

THE DIGITAL REVOLUTION IN THE FINANCIAL SECTOR AND ITS IMPACT ON FINANCIAL STABILITY; THE CASE OF JORDAN

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ABSTRACT

Digital revolution has changed the ways activities were being performed in all aspects of life and same is the case with financial services across the globe. Current study aims at exploring the impact of digital revolution in financial sector on the financial stability of these financial services providers in Jordan, mainly focusing on the impact of block chains. For this purpose, Jordanian banks and other financial service providing companies listed on Amman stock exchange are investigated. As z-score is the best indicator of the financial stability of such firms, so the impact of block chains is investigated on the financial stability of Jordanian banks and other financial sector firms through evaluating the changes in z-score before and after the adoption of such technological advancement i.e. block chains. The study incorporates the data from 2011 to 2019 and indicates that till now such digital transformation i.e. adoption of block chain technology has no significant positive contribution towards the financial stability of financial sector in Jordan. Hence, Jordanian financial sector still requires effective implementation of such adoptions to harvest financial benefits.

Keywords: Digital Revolution, Block Chains, Financial Sectors, Banks, Jordan, Z-Score

INTRODUCTION

Technological and information revolution has influenced each aspect of people's life and financial sector is no exception. Financial sector is the significant contributor of economic development and determines the pace and eminence of change so e-commerce and e-payments has become an integral part of this sector to cope with the digital revolution across globe (Litvishko et al., 2020). The digital revolution has altered the ways financial services were being provided, and most importantly the ways transactions are being done, hence influencing the services quality and competition among financial service providers (Siam, 2006). Technological and information advancement has become a significant factor for financial sector's success and more importantly the banks. However with each passing day, technological advancement is becoming less of a competitive advantage and more of a critical requirement for survival in recent era because it has made significant impact on the daily lives of consumers and winning consumers' trust is the most critical success factor for financial sector firms including banks (Halaiqah & Ghannam, 2020), but it's evident that digital transformation has shaken the financial sector. Such transformation, most prominently emerging since 2019, has compelled the financial institutions to stay relevant and updated for their survival. The most dominating trends of digital transformations in financial sector are mobile banking, mobile pay, mobile apps, automated wealth managers, big data, and block chains (Newman, 2019). Such trends has not only altered the ways of operations of financial institutions but has also influenced the financial stability of financial institutions either in positive or negative ways. So in order to investigate the impact of digital revolution on financial sector, current research is mainly focusing on investigating the impact of block chains, which is among the dominating revolution transforming the financial services. Hence, current research aims at investigating the impact of

block chain technology on the financial stability of financial sector in Jordan including banks, insurance companies and companies providing diversified financial services, listed on Amman stock exchange.

Research Problem and Key Question

Despite the emergence of digital transformations, the research in the impact of various digital revolutionary trends is sparse and same is the case with block chains and their emergence in financial sector. Although researchers have started exploring the impact of block chains technology and its pros and cons in financial sector but still a huge gap exists in literature. Some researchers have also explored the impact of digital technologies like block chains on businesses and especially on financial sector like Fanning and Centers (2016) investigated the impact of block chains on financial sector and indicated that block chain is going to be an essential part of financial services. Weking, et al., (2020) investigated the impact of block chain technology on business models and indicated that such technological adoption changes the business models by eliminating the involvements of intermediaries. Xu, et al., (2019) has conducted a systematic review of block chains and highlighted the emergence of this topic in research. Chang et al. (2020) investigated the impact of block chains on financial services and indicated that such technology not only provides benefits to financial services but also poses some challenges to the financial service providers. Magnier & Barban (2018) investigated the impact of block chains and found that adoption of block chain technology changes the corporate governance of organization. Treleven, et al., (2017) investigated the role of block chain technology in finance and highlighted its pros and cons for financial sector. All the above mentioned studies have investigated the impact of block chains on financial sector in various aspects and mostly focusing on the pros and cons of block chain technology adoption for financial sector, but no study to the day has investigated the impact of block chains on the financial stability of financial sector. Hence, current research fills this gap and aims at investigating the impact of block chains on financial stability of financial sector in Jordan. So the study proposes following research question;

Has the Digital Revolution in Financial Sector Influenced the Financial Stability of Financial Sector in Jordan?

This question is further narrowed down in following way;

1. Does the block chain technology influence the financial stability of Jordanian banks listed on Amman stock exchange?
2. Does the block chain technology influence the financial stability of Jordanian insurance companies listed on Amman stock exchange?
3. Does the block chain technology influence the financial stability of Jordanian diversified financial services' companies listed on Amman stock exchange?

LITERATURE REVIEW

Block Chains

Block chain is a disseminated database maintaining an ever growing catalog of records that are hardened against amendment and tempering even by data store nodes' operators. It is indicated as a public ledger incorporating each transaction that has ever been executed. It's growing persistently due to the addition of completed blocks to the previous ones hence forming a chain having blocks in a chronological and linear pattern. Each minor, while joining the network, receives the copy of the block chain incorporating accurate and complete information

about addresses with their balances right from the origin till the most recently accomplished block (Fanning & Centers, 2016).

Block chain technology has altered the ways of performing economic activities while reducing the time and costs associated with these activities as well, so business models in many industries have also changed either by eliminating the intermediaries or by fostering security over performance. Similarly, the use of block chain technology in financial industry has eliminated the intermediation and reconciliation requirements while enabling direct transactions among trading parties (Weking, et al., 2020). Some other associated benefits of this distributed ledger technology, which has attracted financial service providers including banks, are identity services, lending and trade finance, foreign exchange and global payments. Financial institutions especially the banks are adopting this technology due to the provision of next levels of security because it eliminates the challenges of establishing each client's view across various business lines and jurisdictions (Xu et al., 2019).

Block Chains and the Financial Sector

Initially the emergence of block chains threatened the financial sector that “the block chain will do to the financial system what the internet did to media” (Ito et al., 2017), but it is found that block chain technology is not going to obsolete the financial system rather it is to enhance the functionality, power and scope of financial services (Chang et al., 2020). Block chain technology offers decentralization, transparency and safety to the financial service providers even cheaper than the traditional methods. It offers cost effective solutions; enhancing customer satisfaction through more secure and transparent transactions, faster transactions; eliminating the time of transaction conformation, improved security and data quality; having information in a decentralized location (Magnier & Barban, 2018). But on the other hand, there are few challenges that financial institutions have to face while adopting this block chain technology like integration of such technology with existing processes and systems, widespread agreement and collaboration of common standards, potential of manipulation by bad actors, and most importantly the concerns about the ownership and jurisdiction of distributive ledger's transactions and data (Treleaven et al., 2017).

Digital Revolution and Financial Stability of Financial Sector

Digital revolution or transformation not only influences the ways to perform traditional financial activities, but also have significant implications on the financial performance of financial institutes. The structural technological transformation in financial sector goes parallel to the competitive revolution in the industry (Valverde, 2017). Comert, et al., (2016) indicated that during late 1960s innovative behavior of large banks led to the financial instability processes and the accumulative effect of that era's innovations resulted in financial instability due to incoherence and fragility of financial institutions. Hence, the combination of competitive advantage and technology could harvest benefits only if the aspects of new technology and its appropriate implementation is well understood and addressed appropriately otherwise compromising the financial stability of the institutions (Verdier & Mariotto, 2015). Although digitalization and technological revolution has potential of reducing marginal costs and enhancing productivity especially in financial sectors but still the financial stability of the institutions matters, because digital transactional systems accumulate massive intangible capital which faces valuation problems in capital markets as well as creating significant regulatory, legal and privacy challenges due to blur industrial boundaries (Comert et al., 2016).

Block Chain Technology in Jordan

Digital transformation and FinTech has become the top priority of financial sector in Jordan, including the Central Bank, becoming the leader of innovation in Jordanian market. However, the whole sector is mainly focusing on the payment technology while neglecting the other financial innovations, which resulted in fierce competition and robust payment infrastructure in the country. The Jordanian financial sector including banks is putting disproportionate degree of effort for the adoption and implementation of digital payment systems which has transformed the services of financial institutions as well (Halaqah & Ghannam, 2020). Alghusain, et al., (2018) indicated that transformation of banking sector across globe has also influenced the Jordanian banking sector to transform its traditional banking services towards the virtual banking services while passing through various transitional developmental phases. Such transformations and technological adoption has significantly influenced the financial outcomes of services provided by these institutions (Litvishko et al., 2020).

Although digital revolution had made its ways to the Jordanian businesses many years before but the digital transformation of financial services through the adoption of Block chaintechology by Jordanian financial sector has widespread evidences during 2019 (Daniel, 2019), when Jordanian banks started using block chains for their transactions that changed the whole scenario of money transfers through banks. Before this digital transformation the money transfer incorporated third party intermediaries who charged fees at several stages of transactions (Hall, 2019). Hence such revolution has made significant changes in Jordanian financial sector but at the same time raising a critical concern of the financial stability of these financial institutions. Hence current research unveils this fact tat whether the adoption of Block chain technology by Jordanian financial sector has significant impact on the financial stability of this sector.

RESEARCH METHODOLOGY

Current research intends to evaluate the impact of digital revolution in the Jordanian financial sector on the financial stability of this sector. For this purpose, the study incorporates Jordanian Banks listed on Amman stock exchange, Jordanian Insurance companies listed on Amman stock exchange and companies providing diversifies financial services, listed on Amman stock exchange.

Z-score is the best indicator of the financial stability of companies (Ali, 2020), but the z-score for manufacturing firms and for services firms differ (Alshhubiri, 2017), since the current study is investigating the financial stability of financial sector so the z-score for services firms is employed indicated by the following formula:

$$z - score = \frac{\sum ROA + \left(\frac{\sum Equity}{\sum Assets}\right)}{\sum \delta ROA}$$

Where,

ROA = Return on Asset of individual firm, while $\sum ROA$ is the sum of the ROA of all firms in a sector,

Equity= Total equity of the individual firm, while $\sum Equity$ is the sum of the total equity of all firms in a sector,

Assets= Total assets of the individual firm, while $\sum Assets$ is the sum of the total assets of all firms in a sector,

δ .ROA = the standard deviation of the return on assets of the sectors under study.

$\sum ROA$, $\sum Equity$, $\sum Assets$ and $\sum \delta$.ROA are the country level aggregates of the sectors under study to capture the probability of the default of sector at country level, while δ . ROA

captures the volatility or underlying risks. Above mentioned z-score makes the comparison of the buffer of a country's financial sector especially banks (capitalization and returns) (The World Bank, 2021).

Hence, the financial stability of Jordanian Banks, insurance companies and companies providing diversified financial services is calculated through the above mentioned formula, while the impact of block chain technology on the financial stability of these sectors is investigated by comparing the z-score of sectors pre-adoption of technology and post-adoption of block chain technology. The study calculates the z-score for these sectors for 9 years, from 2011 to 2019, due to the data availability of all firms till 2019 on official website of Amman stock exchange (<https://www.ase.com.jo/en>). As, the adoption of blockchain technology by Jordanian financial sector took place during 2019 (Daniel, 2019; Hall, 2019) so the pre-adoption duration is considered as from 2011 to 2018 which indicates the financial stability of sector for last 8 years hence indicating the financial position of sector before adoption of block chain technology, while the z-score of each sector for the year 2019 is considered as the post-adoption indicator of financial stability.

RESULTS AND DISCUSSIONS

In order to capture the financial stability of the sectors before and after the adoption of block chain technology, initially the country level aggregates of the ROA, Equity and Assets are calculated for all the sectors under study, which are further incorporated in the z-score formula to calculate the z-score for the time span under study. The results are as follows:

	Σ EQUITY	Σ ASSETS	Σ ROA	Σ sig.ROA	Z-Score
2011	7.12E+09	4.94E+10	17.06	0.593	53.08
2012	7.41E+09	5.09E+10	18.25	0.472	69.57
2013	7.74E+09	5.36E+10	19.24	0.532	63.32
2014	7.2E+09	5.32E+10	18.82	0.615	52.62
2015	7.72E+09	5.92E+10	17.28	0.506	59.88
2016	7.87E+09	5.85E+10	16.68	0.434	69.41
2017	8.15E+09	6.09E+10	15.26	0.426	67.19
2018	8.18E+09	6.34E+10	16.2	0.411	70.85
2019	8.45E+09	6.65E+10	14.14	0.412	65.25

Table 1 indicates the results for country level aggregates of return on assets (ROA), total equity, total assets and standard deviation of ROA of the Jordanian banking sector. The last column indicates the z-score for each year. The table indicates that although the z-score indicates fluctuations but it indicated improvement before the adoption of block chain technology while it again declined in 2019 which is the block chain technology adoption period. Hence, the adoption of block chain technology is not proven to be good for the banking sector of Jordan, which is evident from the following graph:

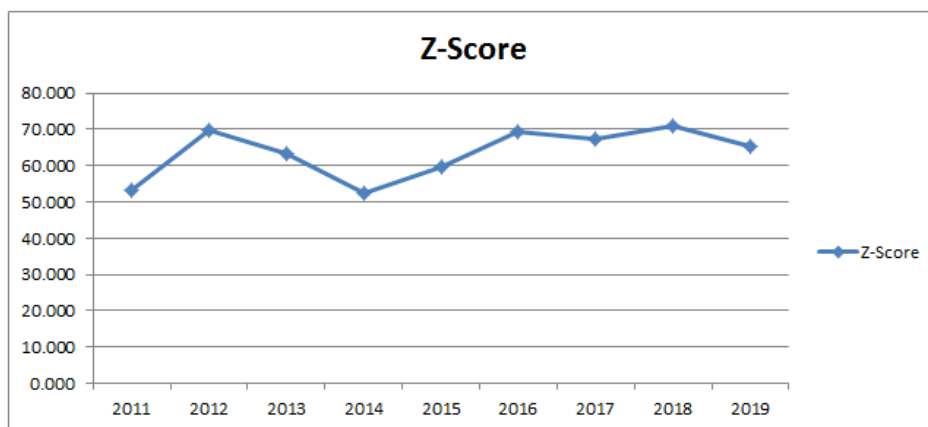


FIGURE 1
Z-SCORE OF BANKING SECTOR IN JORDAN 2011-2019

The graph indicates that the z-score of Jordanian banking sector starts improving since 2014 except for a bit decline in 2017, but it dropped significantly in 2019 hence indicating the negative impact of digital revolution in financial sector i.e. the adoption of block chain technology. Table 2 indicates the results for Insurance companies listed on Amman stock exchange.

TABLE 2
COUNTRY LEVEL AGGREGATES AND Z-SCORE OF JORDANIAN INSURANCE COMPANIES

	Σ ASSETS	Σ EQUITY	Σ ROA	Σ sig.ROA	Z-Score
2011	5.59E+08	2.7E+08	-35.67	6.765	-5.202
2012	6.09E+08	2.76E+08	-3.93	6.273	-0.554
2013	6.65E+08	2.84E+08	20.51	3.298	6.348
2014	7.09E+08	2.96E+08	68.42	2.574	26.741
2015	7.55E+08	3.05E+08	48.8	2.254	21.826
2016	7.96E+08	3.16E+08	56.02	1.941	29.071
2017	7.18E+08	2.88E+08	32.21	3.296	9.894
2018	8.37E+08	3.04E+08	27.11	2.820	9.744
2019	8.64E+08	3.14E+08	26.73	4.638	5.842

Results reported in Table 2 indicate that the financial positions of insurance companies in Jordanian financial sector exhibits high volatilities, with a sharp rise during 2014 to 2016 which again indicated a sharp decline in 2017 and onwards. As the Jordanian insurance companies are already indicating a declining z-score during the pre-adoption duration of block chains so it doesn't indicate the negative impact of block chain technology. rather the financial stability of insurance companies is already indicating the warning signs with continuous decline in each passing year. Further the financial stability of Jordanian insurance companies during the time span of study is indicated by the following graph;

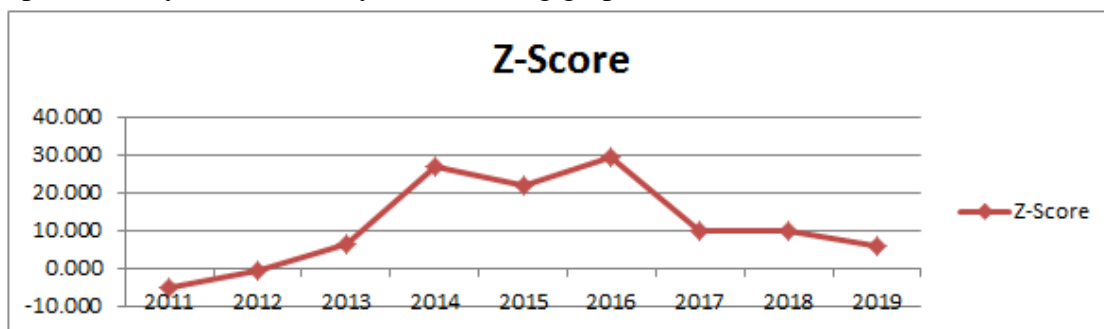


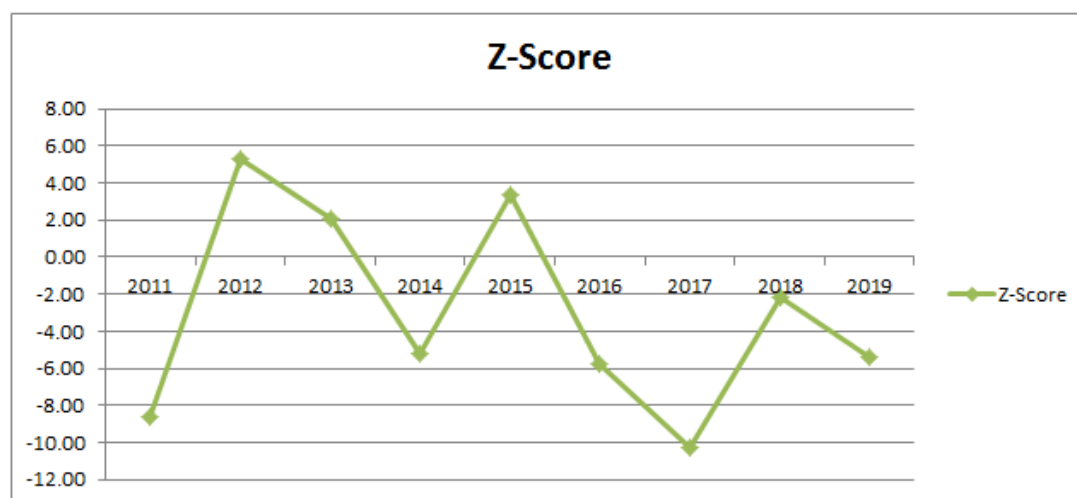
FIGURE 2
THE Z-SCORE OF JORDANIAN INSURANCE COMPANIES 2011 TO 2019

The graph clearly indicates that the insurance sector's financial stability is already indicating a warning sign with a sharp decline during recent years even before adoption of the block chain technology. hence, block chain technology is not significantly influencing the financial stability of Jordanian insurance companies.

In order to investigate the Jordanian financial sector's financial stability during digital revolution, further the diversified financial services firms listed on Amman stock exchange are investigated through their z-score from 2011 to 2019. Table 3 reports the results for diversified financial services firms.

	Σ ASSETS	Σ EQUITY	Σ ROA	Σ sig.ROA	Z-Score
2011	7.98E+08	5.14E+08	-49.9	5.69	-8.66
2012	8.86E+08	5.46E+08	1345.699	254.07	5.30
2013	8.82E+08	5.45E+08	44.589	21.79	2.07
2014	8.51E+08	5.2E+08	-3044.66	579.76	-5.25
2015	8.7E+08	5.18E+08	12.43	3.83	3.40
2016	1.01E+09	5.3E+08	-32.63	5.61	-5.72
2017	1.23E+09	5.21E+08	-38.34	3.70	-10.25
2018	1.37E+09	4.97E+08	-20.58	9.20	-2.20
2019	1.59E+09	4.71E+08	-36.09	6.59	-5.43

There are 29 Jordanian companies listed on Amman stock exchange providing diversified financial services in Jordan, hence capturing a significant part of the financial sector of Jordan. So the financial stability of these firms is also investigated through their z-score to explore the impact of block chain technology on this part of financial sector in Jordan. Table 3 reports the results indicating huge fluctuations in all the aggregates and the z-score of these firms. The z-score for these financial services firms is showing negative sign indicating that the financial stability of these firms is already in a darker zone even more than the insurance companies in Jordan. The z-score, although showing negative sign, but seems to be improved from 2017 to 2018 indicating a less negative value during 2018, which again declined to a more negative value in 2019, hence like insurance companies, these companies also show a negative trend of financial stability during the post-adoption duration of the block chain technology. Further the results are indicated by the following graph:



**FIGURE 3
THE Z-SCORE OF JORDANIAN DIVERSIFIED FINANCIAL SERVICE COMPANIES
2011 TO 2019**

The graph further verifies the results indicated in table 3 showing huge fluctuations in the z-score of diversified financial services firms in Jordan.

Hence, the findings of current study indicate that till now, the adoption of block chain technology by the financial sector of Jordan has not indicated any positive signs for the Jordanian banks, insurance companies, and diversified financial services companies. The findings of study indicate that Jordanian financial sector has not been benefitted by the adoption of block chain technology rather the financial stability of most of the firms in financial sector is on stake.

A big limitation of the current study is the unavailability of data for firm under study for the year of 2020 on Amman stock exchange official website, so a very short term look of the impact of block chain technology has been witnessed through current research, which is the immediate after effect of the adoption of such unique technology.

CONCLUSION

Technological advancements, digital transformations and adoptions have become a common trend in financial sector across globe and Jordan is no exception. Current research aimed at investigating the impact of digital revolution i.e. mainly focusing on the adoption of block chain technology by the financial sector of Jordan on the financial stability of this sector. The financial stability of sectors under study is investigated by calculating their z-score and making a comparison in the change of z-score before and after adoption of the block chain technology in Jordan. It is found that all the tree sectors i.e. Jordanian banks, insurance companies and diversified financial services companies indicated declining z-scores during 2019 which is the year of block chain adoption in Jordan. Although the study indicates a very short term view of the impact of such digital transformation which may have different affects with the passing years. But currently it is not indicating any positive impact on the financial stability of the financial sector in Jordan. Hence, the study suggest that Jordanian financial sector first must understand the different aspects of such unique digital transformations, their pros, cons and their effective implementation should be understood first. Moreover, there is need to win the clients' trust towards such transformations and making them aware of the benefits of novel digital revaluations so that the financial stability of the financial sector could be enhanced.

REFERENCES

- Alghusain, N.S., Alsmadi, A.A., & AlQirem, R. (2018). The impact of e-banking services on profitability: The case of Jordanian commercial bank. *CEA Journal of Economics*, 1, 31-39.
- Ali, M.S. (2020). Evaluating the effectiveness of bird-in-hand dividends policy in the stability of Jordanian listed banks. *International Journal of Financial Research*, 11(4), 96-110.
- Alshubiri, F.N. (2017). Determinants of financial stability: An empirical study of commercial banks listed in Muscat Security Market. *Journal of Business and Retail Management Research*, 11(4), 192-200.
- Chang, V., Baudier, P., Zhang, H., Xu, Q., Zhang, J. & Arami, M. (2020). How block chain can impact financial services- The overview, challenges and recommendations from expert interviewees. *Change*, 158, 120166.
- Comert, H., Davino, C., Dymski, G., Kaltenbrunner, A., Petratou, E., &Shaban, M. (2016). *Too big to manage: Innovation and instability from regulated finance to the mega banking era*. Cambridge Political Economy Society, Working Paper 6/06.
- Daniel, R. (2019). *How block chain technology is distributing aid to Jordan*. Social Protection .org.
- Fanning, K., & Centers, D.P. (2016). Block chain and its coming impact on Financial services. *The Journal of Corporate Accounting & Finance*, 27(5), 53-57.
- Halaiah, E., &Ghannam, M. (2020). *A storm to transform; An outlook of digital transformation of financial institutions in Jordan*. Jordan Payments and Clearing Company (JoPACC), Amman, Jordan.
- Hall, M. (2019). *Arab Jordan Investment Bank in Production with Oracle Blockchain. Block Chain use cases*. Oracle.com

- Ito, J., Narula, N., & Ali, R. (2017). *The block chain will do to the financial system what the internet did to media*. Harvard Business Review.
- Litvishko, O., Beketova, K., Akimova, B., Azhmukhamedova, A., & Islyam, G. (2020). Impact of the digital economy on the banking sector. *E3S Web of Conferences*, 159(04033), 1-10.
- Magnier, V., & Barban, P. (2018). The potential impact of block chains on corporate governance: A survey on shareholders' rights in the digital era. *Journal for the International and European Law, Economics and Market Integration*, 5(2), 189-226.
- Newman, D. (2019). *Top 7 digital transformation trends in financial services for 2019*. Forbes.
- Siam, A.Z. (2006). Role of electronic banking services on the profits of Jordanian Banks. *American Journal of Applied Sciences*, 3(9), 1999-2004.
- The World Bank. (2021). *Bank z-score*. Data Catalog.
- Treleven, P., Brown, G.R., & Yang, D. (2017). Block chain technology in finance. *Computer*, 50(9), 14-17.
- Valverde, S.C. (2017). The impact of digitalization on Banking and Financial Stability. *Journal of Financial Management, Markets and Institutions*, 5(1), 133-140.
- Verdier, M., & Mariotto, R. (2015). Innovation and competition in retail banking. *Communications and Strategies*, 98, 129-145.
- Weking, J., Mandalenakis, M., Hein, A., Hermes, S., Bohm, M., & Krcmar, H. (2020). The impact of block chain technology on business models- a taxonomy and archetypal patterns. *Electronic Markets*, 30, 285-305.
- Xu, M., Chen, X., & Kou, G. (2019). A systematic review of block chain. *Financial Innovation*, 5(27), 1-14.