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Effect of blockchain technology in innovating accountants' skills: a multimethodology study in the industrial companies listed on the Amman Stock Exchange

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Abstract

This study aimed at analyzing the effect of blockchain technology in innovating accountants' skills as a multimethodology study in the industrial companies listed on the Amman Stock Exchange. For achieving this goal, the researchers adopted the multimethodology approach using mixed methods between quantitative and qualitative research methodologies by conducting interviews with accountants, auditors, and financial managers forming a study sample of 50 individuals. Results show that the highest remarkable indication concerning the phenomenon of analyzing the effect of Blockchain technology in innovating accountants' skills is (*Increasing performance efficiency*) as an emerging theme. Then followed by (*Blockchain technology will work on innovating accountants' skills*) as the second emerging theme. And then followed by (*Enhancing accountants' skills*) as the third emerging theme. And these results reflect the convictions and expectations of the study sample of accountants, auditors, and financial managers that the impact of implementing blockchain technology will innovate accountants' skills.

Keywords: Blockchain technology, Accountants' skills, Innovation, Multimethodology, Amman

Introduction

Accounting throughout history kept pace with the level of modernity in each era; traditional accounting which relied on document records and paper accounting books in processing financial operations was appropriate to what was the case in that era (Richardson, 2020). And with the emergence of the digital revolution, we witnessed mixed accounting processes that combine paper archiving with computerized processing; and then, the continuous development of the computer and its technical processing of the large volume of data requires higher capabilities to control the accounting data. And by later, we started hearing about electronic accounting, to witness the emergence of

multiple electronic accounting programs, which improved the level of quality and accuracy of accounting processes, and with higher speed of processing these data (Yoon, 2020).

A decade ago, the use of term cloud storage appears, followed by the concept of cloud accounting, which Ping and Xuefeng defined as the use of cloud computing on the Internet to build a virtual accounting information system, which means that cloud accounting is a mixture of cloud computing and accounting (Ping & Xuefeng, 2011).

The wheel of progress and modernity does not end, in 2008, Satoshi Nakamoto published a paper entitled "*Bitcoin: A peer-to-peer electronic cash system*" emphasizing that the basis on which Bitcoin is built is blockchain technology. And by that, represents a new technological revolution in the field of decentralized databases of a network of interconnected computers in different parts of the world (Yaga et al., 2019). Blockchain technology is characterized by great reliability, high credibility, and security, and Swan (2015) predicted that this technology would become the future boom of technology and global computing platform, and since the financial sector is the most dynamic in dealing with developments, the term of accounting based on Blockchain appeared.

Blockchain and accounting cannot be described as the future of the financial and commercial exchange process in the world, but rather they are the present in which we as Jordanian accountants must participate and be involved in its developments from this moment on.

Literature review

Blockchain technology is a new technological revolution that resembles the fundamental transformation of the face of the world after the emergence of the Internet, because of its many advantages that address part of the current challenges facing the business sector related to keeping records of transactions, processing, protecting and speeding up their completion, in addition to their auditing, verification, and efficiency that implements the level of transparency and integrity (Trade Finance Global, 2018).

Definitions of Blockchain are classified into three groups; the first group of researchers went to define the Blockchain from the angles of technology by explaining its components and describing its mechanism of action. Al-Ruhaili and Al-Sakhwi (2020) defined it as an information network that contains a group of devices, and each device represents a database and a ledger that preserves all transactions that take place within the network, and every transaction that takes place between two devices is subject to verification, and confirmation of its validity by the rest of the network devices. Vijai et al. (2019) shared the same direction by considering the Blockchain as a series of blocks that contain specific information (database), but in a secure way that unites with each other in a network (peer-to-peer), in other words, a Blockchain is a group of computers that are linked together; rather than a central server, but in a decentralized network.

The second group of researchers tended to link it more with cryptocurrencies, given the association of its appearance with the emergence of cryptocurrencies. Blockchain was defined in the Oxford Dictionary as a system that restricts operations carried out with Bitcoin and other cryptocurrencies and is kept across several computers connected in a peer-to-peer network. While the third group of researchers was affected in their definition by the science of accounting mixed with some technological concepts, so we find

in the definitions of accounting terms such as the general ledger, operations, contracts, intermediaries, verification, and disclosure. Swan (2015) defined it as a giant spreadsheet to record all assets, as well as an accounting system to deal on a global scale with all forms of assets by all global parties.

Kroon et al. (2021) have indicated the recent accounting literature focusing on emerging technologies' impacts on accountants' roles and skills. Specifically, it determines what emerging technologies are most studied concerning their impacts on accountants' roles and skills, which research strategies are used in the studies that focus on this theme, and the impacts of the identified emerging technologies on accountants' skills. It also investigates whether open innovation is an influencing factor in this connection. Also, Desplebin et al. (2021) have investigated the potential impact of blockchain technology on accounting systems and businesses, declaring that, Blockchain technology characteristics and operating modes have the potential to bring about innovations to the fields of accounting and auditing. Besides that, Zhang et al. (2020) have reviewed work in the area of the application of Artificial Intelligence (AI) in Accounting and Auditing by investigating a semi-systematic or narrative review approach employed in analyzing relevant published books and journals and faced with the challenges of disruptive technologies brought forth by the industry.

Blockchain characteristics

Modern financial blockchain systems can improve efficiency by engaging all stakeholders to create a banking ecosystem that gains mutual benefits in terms of real-time transfer of cash and assets to settle market transactions (Pradhan, 2018). And the characteristics of the blockchain have been summarized from the viewpoint of Sultan et al. (2018) in four basic characteristics:

1. **Unmodifiable**: Transaction records in the blockchain are permanent and immutable from the moment they are added and cannot be changed; this creates trust in the transaction history.
2. **Decentralization**: Blockchain is stored in a file that can be copied and accessed from any registry on the network.
3. **Transparency**: From the moment the file is opened in the chain, any party can access and audit, and this creates a reference to track the asset history.
4. **Efficiency**: Blockchain is more efficient in terms of cost, speed of settlement, and risk management.

Blockchain and accounting

There is no doubt that there are many advanced advantages that can be achieved by adopting Blockchain technology as a basis for accounting information systems. And according to Kwilinski (2019), they are in Table 1.

Blockchain is slowly making its way into accounting, and if fully embraced it is likely to change the concept of accounting forever. Here is a look at the implications of using blockchain technology in accounting:

Table 1 Advanced advantages of adopting Blockchain technology in accounting information systems

Field	Expected results
Administrative organization	- Rapid access to information makes decisions more efficient - Flexibility and response to changes in the internal and external environment - Providing users with complete, reliable, and unbiased information to maximize objectivity in their decisions
Economically	- Reduction in the cost of obtaining information, and a reduction in accounting bookkeeping expenses - Saving money resulting from reducing the number of accountants and saving the cost of accounting software
Professionally	- Activating technology control to ensure transparency and accounting efficiency - Provide reasonable assurance that the financial statements do not contain material misstatements - Expansion of the scope and functions of the use of financial information
Quality	- High quality in accounting, control, taxation, and regulations

- **For the blockchain, it will make the auditing unimportant**: Because the operations are stored in distributed ledgers, and accessible to all authorized persons, the good thing about this is that all restrictions are distributed and encrypted, and thus it is difficult to destroy or modify the stored data, and this will reduce the need for auditors, or even changes their role completely (Biliavska, 2019).
- **Blockchain-based real-time accounting system**: A software system that allows currency transactions, financial derivatives, and other digital documents between two or more peers, and stores transaction data in cryptographically protected blocks, thus ensuring the integrity of which is verified through the mining process.[1] This system enables the formation of financial statements at any time (Inghirami, 2020).
- **Accountants' skills**: Successful accountants will be those who work in evaluating the true economic interpretation of blockchain records, linking the record to economic reality, and evaluating (ICAEW, 2017).

Comparing traditional accounting with blockchain accounting

Traditional accounting is represented by the procedures, documents, and accounting books that are currently applied in most institutions and companies, whether they are computerized in the form of accounting programs, which is the most, or they are paper accounting books, which is the least. Blockchain accounting is an encrypted electronic accounting system based on blockchain technology, and it is an emerging system under continuous development and improvement. And according to Biliavska (2019), the most prominent differences between traditional accounting and blockchain accounting are represented in Table 2.

[1] Each block in the chain is independently verified via a consensus model which gives rules for verification blocks and usually uses a resource such as computing power to demonstrate that sufficient effort has been made. In Bitcoin, this process is called mining.

Table 2 Comparison between traditional accounting and blockchain accounting

Comparison concept	Traditional accounting	Blockchain accounting
System	Centrally process and maintain records of operations	Process and maintain transaction records in the (decentralized) distributed ledger
Accounting model	Double-entry accounting model	Triple-entry accounting model
Data entry and editing	The accountant enters the financial data into the system and adjusts it according to the client's needs	Once the operations are approved, the records do not accept modification or change
Data accessibility	Only accountants and auditors have direct access to the central ledger	Accounting information can be accessed from all relevant parties (accountant, auditor, client, regulators)
Security	Medium security	High security

Problem statement

Blockchain is an accounting technology. It is concerned with the transfer of ownership of assets and maintaining a ledger of accurate financial information. The accounting profession is broadly concerned with the measurement and communication of financial information, and the analysis of said information. Much of the profession is concerned with ascertaining or measuring rights and obligations over property or planning how to best allocate financial resources. For accountants, using blockchain provides clarity over ownership of assets and the existence of obligations, and could dramatically improve efficiency.

The financial industry in the world has witnessed fundamental changes driven by three elements related to technology: automation, disintermediation, and decentralization. Blockchain technology represents the basis for many successful innovations in the financial sector (Kunduz, 2019), where Blockchain technology in accounting is considered a new technological revolution due to its characteristics of enhancing accuracy, transparency, disclosure, speed, efficiency, and security. For that, the researchers believe it is necessary to explore Jordanian accountants' degree of knowledge of blockchain technology, its characteristics, and its uses, as well as analyze their opinions and expectations about the effect of Blockchain technology in innovating accountants' skills. Accordingly, the problem statement can be formulated in the following questions:

1. *What is the degree of Jordanian accountants' knowledge of blockchain technology, its characteristics, and its uses?*
2. *What are the expectations of Jordanian accountants regarding the repercussions of the impact of blockchain technology on innovating accountants' skills?*

Research methodology

The qualitative approach is used in many fields in which statistical or quantitative measures cannot be used, due to the lack of feasibility in enabling the researcher to secure and explain the problems or the phenomena (Queirós et al., 2017). Qualitative research has many directions, one the most important of which is Phenomenology (Khan, 2014), which represents a school of thought that studies the subjective experiences of humans, to know their perceptions, opinions, and expectations about a particular topic.

Phenomenology is a philosophical concept and a research methodology, its structure is that basic human facts can only be accessed through inner subjectivity and that the person is an integral part of the environment, which is an approach that seeks to reveal the experiences of the respondents in a particular issue, throughout the awareness of the Researcher (Faisal, 2017).

The researchers adopted the multimethodology approach using mixed methods between quantitative and qualitative research methodologies, as this type of research helps to reach a more complete picture of the problem, as it combines the benefits of the two methods. And despite the importance of the quantitative measures, the qualitative phenomenological approach remains the main pillar for identifying the phenomenon of interest and for describing it in this study.

Methods and producers

For achieving the research goals, the researchers seek to determine the philosophical assumptions of the phenomenological aspects that measure the effect of Blockchain technology in innovating accountants' skills. For that, data are collected from individuals (the study sample) with experience with the phenomenon using numerous in-depth interviews, observations, and documentation. And then deriving ideas from the analysis of phrases, developing a description of the structure and context, and understanding the phenomenon using a compound description.

Study sample

The study population represented the industrial companies listed on the Amman Stock Exchange, and their number is 34. And these companies have 137 accountants, auditors, and financial managers; out of these, the study sample was selected from these companies based on the degree of cooperation (with a size of 50 individuals) by conducting interviews with accountants, auditors, and financial managers.

Interviews

The interviews were based on open-ended questions, where individual interviews were conducted for all members of the study sample, then focus groups were conducted according to the job title in the following distribution:

1. The first focus group for accountants (24 members).
2. The second focus group for auditors (15 members).
3. Third focus group for the financial managers (11 members).
4. The fourth focus group combines the three job titles (16 members).

Interview questions

To explain the phenomenon, and to measure the effect of Blockchain technology in innovating accountants' skills, the interview questions focused on the level of awareness of the study sample members with blockchain technology, and Table 3 represents these questions.

Table 3 Interview questions

No.	Question
1	With a yes or no answer, do you know what blockchain technology is?
2	With a yes or no answer, do you know what the applications of blockchain technology in the financial and accounting field are?
3	With a yes or no answer, does your company implement blockchain technology in the accounting system?
4	Discuss the following items: 1. Blockchain has the potential to enhance the accounting profession by reducing the costs of maintaining and reconciling ledgers 2. Blockchain could help accountants gain clarity over the available resources and obligations of their organizations 3. Successful accountants will be those that work on assessing the real economic interpretation of blockchain records, marrying the record to economic reality and valuation 4. Blockchain is a replacement for bookkeeping and reconciliation work 5. To become truly an integral part of the financial system, blockchain must be developed, standardized, and optimized 6. The parts of accounting concerned with transactional assurance and carrying out the transfer of property rights will be transformed by blockchain and smart contract approaches 7. Accountants' skills will need to expand to include an understanding of the principle features and functions of blockchain 8. blockchain will lead to more and more transactional-level accounting being done 9. Many current-day accounting department processes can be optimized through blockchain

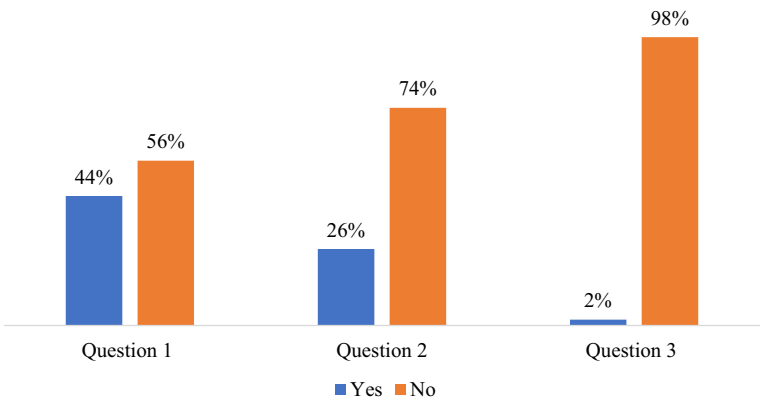

Fig. 1 Respondents' answers to the first three (Yes or No) questions

Study limitation

All qualitative research is inherently limited by the fact that its findings cannot be generalized to people who were not included in the study's sample. Therefore, the results of this study are limited to the industrial companies listed on the Amman Stock Exchange.

Analysis and discussion

With individual 50 interviews and four group interviews, the respondents' answers to the first three (Yes or No) questions are shown in Fig. 1.

Concerning respondents' answers to the first question (*With a yes or no answer, do you know what blockchain technology is?*), data in Fig. 1 show that (44%) answered with yes, and (56%) answered with no. And this reflects almost equal awareness among the members of the study sample of the concept of blockchain technology. But concerning respondents' answers to the second question (*With a yes or no answer, do you know what*

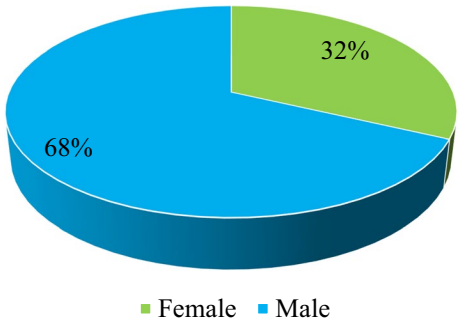

Fig. 2 Distribution of the study sample by gender

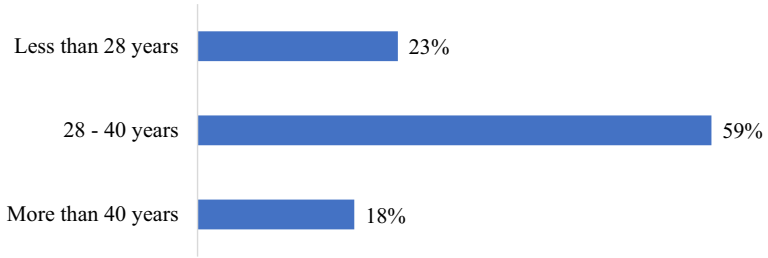

Fig. 3 Distribution of the study sample by age

the applications of blockchain technology in the financial and accounting field are?), data in Fig. 1 show that 26% answered with yes, and 47% answered with no. And this reflects a low percentage of knowledge among the members of the study sample of accountants, auditors, and financial managers about the applications of blockchain technology in the financial field, specifically in the accounting profession. More than that, and concerning respondents' answers to the third question (*With a yes or no answer, does your company implement blockchain technology in the accounting system?*), data in Fig. 1 show that (2%) answered with yes, and (98%) answered with no. And this reflects that Blockchain technology in the financial field, specifically in accounting, has not been applied yet in the Jordanian industrial companies listed on the Amman Stock Exchange.

Demographic characteristics of the study sample

The demographic characteristics of the study sample were distributed according to gender, age, years of experience, and job title.

Gender

Figure 2 shows the distribution of the study sample by gender, where the percentage of females (32%) and the percentage of males (68%).

Age

Figure 3 shows the distribution of the study sample by age, where the percentage of the age category (less than 28 years) reached (23%), the percentage of the age category (28–40 years) reached (59%), and the percentage of the age category (more than 40 years) reached (18%).

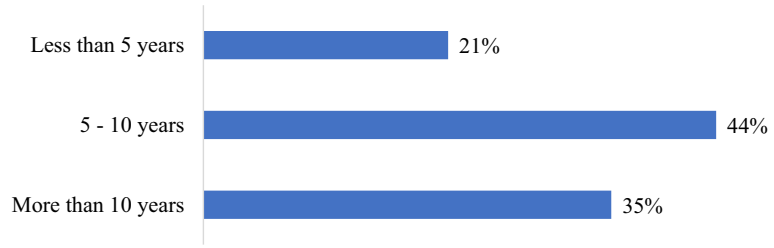

Fig. 4 Distribution of the study sample by years of experience

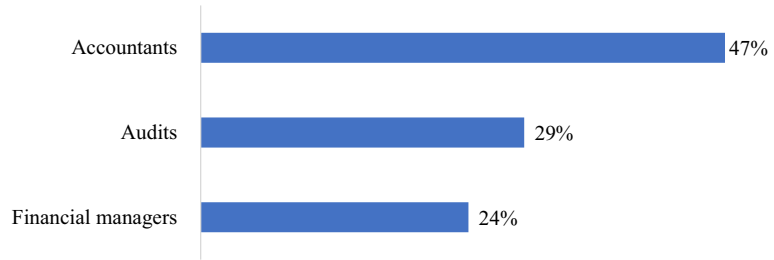

Fig. 5 Distribution of the study sample by job title

Experience

Figure 4 shows the distribution of the study sample by years of experience, where the percentage of the experience category (less than 5 years) reached (21%), the percentage of the experience category (5–10 years) reached (44%), and the percentage of the experience category (more than 10 years) reached (35%).

Job title

Figure 5 shows the distribution of the study sample by job title, where the percentage of accountants reached (47%), the percentage of audits reached (29%), and the percentage of financial managers reached (24%).

Phenomenological approach

A strategy for examining data is termed coding. Therefore, in open coding, it might comprise a sentence, a line from a transcription, a physical activity, or an acquisition of past components (Strauss & Corbin, 1994). And thus, the researchers will be using purposive sampling or what is also known as the theoretical sampling strategy to identify informers to participate in the current research. It engaged in selecting groups or individuals to be investigated based on their significance to research questions.

The coding process

Data are accumulated in four phases that differ in purpose and data collection strategies. Data analysis of the current study was completed by using (NVivo11)[2] to face

[2] NVivo is a software program used for qualitative and mixed-methods research. Specifically, it is used for the analysis of unstructured text, audio, video, and image data, including (but not limited to) interviews, focus groups, surveys, social media, and journal articles.

Table 4 Four phases in data collection

Phase	Coding	Purpose	Interviews
1	Open	Categorizing codes within categories for advanced analysis	50 individuals and 16 in group interviews
2	Axial	Specifying codes in detail; relay codes to one another to generate themes	
3	Selective	Creating a paradigm model and investigating themes relative to the model	
4	Selective	Testing, certifying, and explaining the paradigm model until saturated	

Table 5 Obtained categories and themes

Categories	Themes
Antecedents	1- Weak knowledge of the relationship between blockchain technology and accounting
	2- The responsibility for implementing blockchain technology is decided by the company
	3- Blockchain technology has the potential to enhance the accounting profession
	4- Blockchain is a replacement for bookkeeping
	5- Of course, blockchain technology will work on innovating accountants' skills
	6- Accountants' skills will need to expand
Phenomenon: positive sides	7- Enhancing accountants' skills
	8- Innovating accountants' skills
	9- Increasing performance efficiency
	10- Reducing costs
Phenomenon: negative sides	11- Not using blockchain technology in the accounting profession will weaken accountants' skills
	12- Weak performance
	13- Undeveloped accountant skills
	14- Increased costs
Consequences	15- Higher costs
	16- Technical lag
	17- More future complications
	18- Decrease market share

the terms of "trustworthiness", "rigorousness", or "quality" of the data, therefore it is important that this is carried out in a thorough and transparent manner. Therefore, using software in the data analysis process has been thought by some to add accuracy to qualitative research. The present study used a four-stage data collection strategy, summarized in Table 4.

And Table 5 shows 18 preliminary codes obtained from the interview sessions with each code representing a significant topic of discussion related to the effect of Blockchain technology in innovating accountants' skills. The researchers thus concluded that the focus group and individual interviews saturated the codes that were necessary to understand the phenomenon of analyzing the effect of Blockchain technology in innovating accountants' skills after similar themes emerged during the interviews.

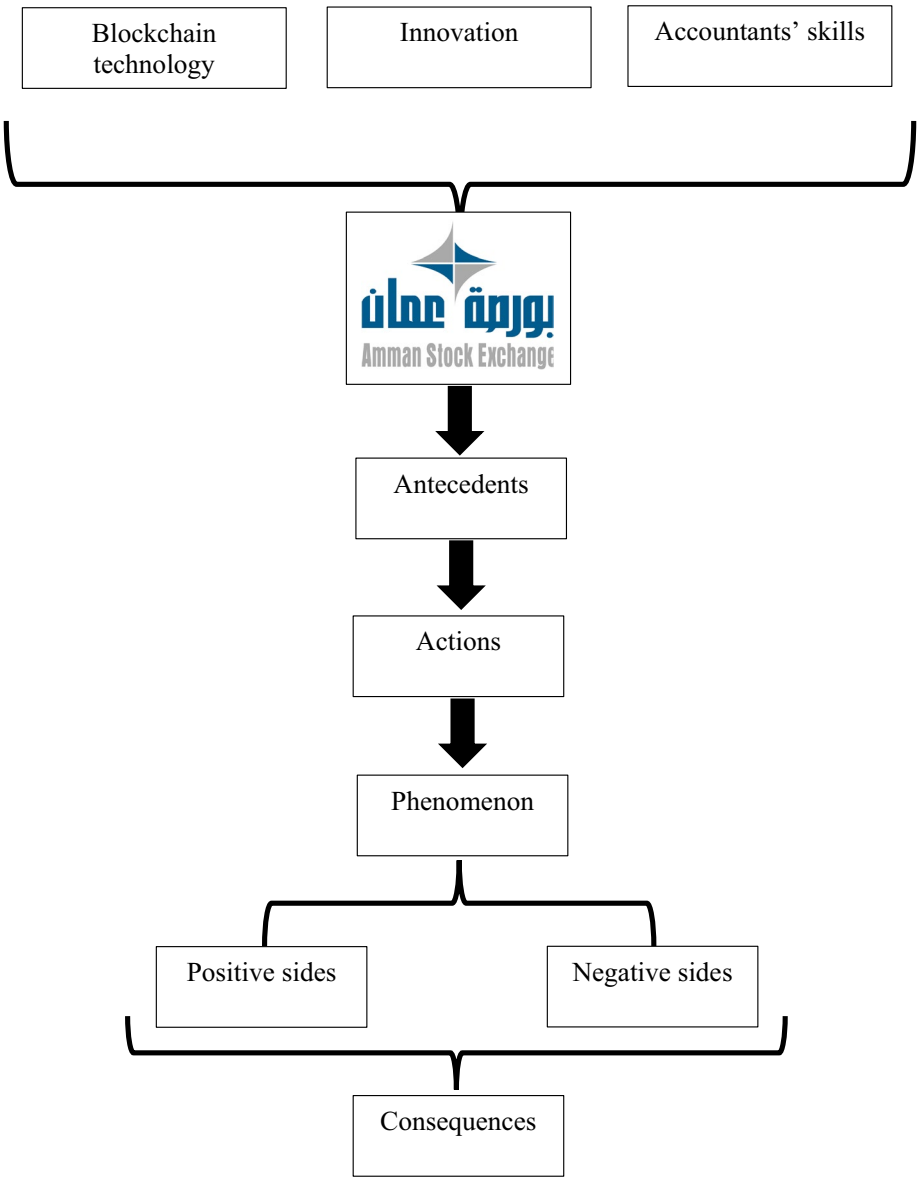

Fig. 6 Paradigm model

Study paradigm model

The model illustrated in Fig. 6 is generated entirely by utilizing NVivo 11 as a result of themes established being linked together. These relationships of concepts are rigorously established based on the validation process in phase four of selective data analysis.

Content analysis related to paradigm model

Table 6 below shows the frequencies[3] and percentages of the responses of the study sample related to the effect of Blockchain technology in innovating accountants' skills.

[3] Frequencies do not depend on the size of the study sample, but rather on the frequency of responses to each member of the study sample during the interviews.

Table 6 Frequencies and percentages of the participants' responses

Categories	Themes	Total	
		N	%
Antecedents	Weak knowledge of the relationship between blockchain technology and accounting	33	15
	The responsibility for implementing blockchain technology is decided by the company	21	10
	Blockchain technology has the potential to enhance the accounting profession	40	19
	Blockchain is a replacement for bookkeeping	29	14
	Of course, blockchain technology will work on innovating accountants' skills	51	25
	Accountants' skills will need to expand	34	16
Total		208	100
Phenomenon: positive sides	Enhancing accountants' skills	45	23
	Innovating accountants' skills	67	34
	Increasing performance efficiency	52	27
	Reducing costs	33	16
Total		197	100
Phenomenon: negative sides	Not using blockchain technology in the accounting profession will weaken accountants' skills	59	28
	Weak performance	71	33
	Undeveloped accountant skills	44	21
	Increased costs	39	18
Total		213	100
Consequences	Higher costs	41	17
	Technical lag	55	23
	More future complications	61	25
	Decrease market share	81	35
Total		238	100

Data in the previous table show the frequencies and percentages of the participants' responses upon the categories and themes related to the effect of Blockchain technology in innovating accountants' skills and highlighting these results:

- In the category of antecedents, the theme (*of course, blockchain technology will work on innovating accountants' skills*) is ranked with the highest percentage of (25%). This shows that the estimates of the study sample reflect their convictions of implementing blockchain technology in accounting systems will lead to the development and refinement of accountants' skills.
- Furthermore, in the category of antecedents, the theme (*Blockchain technology has the potential to enhance the accounting profession*) came second with a percentage of (19%). This reflects that the estimates of the study sample express their future expectations of implementing blockchain technology in accounting systems, as it will lead to the development and refinement of the accountants' skills.
- Also, in the category of antecedents, the theme (*The responsibility for implementing blockchain technology is decided by the company*) is ranked with the lowest percentage (10%). This reflects that the estimates of the study sample placed the responsibility of implementing the blockchain technology on the company's management, and

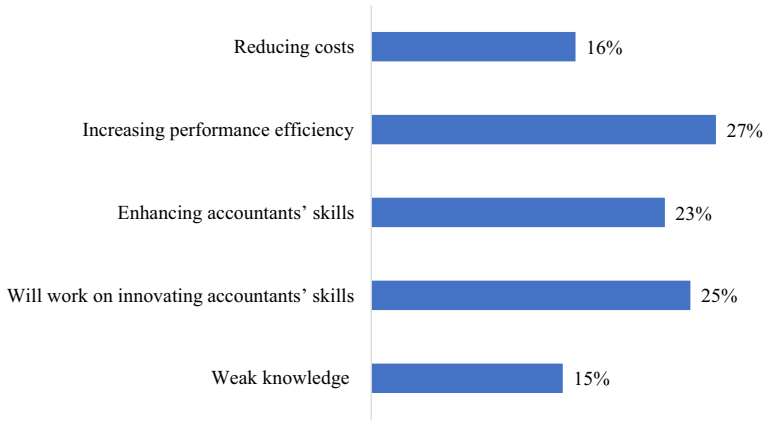

Fig. 7 Remarkable indications of the estimates of the study sample

ignored the individual responsibility of accountants, auditors, and financial managers to express the desire to develop work systems by adopting new technologies.

- In the Phenomenon: Positive sides, the theme (*Innovating accountants' skills*) is ranked with the highest percentage of (34%). This reflects that the estimates of the study sample emphasize that, one of the important advantages of implementing blockchain technology in accounting systems is innovating the accountants' skills.
- In the Phenomenon: Negative sides, the theme (*Weak performance*) is ranked with the highest percentage (33%). This reflects that the estimates of the study sample emphasize that one of the disadvantages of not implementing blockchain technology in accounting systems will weaken performance.
- In the consequences category, the theme (*Decrease market share*) is ranked with the highest percentage (35%). This reflects that the estimates of the study sample emphasize that one of the disadvantages of not implementing blockchain technology in accounting systems will decrease the market share.

Content analysis related to phenomenology

Figure 7 illustrates the remarkable indications of the estimates of the study sample concerning the phenomenon of analyzing the effect of Blockchain technology in innovating accountants' skills.

Data in Fig. 7 show that, the highest remarkable indication[4] concerning the phenomenon of analyzing the effect of Blockchain technology in innovating accountants' skills in the (*Increasing performance efficiency*) theme. Followed by the (*Will work on innovating accountants' skills*) theme. And then followed by the (*Enhancing accountants' skills*) theme. And these results reflect the convictions and expectations of the study sample of accountants, auditors, and financial managers that the impact of implementing blockchain technology will innovate accountants' skills.

[4] Remarkable indications are determined based on the priority of repetition during the interviews.

The move to a financial system with a significant blockchain element offers many opportunities for the accountancy profession. Accountants are seen as experts in record keeping, application of complex rules, business logic and standards setting. They can guide and influence how blockchain is embedded and used in the future, and to develop blockchain-led solutions and services. And to become truly an integral part of the financial system, blockchain must be developed, standardized, and optimized. This process is likely to take many years—it has already been nine years since bitcoin began operating and there is much work still to be done. There are many blockchain applications and start-ups in this field, but there are very few that are beyond the proof of concept or pilot study stage. Accountants are already participating in the research, but there is more for the profession to do. Crafting regulations and standards to cover blockchain will be no small challenge, and leading accountancy firms and bodies can bring their expertise to that work.

Conclusion

Alongside other automation trends such as machine learning, blockchain will lead to more and more transactional-level accounting being done—but not by accountants. Instead, successful accountants will be those that work on assessing the real economic interpretation of blockchain records, marrying the record to economic reality and valuation. For example, blockchain might make the existence of a debtor certain, but its recoverable value and economic worth are still debatable. And an asset's ownership might be verifiable by blockchain records, but its condition, location, and true worth will still need to be assured. By eliminating reconciliations and providing certainty over transaction history, blockchain could also allow for increases in the scope of accounting, bringing more areas into consideration that are presently deemed too difficult or unreliable to measure, such as the value of the data that a company holds. Blockchain is a replacement for bookkeeping and reconciliation work. This could threaten the work of accountants in those areas while adding strength to those focused on providing value elsewhere. For example, in due diligence in mergers and acquisitions, distributed consensus over key figures allows more time to be spent on judgmental areas and advice, and an overall faster process.

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Declarations

Competing interests
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