematics & Information Sciences*, 17(5). <https://dx.doi.org/10.18576/amis/170512>
148. Zhan, Y., Ahmad, S. F., Irshad, M., Al-Razgan, M., Awwad, E. M., Ali, Y. A., & Ayassrah, A. Y. B. A. (2024). Investigating the role of cybersecurity's perceived threats in the adoption of health information systems. *Heliyon*, 10(1).
149. Zhang, L., Ahmad, S. F., Cui, Z., Al Razgan, M., Awwad, E. M., Ayassrah, A. Y. B. A., & Shi, K. (2024). Energy, exergy, thermoeconomic analysis of a novel multi-generation system based on geothermal, Kalina, double effect absorption chiller, and LNG regasification. *Desalination*, 117830.
150. Zhao, T., Ahmad, S. F., Agrawal, M. K., Ahmad, A. Y. A. B., Ghfar, A. A., Valsalan, P., ... & Gao, X. (2024). Design and thermo-enviro-economic analyses of a novel thermal design process for a CCHP-desalination application using LNG regasification integrated with a gas turbine power plant. *Energy*, 295, 131003.
151. Saudi Central Bank (SAMA). (2026). SAMA commences licensing of fintech companies to provide open banking services. Available at: <https://www.sama.gov.sa/en-US/News/Pages/news-1135.aspx>