Enhancing cyber governance in Islamic banks: The influence of artificial intelligence and the moderating effect of Covid-19 pandemic

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C H R O N I C L E	A B S T R A C T
	The aim of this study was to examine how the implications of the Covid-19 pandemic moderate the impact of Artificial Intelligence (AI) on the effective application of Cyber Governance (CG) in Islamic banks. A total of 93 questionnaires from branch heads of Islamic banks were used in this study, and the data were analyzed using the Statistical Package for Social Sciences (SPSS) through descriptive-analytical methods. The findings indicated that AI has a significant influence on the effective application of CG in Islamic banks. The study also revealed that the Covid-19 Pandemic positively moderates the influence of AI on the effective application of CG in Islamic banks. The results of this study have implications for regulators and decision-makers in proposing new legislation to effectively apply CG in the Islamic banking sector, which can help protect public funds and limit cyber-attacks. This study is the first to investigate the moderating effect of the Covid-19 pandemic on the influence of AI on the effective application of CG in Islamic banks.

1. Introduction

An effective and integrated accounting system that incorporates modern computing technologies is crucial for establishing a good corporate governance system in both companies and banks (Ashraf, 2022; Awwad & El Khoury, 2021; Idris, & Mohamad, 2016; Melaku, 2023; Lutfi et al., 2023a). To make progress and improve performance, it is essential to utilize technology and innovation (Hartmann, Carmenate, 2021). Information Technology (IT) transformation, rapid advancements in science (Idris, & Mohamad, 2017; Khassawneh, 2014), and the complexities of the business environment are important to change factors that have resulted in new business models, leading to increased competition at local and global levels (Ionescu, 2019; Mohammad et al., 2018). Thus, the accounting profession cannot remain isolated from these developments (Al-Qudah et al., 2022; Lutfi, & Alqudah, 2023). Failure to consider these advancements would result in diminishing the importance of the accounting profession and render it unable to meet the needs and aspirations of modern developments (Haenlein & Kaplan, 2019; Saraiva, & Vieira, 2023). The accounting profession must be aware of these changes, as they will restructure the

economic units it serves (Alshirah et al., 2021a; Haapamäki, Sihvonen, 2019; Lutfi et al., 2022a). Consequently, the accounting profession has adapted by keeping pace with these advancements and utilizing them through the introduction of the AI model (Faccia et al., 2019; Damerji & Salimi, 2021).

The rapid advancement of AI is contributing to our understanding of human intelligence by developing computer programs that can simulate intelligent human behavior (Almaiah et al., 2022a; Alrfai etal., 2023; Kokina & Davenport, 2021; Qasaimeh, & Jaradeh, 2022). These programs are capable of electronically processing operations and providing internal and external users with quick access to financial data and information to support decision-making (Almaiah et al., 2022b; Alqudah, Lutfi et al., 2023; Lutfi et al., 2022b). Currently, the most significant trend in information and communication technology is the strategic use of expert systems, neural networks, genetic algorithms, and intelligent agents (Al-Tahat, & Moneim, 2020; Lutfi et al., 2022c; Qasaimeh et al., 2022; Nasim, Ali, & Kulsoom, 2022). Information systems are now an integral component of management in companies and banks and are a fundamental resource for activating administrative and financial processes, supporting decision-making, and improving overall performance quality (Liaropoulos, 2016; Alshirah et al., 2021b; Al-Sakka and Rashid, 2012; Marei, 2022).

The significant development in the banking industry has created opportunities for banks to improve their level of customer service by introducing innovative channels beyond the traditional means of providing banking services (Kaur et al., 2020). As a result, there has been a significant shift in the banking sector's operations. The provision of banking services through electronic transactions has saved time, money, and effort through these new channels, while also increasing security and protection risks (Anu, 2021). If effective systems are not utilized, it can disrupt financial services (Kuzmenko, Kubálek, Bozhenko, Kushneryov, & Vida, 2021), and cyber-attacks pose a threat to the entire financial system, resulting in huge losses (Kitsios et al., 2021; Janvrin, & Wang, 2022). Therefore, the need for Cyber Governance (CG) and a cyber security strategy has emerged, and each financial institution must develop its own strategy based on principles-based risk management practices (Apruzzese et al., 2018; Del Giorgio Solfa, 2022; Dube et al., 2022; Razzaq et al., 2013; Suresh et al., 2022; Savaş & Karataş, 2022). Supervisory authorities review these strategies as part of their assessment of comprehensive risk management practices in banks (Kuzmenko, Kubálek, Bozhenko, Kushneryov, & Vida, 2021; Walton, Wheeler, Zhang, & Zhao, 2021).

However, most of the previous studies have dealt with commercial banks, while Islamic banks have been neglected despite their importance in the context of Arab societies, such as Jordan as an Islamic country (more than 90% of the people are Muslims) (Qatawneh & Bader, 2020; Mutamimah & Saputrim, 2023). Therefore, this study seeks to proactively address such a distinguished and pioneering topic (i.e., artificial intelligence and cyber governance) in the banking sector and apply it in the Islamic banks in Jordan.

AI is a highly significant topic that can bring about significant changes in the performance of the accounting and governance profession (Kokina & Davenport, 2021; Rabbani et al., 2023). The CG field provides a fertile environment for applying AI in its various forms, such as expert systems, neural networks, genetic algorithms, and smart agents, given the advancements in IT (Wilkin, & Chenhall, 2020). The accounting profession faces significant challenges due to scientific and technological developments (Al-Qudah et al., 2022), including the emergence of AI technology. Jordanian Islamic banks are struggling to establish an accounting system that keeps pace with these new technologies, as it requires ready-made programs, skilled accountants to operate these programs, and ongoing training, updating, and maintenance of the programs (Qatawneh & Bader, 2020; Marei et al., 2023). Additionally, providing the necessary storage devices and materials for these programs is often costly and risky (Kitsios et al., 2021; Zaitoun & Alqudah, 2020). Furthermore, these banks are having difficulty understanding the true impact of AI on the effective application of CG, as well as the impact of the Covid-19 pandemic on the relationship between AI and the effective application of CG in Jordanian Islamic banks (Zakarneh et al., 2022).

However, the significance of the present study arises from the originality of the topic of AI and the effective application of CG in light of the implications of the Covid-19 Pandemic in Jordan. The idea of the present study was reached due to the benefits delivered by adopting in different areas, which promotes access to financial/non-financial data or information from anywhere and at any time and helps it to readily keep pace with developments and updates in international standards (Zakarneh et al., 2022). Besides, CG is linked to the basic elements and principles of governance, which are transparency, justice, accountability, and combating corruption (Mutamimah & Saputrim, 2023; Al-Bar & Al-Marhabi, 2018; Suresh et al., 2022). The COVID-19 pandemic has inevitably impacted the world in terms of economic fallout and business disruption (Saad et al., 2022). The risks arising from COVID-19 resemble that of the 2008 global crisis in deterring economic performance and organizational sustainability. Since that time the world has been directed to online works and the need to use 's applications has increased, meanwhile those applications required CG to organize and protect their activities (Apruzzese et al., 2018; Dube et al., 2022).

The Islamic banks are confronted with multiple intricacies, such as novel IT adoption given the competitive business environment (Al-Fakeh et al., 2020). Particularly, the Jordanian Islamic banks, in this study, require improved IT implementation to manage technological complexities and improve competitive positions (Qatawneh & Bader, 2020; Lutfi et al., 2022d). Thus, the need of using AI has been raised to enhance the IT usage among Jordanian banks, especially, during and after the implications of the Covid-19 Pandemic. Hence, it is deemed essential for both practitioners and scholars to acknowledge how

AI can create organizational values and impacts to the application of cyber governance and knowing impacts of the implications of the Covid-19 Pandemic in such a domain.

The current study addresses this empirical concern by recommending a framework that addresses AI's applications (i.e., expert systems, neural networks, genetic algorithms, smart agents) and CG with the implications of the Covid-19 Pandemic as a moderator variable. This perspective based on the following objectives: (1) to examine the influence of AI's applications (i.e., expert systems, neural networks, genetic algorithms, smart agents) on the effective application of CG in Jordanian banks; (2) to examine the influence of AI's applications on the effective application of CG in Jordanian banks in light of the implications of the Covid-19 Pandemic as a moderator variable.

2. Literature Review

Islamic banks operate on the principles of Islamic finance, which are based on Islamic law or Shariah. One of the key principles of Islamic finance is the prohibition of interest (Riba) and other unethical financial practices (Jarah et al., 2022; Marei et al., 2022). Instead of charging interest on loans, Islamic banks provide financing through profit-sharing arrangements or partnerships (Al-Fakeh et al., 2020; Mustafa et al., 2023). For example, in a Mudarabah partnership, the bank provides the capital, and the entrepreneur provides the labor, and profits are shared according to an agreed-upon ratio (Qatawneh & Bader, 2020). In a Musharakah partnership, both the bank and the entrepreneur contribute capital, and profits and losses are shared according to their respective contributions.

Islamic banks also offer other financial products and services, such as deposits, trade financing, and investment products, that comply with Shariah principles. For example, instead of offering traditional interest-bearing savings accounts, Islamic banks offer profit-sharing accounts, where depositors share in the bank's profits and losses (Kaur et al., 2020; Al-Fakeh et al., 2020). In addition to financial products and services, Islamic banks also prioritize social responsibility and ethical investing (Jarah et al., 2022). They avoid investments in industries that are prohibited under Islamic law, such as alcohol, gambling, and pork products, and may also engage in charitable activities to benefit the community (Qatawneh & Bader, 2020).

Islamic banks have been playing an important role in the Jordanian economy in recent years. Here are some reasons why: Meeting the Needs of Muslim Consumers: Jordan has a large Muslim population, and many of these consumers prefer financial products and services that comply with Shariah principles (Al-Fakeh et al., 2020). Islamic banks in Jordan provide these consumers with an alternative to traditional banks that offer interest-based products (Jarah et al., 2022). Boosting Financial Inclusion: Islamic banks in Jordan have been instrumental in increasing financial inclusion. They have introduced innovative products and services, such as microfinance and takaful (Islamic insurance), that cater to low-income and underserved segments of the population (Qatawneh & Bader, 2020). Contributing to Economic Growth: Islamic banks in Jordan have contributed to the country's economic growth by providing financing for small and medium-sized enterprises (SMEs) and infrastructure projects. This has helped create jobs and stimulate economic activity. Overall, Islamic banks in Jordan have been a positive force in the country's economy, promoting financial inclusion, ethical finance, and economic growth (Jarah et al., 2022).

Given the importance of Islamic banks in developing the financial economy in any country, the current study seeks to address the Jordanian Islamic banks as a study society in investigating the impact of AI on CG and in light of the implications of the Corona pandemic.

3. Hypotheses Development and Research Model

3.1 The influence of AI on the effective application of cyber governance

Any work that a person does or intends to do must have goals that he seeks to achieve, and in the field of AI, those goals are to make devices smarter, understand what intelligence is and make devices more useful (Al-Lawzi, 2012). The main goal of AI works to transfer information, knowledge, skills, experiences and creative capabilities from humans to computers, in order to keep pace with advanced technology, which contributes to showing the true value of banks to achieve competitive superiority at various local and global levels (Raisch & Krakowski, 2021).

The applications of AI in various levels and systems have become widely used in all economic and accounting branches, where AI has become one of the important and supportive tools and assistance in making economic decisions (Kokina & Davenport, 2017). AI has been used in the process of forecasting stock market markets due to its ability to absorb a large amount of data (Ionescu, 2019). Financial and processing it in smart ways and then providing quick and correct reports, which makes it highly efficient in the field of economics and accounting. It also has the ability to build systems to help in decision-making, in addition to that it maintains a large amount of financial data and subsequent experiences to use it in similar cases (Norwahida & Shukeri, 2014; Haenlein & Kaplan, 2019).

Also, applications of AI such as artificial neural networks are characterized by the ability to predict the behavior of a large number of variables at one time, which calls for their use in several areas such as analyzing the risks of granting loans in banks

by studying several criteria and files for selection within seconds (Mohammad et al., 2018; Qasaimeh et al., 2022). In addition to the possibility of changing criteria to obtain quick results, in addition to forecasting sales, it has also been used in the process of retrieving lost data by modelling previous and subsequent data to predict its value. Genetic algorithms are used in all areas of financial and banking business and in investment applications as well. It is also used to solve the problems of logistical operations and control the movement of materials (Habib & Najat, 2018; Qasaimeh et al., 2022). Whereas expert systems can carry out tasks as humans do, expert systems provide rare human knowledge and experiences and save them (Qasaimeh et al., 2022). Finally, expert systems can identify appropriate solutions to problems and draw appropriate results for decision-making. Finally, the smart agent can be tasked with reading e-mails or sorting sales agents' reports and, for example, searching for the cheapest airline ticket or the best sales deal executed during the last period by the company's branches (Ionescu, 2019; Damerji & Salimi, 2021).

No bank can ignore AI in the era of increasing competitiveness, and among the possible uses of IA in the field of services in banks is: 1) combating money laundering: so it has become necessary to rely mainly on IA in banks all over the world because it is characterized by accuracy and strength. Intelligence in combating money laundering, and these innovative systems have been adopted so that banks can become more accurate and faster with continuous improvements and innovations in the field of AI. (Mangani, 2017). 2) Detection of fraud and fraud: The intervention of AI led to the provision of accurate and credible results and great support in detecting fraud, which is one of the audit fields (Bozkus Kahyaoglu, Caliyurt, 2018). 3) Automation of automated processes are those processes that operate automatically or without Human intervention. 4) chatbots: are applications that are used by banks to act as customer service.

Despite what has provided of distinguished and new products, services and innovations within Islamic banks, Islamic banks are always working to protect their business, interests, and local and global economic activities in line with the growth and continuous development in ITs and its legal requirements, and this is done through the enforcement of provisions the law, directives, and instructions issued by the relevant authorities or the relationship, which aim to protect their infrastructure (Savaş, & Karataş, 2022). This matter requires Jordanian Islamic banks that use information and communication technology and deal with information and financial or personal data. In light of the progress and development in IT, the dependence of Jordanian Islamic banks, investors, and customers on the Internet has increased dramatically, as they are conducting their transactions through the network, and this is very dangerous (Central Bank of Jordan, 2018), which exposes them to harm due to cyber-attacks (Cuihong, 2018); Where many banks in the world are exposed to these attacks, especially the banking sector, and there are many banks that have been subjected to cyber-attacks and attempts to access systems and steal data and money, and this is what exposed them to losses estimated at millions, so it is necessary to know the concept of cyber governance, and the importance of cyber security for Islamic banks (Calandro, & Berglund, 2019). The main objectives of cyber governance, as well as factors for the success of CG in banks, and the real conditions for CG in Islamic banks (Soni, 2019; Sharma et al., 2020).

CG directs, guides, monitors and improves actions and decisions in banks to raise efficiency and facilitate coordination of efforts between relevant institutions in a manner commensurate with the orientations and aspirations of stakeholders in the institution, meaning that it is the exercise of economic, political and administrative authority to manage state affairs at all levels through the use of technology Information and communication to increase access to government services and disseminate them through the network to benefit individuals, private business owners, and workers (Al-Hamila, 2016; Frizzo-Barker, Chow-White, Adams, Mentanko, Ha, & Green, 2019)

In the context of the current study the CG in the Jordanian Islamic banks is affected by the applications of the AI. There are many characteristics and advantages of AI that may support CG in the banks (Soni, 2019; Sharma et al., 2020). Qasaimeh, Al-Gasaymeh, Kaddumi and Kilani, (2022) and Al-Lawzi (2012) mentioned that one of the characteristics of AI is that it helps in solving problems existing due to the absence of complete information. It helps to think, comprehend, and the capability to obtain and use knowledge. Also, the ability to learn from previous experiences and employ them in new situations. has the ability to respond quickly to new situations and conditions and to deal with difficult and complex cases (Hashem & Alqatamin, 2021). Among the characteristics of AI is the ability to distinguish the relative importance of the elements of the presented cases, and the ability to visualize, create, understand and perceive visual matters. Finally, the ability to provide information to support administrative decisions. Therefore, AISs are greatly affected by the use of AI applications. This leads to the following hypothesis :

H_1: The Cybersecurity governance in the Jordanian Islamic banks affected positively by using AI application.

3.2 The Moderating Influence of the Covid-19 Pandemic's implications

The Covid-19 pandemic has certainly had significant implications on many aspects of our lives (Alsyouf et al., 2021; Alsyouf et al., 2022a; Saad et al., 2022), including the application of CG and the role of AI in this process. On the one hand, the pandemic has highlighted the importance of cybersecurity (Agbodoh-Falschau, & Ravaonorohanta, 2023; Berkman, Jona, Lee, Soderstrom, 2018), as many people have shifted to remote work and online communication, making them more vulnerable to cyber-attacks (Lutfi et al., 2022e; Zakarneh et al., 2022). This has led to an increased focus on CG and the need for effective measures to prevent and respond to cyber threats (Apruzzese et al., 2018).

Furthermore, The Covid-19 pandemic has had a significant impact on the banking sector, including the way in which AI is applied to cyber governance (Zakarneh et al., 2022). The pandemic has led to an acceleration of digital transformation in the banking sector, with many customers turning to online banking and other digital services (Qushtom et al., 2023). This has increased the need for effective CG measures to ensure the security and integrity of banking systems and customer data. Another challenge is that the pandemic has created a difficult economic environment, with many banks facing financial constraints and the need to reduce costs. This can impact the resources available for investing in new AI-based solutions for cyber governance. Despite these challenges, AI remains an important tool for effective CG in the banking sector (Damerji & Salimi, 2021). AI can be used to detect and respond to cyber threats in real time and can help to identify patterns and trends in cyber-attacks that can be used to improve overall cybersecurity strategies (Cram, Wang, & Yuan, 2023; Mishra, Alzoubi, Anwar, & Gill, 2022).

This study proposed that the Covid-19 pandemic moderate the influence of AI on the effective application of CG. The continuous and accelerating technological developments that took place in the Islamic banking fields, the large size of their activities, led to the production of huge amounts of various data and information (Soni, 2019; Sharma et al., 2020). At the same time, Islamic banks have taken advantage of AI to support and enhance the services they provide to their customers. Hence the need for an effective application of CG system to protect the financial operations and Islamic activities of those banks has appeared (Alhayani et al., 2021; Soni, 2019; Sharma et al., 2020). Additionally, the pandemic has led to changes in the way organizations operate, with many relying more heavily on technology and digital systems (Mijwil, Ali, & Sadıkoğlu, 2023). This can create new challenges for the application of AI in cyber governance, as these systems may be more complex and dynamic than traditional systems.

Therefore, this study proposed that the Covid-19 pandemic's implications could moderate the influence of AI on the effective application of cyber governance. That is, applying AI (i.e., expert systems, neural networks, genetic algorithms, intelligent agents) will increase the effective application of CG among Jordanian Islamic banks, while different levels of Covid-19 pandemic's implications may affect the effective application of CG positively or negatively. This leads to the following hypothesis:

H_2: *Covid-19 pandemic's implications moderates the effect of AI on the effective application of CG in Jordanian Islamic banks.*

4. Research Model

The research model of the present study encompasses three latent variables, namely: i.e., AI (independent variable), effective application of CG (dependent variable), and Covid-19 pandemic's implications (moderator variable).
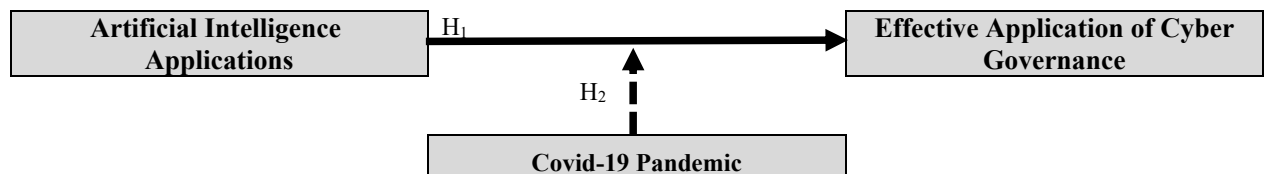
Artificial Intelligence Applications	H_1 ⟶	**Effective Application of Cyber Governance**

H_2

Covid-19 Pandemic

Fig. 1. Research model

5. Research Methodology

The current study aims to identify the impact of AI on the effective application of CG in Jordanian Islamic banks and to know the moderating influence of the Covid-19 Pandemic's implications on the relationship between these two variables. The study population consists of all Jordanian Islamic banks (i.e., Islamic Arab Bank – 48 branches, Jordan Islamic Bank – 111 branches, and Safwa Islamic Bank – 38 branches), which are (197) branches. The electronic questionnaires were distributed to 197 of branch managers in the Jordanian Islamic banks. 93 usable and valid questionnaires were received from respondents.

The questionnaire was used as a main tool for collecting information about the study sample and obtaining data that express their perspective about the variables in the study context, to comprehend and explain the association between respective variables.

5.1 Reliability and Validity

Only a well-designed, well-organized, and dependable research instrument assures the validity of the study findings (Alsyouf et al., 2022b). Many dependability tests are introduced by specialists for this reason. The researcher performed a reliability analysis known as the "Cronbach Alpha Test" for this purpose, which authenticates the research instrument if the Cronbach Alpha value is larger than 0.07 (Sekaran and Bougie, 2016). This test is introduced primarily to assess the dependability of the research tool, which further assures the authenticity of the research instrument and results. As a result, the reliability

analysis of the research instrument used in this study found that it is adequately reliable, that is, found that the result of Cronbach Alpha values for all studied variables is more than 0.07.

Further, the validity test aims to verify the integrity of the linguistic formulation of the study tool, the clarity of its meanings, the interdependence of its paragraphs, its objectivity, and its affiliation with the dimensions it expresses, in a way that guarantees the achievement of the objectives of the study. The arbitrators are those with experience and competence who are most capable of issuing a judgment on the validity of the content of the study tool, and for this reason, the questionnaire was presented to a group of faculty members specialized in the subject of the study in some Jordanian and Arab universities.

5.2 *Data analysis and Results*

The "Statistical Package for Social Sciences (SPSS 25)" was used for the data analysis of this study. Descriptive statistics, simple linear regression and hierarchical regression tests were conducted by using SPSS.

For demographic profile of respondents, four questions were directed to demographic data as age, education level, years of experience and job title.

Table 1
Profiles of Respondents

	Category	**Frequency**	**Percentage (%)**
Age	21-30	0	0
	31-40	3	3
	41-50	65	70
	51-60	16	17
	<60	9	10
	Total	93	100
Education Level	Bachelor	64	69
	Master	22	24
	PhD	7	7
	Total	93	100
Experience	2-4	0	0
	5-7	9	10
	8-10	72	77
	<10	12	13
	Total	93	100

As shown in Table 1, the prevalence of the respondents were within the age group of approximately 41-50 years (70%), and the vast majority of the participants had a bachelor's degree (69%) while 24% of them had a master's degree. Most of the respondents had at least 8 years of working experience (90%). Consequently, the demographic data of the respondents revealed that they had acceptable knowledge and experience to participate in the survey and deliver trustworthy data for this study.

For descriptive statistics, as shown in Table 2 the mean scores of the variables were upper mid-point on the one to five-scales. We classify the five-point scale into three classifications: low, medium, and high scales. Scores smaller than 2.33 are considered low; scores higher than 3.67 are considered high; while scores between 2.33 and 3.67 are considered moderate (Hair, Hult, Ringle & Sarstedt, 2016).

Table 2
Descriptive statistics

	Constructs	Items	Mean	Rank	Level
1.	Artificial Intelligence (AI)	22	4.03	1	High
2.	Effective Application of Cyber Governance	7	3.94	2	High
3.	Covid-19 Pandemic's Implications	8	3.48	3	Moderate

As shown in Table 2 the mean for the study variables ranged between 3.48 and 4.03. That means all study variables have a very good mean level. More precisely, the result demonstrates that from the perspective of the branch managers in Jordanian Islamic banks, there is a high level of AI's applications, a high level of the effective application of cyber governance, and there is a Moderate level of Covid-19 pandemic's implications in Jordanian Islamic banks.

For the Simple Linear regression test, Table 3 depicted the simple regression coefficients of the AI's applications as an independent variable to the effective application of CG as a dependent variable.

Table 4
Multiple Linear Regression Analysis

Constructs	t-value	Sig.	Result of Hypothesis
AI's applications	6.218	0.000	Accepted
Dependent variable: the effective application of cyber governance			
R^2= 0.386			

It is apparent from Table 3 that AI's applications have a significant and positive influence on the effective application of cyber governance, where the p-value was equal to 0.000 which is less than 0.05, T-value = 6.218. That means using the AI's applications in the Jordanian Islamic banks will lead to an increase of effective application of cyber governance. Further, the result shows that R^2= 0.386, this indicates that the AI's applications explained (38.6%) the change in the effective application of CG and that its value (61.4%) is attributed to other factors. Accordingly, the first hypothesis is accepted, which states that: the Cybersecurity governance in the Jordanian Islamic banks affected positively by using AI application.

For the Hierarchical Regression test, Table 4 shows the hierarchical regression result of the second hypothesis which proposed that: Covid-19 pandemic's implications moderates the influence of AI's application on the effective application of CG in the Jordanian Islamic banks.

Table 4
Results of the hierarchical regression analysis

Exogenous variables	Endogenous variables	First Model			Second Model		
		Path coefficient	T-value	Sig.	Path coefficient	T-value	Sig.
effective application of cyber governance	AI's application	0.346	6.218	0.000	0.283	4.982	0.000
	Covid-19 pandemic's implications				0.169	2.823	0.001
	R^2		0.386			0.446	
	ΔR^2		0.386			2.16	
	ΔF		54.156			77.672	
	Sig ΔF		0.000			0.000	

The results from Table 4 show that the hierarchical regression is based on two models. The first model measures the impact of AI's applications on the effective application of CG in Jordanian Islamic banks. The results indicate that AI's applications have a statistically significant influence on the effective application of CG. Specifically, the value of (ΔF = 54.156) was observed, which is significant at a level of (Sig ΔF = 0.000), indicating a significance level of less than 0.05. Additionally, the coefficient of R2, which equaled (0.386), suggests that (38.6%) of the variation in the effective application of CG can be explained by AI's applications.

In the second model, the moderator variable (Covid-19 pandemic's implications) was added to the regression model, as the value of the coefficient R^2 increased by (6%), which is statistically significant, as the value of ΔF reached (77.672) at a significant level (Sig ΔF = 0.000), which is less than 0.05, and at a significant level (Sig-T = 0.000). This indicates the difference in the moral influence of AI's applications on the effective application of CG due to the difference in the Covid-19 pandemic's implications. Accordingly, the second hypothesis is accepted, which states that: Covid-19 pandemic's implications moderates the influence of AI on the effective application of CG in Jordanian Islamic banks.

6. Conclusion

In this study, the moderating influence of Covid-19 pandemic's implications on the relationship between AI's applications and the effective application of CG in Jordanian Islamic banks was analyzed. The current study extended the literature related to the effective application of CG by employing AI's applications as an antecedent factor to the cyber governance, and also by using Covid-19 pandemic's implications as a moderator variable among these factors. The present study's results support theoretically and empirically the relationship between AI's applications and the effective application of CG in Jordanian Islamic banks, and the role of Covid-19 pandemic's implications as a moderator variable in such a suggested model. Figure 2 summarises the SPSS analysis findings of the study model.
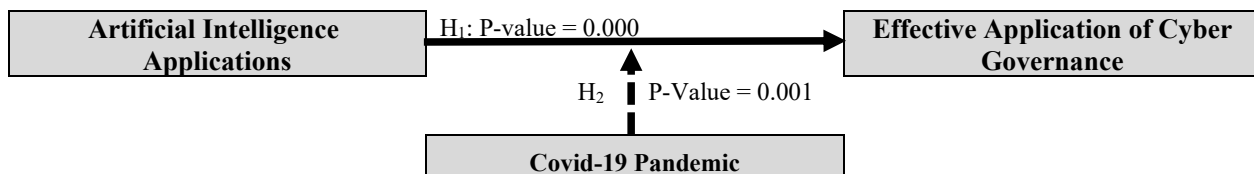

Fig. 2. Research results

The results of the current research indicate a significant positive influence of IA applications on the effective application of CG (with a value of p = 0.000), which is agreeable with the earlier literature in the field despite its scarcity (e.g., Soni, 2019; Sharma et al., 2020). In this vein, it is recommended that Islamic banks should convince adopters of IA's applications to assist in enhancing the effective application of cyber governance. In an effort to increase the adoption of IA's applications among Islamic banks, also recommended overcoming concerns about cyber-attacks through the effective application of cyber security. This, in turn, may influence users' decisions about CG adoption.

The results also show that the influence of IA's applications on the effective application of CG in Jordanian Islamic banks is moderated positively by the Covid-19 pandemic's implications. More precisely, the result confirmed that with a high level of Covid-19 pandemic's implications will increase the influence of IA's applications on effective application of cyber governance.

7. Implications

Some special practical and theoretical implications are shown in the present study. Theoretically, there are very few studies that have addressed the applications of AI in the Islamic banks. this study strongly supported the adoption of AI's applications in promoting effective application of CG among Islamic banks. Further, in prior studies on cyber governance, scholars have given attention to the factors affecting effective CG among commercial banks, rather than examining the influence of AI applications that could facilitate the effective application of CG among Islamic banks. Besides, studying COVID-19 pandemic implications as a moderator factor between respective factors in the Jordanian Islamic banks is a fascinating study that can create insights into diverse countries alike, especially developing countries.

The practical implications of using AI applications and effective application of CG among Jordanian Islamic banks are numerous and can lead to several benefits especially in light of the COVID-19 pandemic implications, including: 1) AI-powered tools can detect and respond to potential cyber threats, such as malware, phishing, and hacking attacks, minimizing the risk of cyber-attacks. 2) Effective CG practices can help Islamic banks to identify and manage cyber risks, including data breaches, system failures, and cyber-attacks. 3) Effective CG practices can help Islamic banks to identify and manage cyber risks, including data breaches, system failures, and cyber-attacks. 4) Effective CG practices can help Islamic banks to comply with regulatory requirements related to cybersecurity, such as data protection laws and regulations. 5) Effective CG practices can help Islamic banks to establish and maintain customer trust by ensuring the security and confidentiality of customer data. 6) AI-powered tools can automate manual and repetitive tasks related to cybersecurity, reducing the time and cost of operations while also minimizing the risk of human error. 7) By adopting AI applications and effective CG practices, Islamic banks can gain a competitive advantage in their industry by improving efficiency, reducing costs, and providing better customer service. Overall, the practical implications of using AI and effective CG in the Jordanian Islamic banking are significant and can lead to improved cybersecurity, better risk management, and increased customer trust. However, it's important to ensure that these applications are developed and used ethically and responsibly, and in compliance with regulatory requirements and Islamic finance principles.

8. Limitations and Future Research

The current study has some limitations like any research. First, this study focused on the influence of all AI's applications together on effective application of CG among Islamic banks. Future research can use the applications of AI separately as factors and compare the different aspects to make additional contributions. Second, this study relies on data from Jordan. Future studies recommend drawing data from other countries to understand the effects of cultural differences on the research context. Third, the applications of AI are still new in Jordan, especially in the field of Islamic banks. Further research could examine the factors affecting adopting those applications. Fourth, the present study has addressed Jordanian Islamic banks as a study population. Future research could be conducted in other fields.

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