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Evaluation chain management model with emphasis on intellectual capital using blockchain technology

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Abstract
Purpose: The main purpose of this paper is the evaluation of the chain management model with an emphasis on intellectual capital in knowledge-based organizations using blockchain technology.
Research methodology: First, by reviewing previous studies and researches, the framework for readiness to accept blockchain was extracted. Then, the different areas of the value chain of knowledge-based organizations were identified. Then, a questionnaire for pairwise comparisons was distributed using a hierarchical approach. Finally, the TOPSIS questionnaire was distributed to rank the 5 identified areas of activity in the value chain and knowledge management of knowledge-based organizations. Semi-structured interviews with the organization's experts have been used to explain the promising methods in the organization further to improve the efficiency of blockchain acceptance and meaningful research orientations for researchers.
Results: These findings include the undiscovered potential of knowledge sharing and collaboration networks, the expected evolutionary stages of the Internet of Things, and eliminating intermediaries that lead to new business models such as token building and short-term rather than long-term relationships. Obstacles include staffing problems, legal uncertainty, loss of infrastructure and standardization, and unclear governance structures. Improving smart contract security and interoperability between private and public protocols will further expand technolog
Contribution: The application of blockchain technology in the field of knowledge and intellectual capital management, due to the promotion of key indicators such as improving security in the context of non-forgery, unchangeable information, tracking, decentralization, and transparency, leads to the application of this technology in knowledge and intellectual capital management.
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1. Introduction

Blockchain is an exciting innovation that can revolutionize organizations and offer a variety of applications. Blockchain was created for the financial sector(Chen, 2018). But now researchers, academics, and industry are exploring blockchain for other applications in various fields(Kouhizadeh, Saberi, & Sarkis, 2021). It is commonly asked that if blockchain is distributed, then how can it provide a secure platform? Note that in blockchain technology, cryptography is used to generate digital signatures. The digital signature includes two items: "private key" and "information or data to be transmitted over the network. The private key can only be accessed by its owner, but each network

member has access to the public key of the other network members. In the process of creating a digital signature and sending it to the blockchain network, this digital signature is decrypted by the network using the sender's public key, and the information is separated from the signature, if the original information is the same as the information decrypted from the public key (M. R. Zahedi & Khanachah, 2020). Otherwise, the decrypted information is not the same as the original information, if the original information was tampered with during the entry into the network, or if the digital signature is formed by the personal key of another person whose original owner is the information. Is not ". This is how the network prevents information manipulation and detects it.

In the existing literature, several contexts have been proposed for the use of blockchain (Al-Mamun, Li, Sadoghi, & Zhao, 2018; Parela, 2022). In addition to common financial applications such as the digital payment system, cryptocurrencies and cash transactions such as smart contracts, scientific, cultural, artistic, health, and in various political and governmental sectors, potential areas for the use of blockchain were mentioned(Perera, Nanayakkara, Rodrigo, Senaratne, & Weinand, 2020). In the field of data storage, before the development of blockchain, companies stored their data traditionally or through a cloud database. Blockchain can share data in addition to data storage and high-level security and protection without the need for a third party or organization (Fernández-Caramés, Blanco-Novoa, Froiz-Míguez, & Fraga-Lamas, 2019). Blockchain can also be used in government and political sectors and can affect the structure of policies, governments, and societies (Berryhill, Bourgery, & Hanson, 2018). Managing the identity, criminal record, and access to accurate information about individuals in a community, such as driver's licenses, passports, and visas, are other benefits of using blockchain in government (Mainelli & Smith, 2015). No need for a government agency to oversee the performance of government agencies and pay taxes by using blockchain smart contracts reduces administrative and auditing costs. The blockchain-based electoral system is another application of this technology in the public and political sectors(Peters & Panayi, 2016). As a revolution, blockchain can change business processes and supply chain networks and various industries at the international level create value for organizations, and improve trade and the economy (Min, 2019). In the field of financial transactions, companies can use blockchain to register, control, or track their assets globally (Kshetri, 2017). Murray, Kuban, Josefy, and Anderson (2019) introduced the use of blockchain in human resource activities of organizations such as hiring labor for different parts of the organization in which degrees, degrees, education and previous employment of individuals in various institutions and companies can be implemented as a blockchain and information Candidates should be available to different recruiting companies and tracked(Murray et al., 2019). In the field of art and music, the founder of a new style, idea, or work, especially in art and music products, can encrypt his style, idea, or to protect against imitation in the blockchain (Finucane, 2018). Also in the health sector, for medical research, the use of a chain of blocks to record the physical and mental condition of each patient leads to patient information with full detail and accuracy in special situations such as war and earthquakes or the patient's condition is severe, error reduction Medicine in recording patient information, reducing the bias of medical research, increasing the security of recorded data and reducing the risk of data loss by cyber-attacks can be mentioned (Benchoufi, Altman, & Ravaud, 2019). In the pharmaceutical sector, blockchain as a suitable solution leads to security in drug distribution and reduction of drug counterfeiting, reducing the possibility of tampering with drug ingredients and delivery of expired drugs (Bell, Buchanan, Cameron, & Lo, 2018; Mubarok, 2022).

This study contributes to the literature by adding to the body of knowledge on BDA and a firm’s market competitiveness in developing markets. The implementation of BDA is likely to have a substantial effect on the performance of manufacturing enterprises. Most empirical research conducted in developed nations cannot be extrapolated to the Nigerian market, necessitating further explanation of the link. Against this backdrop, this study examines the effects of BDA on a firm’s market competitiveness. The specific objectives of this study are as follows:

1. To ascertain the effect of the organizational use of intangible BDAR on market competitiveness.
2. To examine the effect of organizational use of tangible BDAR on market competitiveness.

2. Literature Review

2.1. Value chain knowledge-based management

Today, in different countries, including Iran, managers are eager to create knowledge management systems in organizations to benefit from their useful results. One of the most important and common processes in the various structures introduced for knowledge management is knowledge sharing. Motivating people to share their knowledge in organizations is also an important priority. Is involved in knowledge management (Asrar-ul-Haq & Anwar, 2016; Putra, 2022).

Knowledge sharing is an activity through which knowledge, information, skills, and expertise are exchanged between people, friends, family, communities, or organizations. The role of knowledge sharing in knowledge management is so important that some authors have stated that the existence of knowledge management is to support knowledge sharing (Al Saifi, Dillon, & McQueen, 2016).

Therefore, an organization that supports information sharing and knowledge creation among its members can better define effective and efficient processes and improve its organizational performance. With the shift from an industry-based economy to a knowledge-based economy, organizations have also sought to increase their competitiveness by relying on knowledge and information and using it in the business process (Ghorbani & Khanachah, 2021; Navimipour, Milani, & Hossenzadeh, 2018). Thus, in a knowledge-based economy, intangible assets (intellectual capital, experience, organizational knowledge, and organizational information rather than tangible assets) (machinery and equipment) have increasingly become a competitive determinant. Businesses, organizational reputation, skills, and technical knowledge of employees are seen as the essence of competitive advantage, so to stay competitive, organizations must focus on how to implement knowledge management, create knowledge, and value knowledge (Chude, Chude, & Egbunike, 2022; Ghorbani & Khanachah, 2020; Malik et al., 2020). Simply put, it provides the conditions for creating more benefits than the cost and success of an enterprise in the long run, and this means that managers create value for the sympathy of the organization's stakeholders, ie customers, shareholders, vendors, employees and society in the broadest sense. Otherwise, any of the stakeholders who do not receive value from the organization will leave the organization and jeopardize the success of the organization, so the company's value chain will allow managers to gain insight into the company's processes. Factors or main components of product production with Institutions' service delivery begin (Smith, Gonin, & Besharov, 2013) and include all the processes that take place to satisfy customers. Art strategy is worth creating. The mindset strategy provides conceptual models and guides ideas, allowing corporate executives to identify opportunities to create value for customers and transfer that value as a benefit(M. R. Zahedi & Khanachah, 2019).

2.2. Criteria for assessing the readiness to accept blockchain in the organization

The blockchain readiness framework is more of a management issue than a technical one, and organizations need to develop benchmarks to measure it (Kshetri, 2018; Pramono & Safarini, 2022). The technical debate, however, is one of the most important factors. For example, the company may have the necessary technical infrastructure to enter into a smart contract, but because the legal infrastructure does not exist in the event of a dispute and a claim authority, the smart contract may not be effective in practice. Interoperability in the application of blockchain includes both technical and organizational, structural and inter-organizational dimensions (Adula, Kant, & Birbirsa, 2022; Anochiwa, 2021; Savelyev, 2017).

One of the key questions in using blockchain is "time" to use it. From a technical point of view, blockchain technology can be implemented in several scenarios; but certainly not every situation is suitable for this. In particular, there are situations where the application of blockchain technology creates significant value over existing technologies. Of course, it must be ensured that the main capacities of the blockchain are used and that large investments are worthwhile. Positive answers to questions such as "Do different parties share the information? Or do they update it? Is there a need for approval? Are intermediaries removable and this reduces cost and complexity?" Indicates that there is a potential scenario for blockchain application. Of course, depending on the sensitivity of the issue, a more diverse range of questions and considerations can be considered. For example, it is suggested that to design a winning business strategy in blockchain, a set of key considerations and questions should

be considered before taking any action. In principle, six thematic groups (as shown in Figure 2) are considered in preparation for the blockchain, and the relevant questions under each of these groups are considered. In the future, following each relevant question and answer, a mechanism should be activated to evaluate the opportunities. It is predicted that if the answers to these questions are determined before any executive activity, the chances of success in obtaining results and benefiting from the benefits of blockchain will increase (Wang, Singgih, Wang, & Rit, 2019). Of course, launching a transparent operating model and organizing a comprehensive consortium effectively solves the next problems in the management of the platform and its responsibilities.

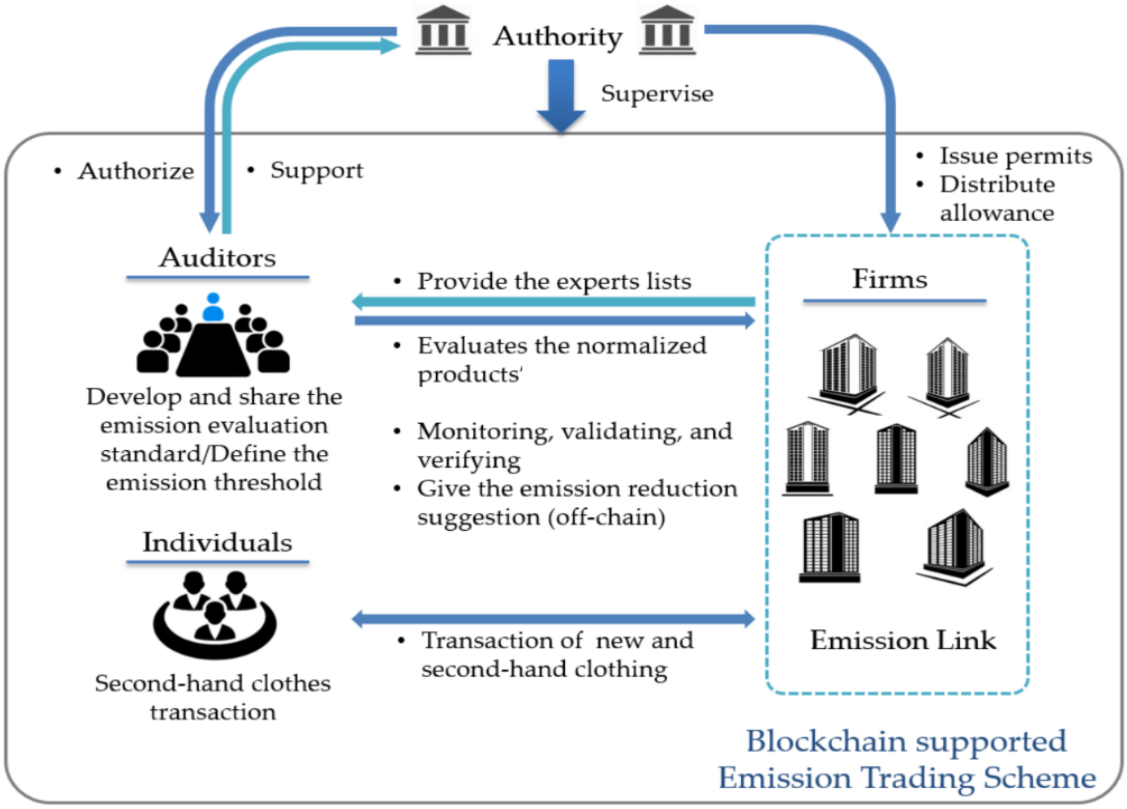

Figure 1: Blockchain supported emission trading scheme (Fu, Shu, & Liu, 2018)

It is important to note that in the application of blockchain technology, the issue is not merely mediation, but there are deeper issues. In this regard, Mackenzie Institute's in-depth interviews with managers of major industries around the world show 90 separate applications at different maturity levels in major industries. Therefore, managers need to know with what application they should expect what results. In other words, managers must determine with a pragmatic and skeptical view how much and to what extent the impact of blockchain on their business is possible. Even more precisely, companies must look to the core of their pain to seek treatment and blockchain applications. In addition, measures such as shaping the ecosystem, setting standards, and resolving legal barriers should be on the agenda (Seppälä, 2016; M. Zahedi, Akhavan, & Naghdi Khanachah, 2020).

If the right strategy for blockchain development is chosen, companies can create value in the short term. Also, the top and dominant actors who can present their blocks as market solutions will now be able to present their services as a leading market maker. Therefore, the main issue is the choice of strategy, and the analysis shows that there are three main dimensions to the strategic value of blockchain technology: Dimension 1: It does not matter if the blockchain technology is unmediated to create value. This means that other values can be created by reducing complexity, increasing transparency, and preventing counterfeiting and corruption. Second dimension: The short-term value of blockchain is mainly in reducing costs and then in creating business transformation models. Explain that, blockchain is indeed the basis of an evolutionary technology, but its primary effect is to improve operational productivity.

Blockchain can achieve operational efficiency by avoiding existing processes, eliminating intermediaries or administrative activities to maintain documents, and consolidating transactions that lead to "attracting lost revenue and creating new revenue for service providers." In the evaluation of blockchain applications, it is estimated that 70% of the short-term available value is in cost reduction. This 70% leads to revenue generation and capital liberalization. For example, one of the much-anticipated developments is the creation of a distributed digital identity for consumer identity, customer processes, and related services. Dimension 3: It will take between 3 and 5 years for blockchain to become feasible on an appropriate scale, first because of the difficulty of resolving the "competing" conflict to establish common standards. In other words, the strategic value of blockchain will only be understood when Real-scale business must be usable; that is, it must be feasible in the face of standards, technology, assets, and ecosystems, so in a situation where most companies are testing blockchain technology, significant scalability will take that long. Another issue is where organizations should compete in the field of blockchain to start. The answer is that blockchain applications are diverse, but the main suggestion is to pay attention to specific and promising applications. "Companies can evaluate their options with a pair of glasses of practical skepticism and in a structured way. They must first determine sufficient and affordable value Is there a focus on the real problem that is problematic for the customers? Otherwise, companies should not enter the second step, which is to determine the strategy for adapting to the blockchain. If companies are to compete in blockchain, they must develop their strategy based on market position. Many of the feasibility issues raised earlier need to be considered. Even technological and financial constraints can be managed through a set of debt consolidation solutions. Therefore, the optimal strategic solution of a company for the development of blockchain technology is mainly determined by the following two factors: Market dominance: The ability of an actor to influence the main parties around an application Legal barriers and standards require legal approval or standard requirements In applying these two factors, it should be noted that the value of blockchain is derived from the effects of the network and the interoperability of the parties, and all parties need to agree on a certain standard. Importantly, island behavior and multiple solutions will provide little advantage. Especially as technology develops, market standards will emerge, and investing in miscellaneous standards will be detrimental. As can be seen in the figure below, the optimal blockchain solution for each application is tailored to the market position and the ability to influence legal barriers and standards. In this way, even the followers must be ready for a rapid rise to adapt to emerging standards (Meinert et al., 2019).

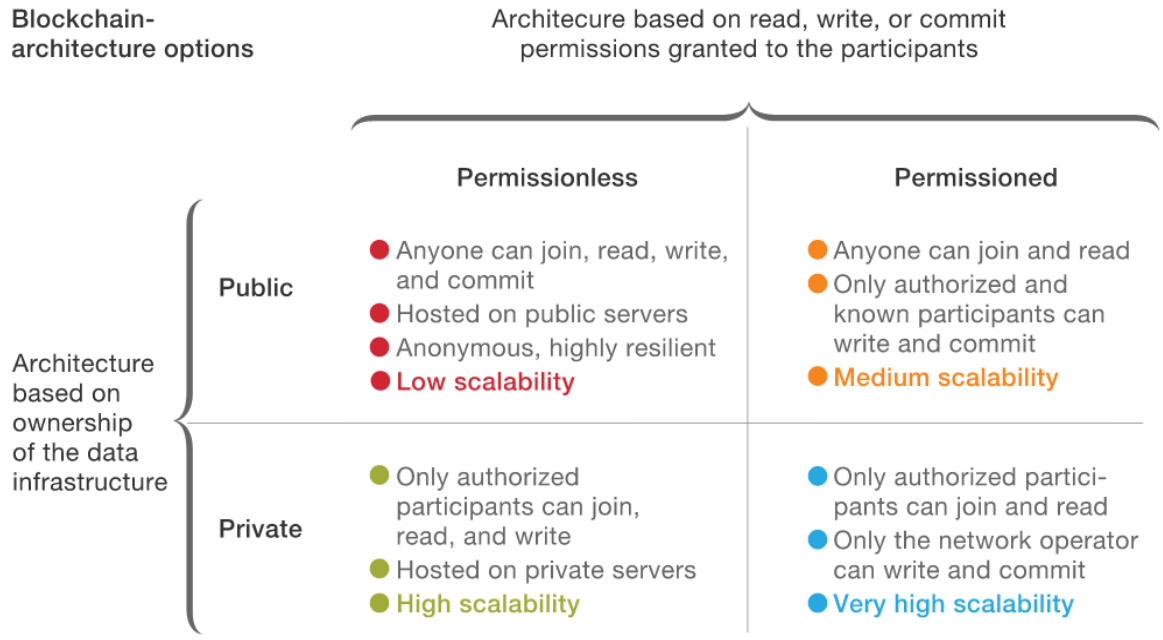

Figure 2: Review and leveling to determine the appropriate strategy for implementing blockchain (Carson et al., 2018)

The figure above appears to be four separate strategic areas for the development of blockchain technology, but in practice emphasizes the prioritization of applications according to the position of companies; Therefore, managers can learn about their internal and external environment and choose their field of application depending on the results(Lohmer, Bugert, & Lasch, 2020).

Specifically, for the field of knowledge management and value chain in knowledge-based organizations, according to studies conducted in this field, 5 steps are proposed for action in the field of blockchain, which are described separately below. It is worth noting that in most of the steps suggested by the report, two issues are important, first, the choice of application appropriate to the mission and program of the organization, and second, the focus on legal issues and challenges(Maroun, Daniel, & Fynes, 2019).

2.3. Create an interdisciplinary and agile working group for blockchain

Working groups are formed to review the applications of blockchain with a combination of the whole organization and create coordination between different departments. In this combination of technical capabilities to business skills must be present. The working group prepares and proposes business cases and thus gains the support of the organization's leadership. This group acts like a startup and has features based on flexibility and transparency. The key elements of "continuous experimentation" and "drawing a way to validate assumptions and ideas" need to be considered. Entrepreneurship in an environment such as blockchain also requires the empowerment of working group members and full authority to implement the program(Moşteanu & Faccia, 2020).

2.4. Identify appropriate blockchain applications

Value chain companies need to be careful not to develop technology because of technology. These companies need to move beyond the exaggerations of blockchain technology and act more carefully. It is better to answer some basic questions first and then make a decision based on the answers (Sulkowski, 2018).

1. What problems do companies in the supply chain of project-oriented organizations want to solve with this technology?
2. What are the current solutions to these problems?
3. What applications can solve these problems?
4. What are the working requirements of these applications?
5. And is blockchain the right technology to meet these requirements?
6. What is the value proposition of blockchain compared to other technologies?
7. How does blockchain integrate with existing technologies, processes and, systems in use today?

2.5. Design experiments and define successes in blockchain and create value proposition

Once blockchain applications are identified, the working group should focus on pilot design. First, a time must be set for determining the success criteria and expectations of the organization leader. The challenge at this stage is to change the internal view of specific financial results and the exact rate of return on investment in the pilot “mindset of experiencing learning experience.” The main goals in these early steps are to understand the potential possibilities, constraints, and business models If the pilot outputs include "where blockchain technology excels" and "how blockchain brings new performance to the customer", then these gains should be considered a victory. Once the applications are selected, the next step is to choose the right location for the blockchain. Establish and initiate feasibility studies, which formulate the program's value proposition and provide a cost-benefit analysis for legislators, users, and customers (Andoni et al., 2019).

2.6. Focus on collaboration and joint creation of blockchain Blockchain

Pilots in the value chain can reap great benefits from industry-wide collaboration. Cooperation between oil and gas companies, utilities, major equipment manufacturers and startups can add unique value to each of these companies and their customers. Each of these organizations has unique capabilities, relationships, and benefits that reduce risk. It should be noted that working together with various stakeholders, especially customers, will be crucial to designing and launching a successful blockchain pilot. Collaboration should go beyond industries and geographies and not be limited to specific pilot designs. Knowledge sharing is critical to better understanding how blockchain evolves and what its

most appropriate uses are. Industrial consortia can help build an ecosystem of participants and accelerate the development and dissemination of industry standards.

2.7. Legislators will be needed to empower blockchain experiences

The value chain and knowledge sharing of the organization's intellectual capital will benefit from legal efforts to facilitate experiences and pilot blockchain and other innovations. For example, the UK Supply Chain Consortium and the Supply Chain Governing Body have created a body of legislation that allows supply chain companies to test innovations without compromising common legal requirements. As pilots continue to demonstrate results, there will be greater transparency about the technical and operational requirements of the platform and the functions of the blockchain. Ensuring the security and reliability of these platforms before developing common standards is one of the main tasks of legislators. In general, all eyes are on the output of these blockchain pilots. The successful design, planning, and implementation of these experiences will be critical to helping to recognize the full potential of blockchain technology in the area of knowledge sharing in an organization. At the end of this section, using the roadmap tool, a process is proposed that is based on three main processes. These three processes focus on applications, concept proofing, and scale implementation. To evaluate blockchain applications, a scale is proposed that is based on reliability, feasibility and desirability. Of course, these frameworks are a good guide for implementing blockchain, but with the decision to implement blockchain, there is a long way to go, the first step of which is awareness of the technology itself (Rezaee, 2019).

3. Research Methodology

The present study is applied in terms of purpose. This means that in this study, no theorizing has been done and different areas of the value chain and knowledge management of the organization have been examined in terms of readiness to accept blockchain. Also, this research is descriptive and analytical in terms of method. This means that the researcher does not interfere in the variables and describes the variables as they exist and analyzes the collected data. Also, the present study is a survey because the data and opinions of experts have been collected using a questionnaire. Multi-criteria decision making methods consider prescriptive and normative analyses. Multi-criteria decision-making methods are tools for decision-making analysis in managerial issues. Multi-criteria models have been used to select and evaluate variables from several dimensions (Amiri et al., 2020). This study seeks to evaluate the applications of blockchain in various fields in the value chain and knowledge management and intellectual capital of the organization. For this purpose, by exploring and studying literature and research, the blockchain adoption readiness framework was extracted. Next, different areas of the value chain of knowledge-based organizations were identified. And using the hierarchical approach, a questionnaire was distributed for pairwise comparisons. Finally, the TOPSIS questionnaire was distributed to rank the five activity areas identified in the value chain and knowledge management of knowledge-based organizations. The following figure shows the process of actions taken schematically.

To identify and evaluate blockchain readiness and rank the scope of activities of companies in the supply chain and network of project partners, in this study, the opinions of experts and specialists in the field of value chain and knowledge management in knowledge-based organizations are used. To complete the AHP and TOPSIS questionnaires, the expert opinions of 25 experienced experts who worked in key and related positions in the knowledge and intellectual capital management of the organization and were also familiar with the concept of blockchain technology were used. The method of selecting these people was based on expertise and access. Data collection was done in two ways: library and field. The method of collecting secondary data was library and the method of collecting primary data was field; That is, using a questionnaire, the required data were collected from a sample of the community of experts and specialists and designated experts. In this study, two questionnaires were used. The data collected in the research were first weighted based on the technique of hierarchical analysis process and then using the TOPSIS technique, the domain of the companies' area of activity was ranked.

4. Results and Discussions

Based on the studies, the indicators for assessing blockchain readiness are as follows:

Table 1. Blockchain Readiness Assessment Indicators

Row	Indicator	Explanation	Code
1	Consortium	Ability to work with key actors to ensure network impact	C1
2	Technology	Route with rapid technological changes	C2
3	the operation	Ability to perform actions related to the main activities	C3
4	Talent	Finding the right people to lead the operation	C4
5	Conformity	Compliance with laws and regulations	C5
6	Business Impact	Understanding the effects on core business processes	C6

AHP technique was used to weight each of the above indicators.

Table 2. Average opinions of experts in the pairwise comparison questionnaire

Row	Indicator	C1	C2	C3	C4	C5	C6
1	Consortium	1.000	0.416	0.167	0.383	0.698	1.154
2	Technology	1.835	1.000	0.260	0.875	1.425	1.176
3	the operation	3.625	2.666	1.000	2.052	2.020	3.416
4	Talent	2.066	1.014	0.363	1.000	1.836	3.016
5	Conformity	1.150	0.554	0.394	0.415	1.000	1.527
6	Business Impact	0.696	0.682	0.183	0.230	0.513	1.000

The incompatibility rate of the above pairwise comparison table is 0.021, which is less than 0.1 and indicates a compatibility rate of more than 90%.
The weights and final rank of blockchain acceptance indicators are calculated below.

Table 3. Weights and ranking of acceptance readiness indicators in knowledge-based organizations

Row	Indicator	C1	C2	C3	C4	C5	C6	Final weight	Index rank
1	Consortium	1.000	0.416	0.167	0.383	0.698	1.154	0.093	5
2	Technology	1.835	1.000	0.260	0.875	1.425	1.176	0.155	3
3	the operation	3.625	2.666	1.000	2.052	2.020	3.416	0.341	1
4	Talent	2.066	1.014	0.363	1.000	1.836	3.016	0.198	2
5	Conformity	1.150	0.554	0.394	0.415	1.000	1.527	0.123	4
6	Business Impact	0.696	0.682	0.183	0.230	0.513	1.000	0.084	6

After pairwise comparison, it was found that the ability to perform activities and actions and operations is the most important indicator of readiness. After that, the talent and ability of organizational resources to do it is the second priority. In third place is the route with rapid technological changes.

In the theoretical foundations of the research, in the field of value chain and knowledge management and intellectual capital, the applications of blockchain technology from its young identity; That is, cryptocurrencies in the form of jointly distributed accounts have gone further and become facilitators of smart contracts. Blockchain takes on the role of a reliable guardian and provider of a platform for transparency, creating more value than increasing productivity by eliminating legal and financial intermediaries in an agreement. The key areas and opportunities of blockchain technology in the field of value chain and knowledge management and intellectual capital, which are currently based on studies and research are time management, knowledge chain, communication, knowledge update operations and knowledge capacity measurement. Also, as described in Table 1, these activities can be performed in three upstream, middle, and lower sections. Accordingly, the 5 main areas in the value chain section are defined as follows:

Value Chain Policy and Knowledge Management (A1), Sustainability of Collaborations (A2), Information Sharing (A3), Structures, Rules and Regulations (A4), and Operational Strategies (A5) are the five activities of the value chain department and the management of knowledge and intellectual capital have been studied according to the indicators of acceptance readiness using the TOPSIS technique. The following table shows the normalized matrix and the weighted normalized matrix.

Table 4. Normalized matrix

Row	Scope of activity of companies	Consortium	Technology	Operation	Talent	Conformity	Business Impact
1	policy	-0.53772	-0.52882	-0.2482	-0.67599	-0.58357	-0.53944
2	Sustainability of collaborations	-0.7203	-0.52882	-0.7646	-0.67599	-0.77446	-0.81416
3	Information sharing	-0.17257	-0.52921	0	-0.1615	-0.19612	-0.12736
4	Structures, rules and regulations	0	0	-0.2452	0	0	0
5	Operational strategies	-0.35515	0.52882	-0.5064	-0.1715	0	0

Table 5. Rhythmic normalized matrix

Row	Scope of activity of companies	Consortium	Technology	Operation	Talent	Conformity	Business Impact
1	policy	-0.0509	-0.084	-0.088	-0.1365	-0.0729	-0.0467
2	Sustainability of collaborations	-0.0679	-0.084	-0.2649	-0.1365	-0.0972	-0.07005
3	Information sharing	-0.0169	-0.0506	0	-0.0341	-0.0243	-0.01168
4	Structures, rules and regulations	0	0	-0.0884	0	0	0
5	Operational strategies	-0.0339	-0.084	-0.1766	-0.0341	0	0

After calculating the distance between the options to the ideal and anti-ideal response, the final weights of the options and the rank of each are calculated based on the weight obtained.

Table 6. Results of weighting and ranking of areas of activity of project-oriented organizations in the field of knowledge management and intellectual capital in terms of readiness to accept blockchain.

Row	Scope of activity of companies	di+	di-	ci	Final rank
1	policy	-0.53772	-0.52882	-0.2482	2
2	Sustainability of collaborations	-0.7203	-0.52882	-0.7646	1
3	Information sharing	-0.17257	-0.52921	0	5
4	Structures, rules and regulations	0	0	-0.2452	4
5	Operational strategies	-0.35515	0.52882	-0.5064	3

Based on the obtained results, the field of value chain and knowledge management at the level of stability of knowledge relations and collaborations has the highest readiness to accept blockchain. After that, the value chain is in the second place at the level of policies. In third place are operational strategies such as knowledge processes and integrated intellectual capital in the field of blockchain-based organization value chain. The fourth position is related to structures, rules and regulations such as incentive alignment and the last rank in terms of readiness to accept blockchain in the field of value chain and partner network is related to knowledge and information sharing.

4.1. Optimal knowledge management system in knowledge-based organizations

According to the contents and evaluation and familiarity with the important indicators of the value chain, the presentation of a knowledge management system based on blockchain technology is presented to fill the gaps in the knowledge management system of the knowledge-based organization. In this proposed system, considering a knowledge sharing-platform, the validity of the role and its advantages are considered, considering that these items are of great importance in any organization. There is a need to examine whether a particular user is the real owner of a particular role related to a particular source of knowledge. Without a proper authentication process, the system will not be secure and the access control mechanism will be unreliable. For example, passports and ID cards are commonly used as verification methods; but they cannot be used in the digital world. In this work, we introduce an efficient authentication and access control method based on elliptic curve encryption (ECC) previously proposed by Nyame, Qin, Obour Agyekum, and Sifah (2020) because it is the mechanism of progress of blockchain systems. Our access control system must provide effective management of the knowledge repository, key release, deletion and verification. The blockchain also has the transparency and immutability of knowledge resources.

The proposed system, as shown in Figure 3, consists of the following main components: user layer, knowledge processing and management units, blockchain, and cloud server. The various components are described below.

User-related layer: The user-related layer consists of two main parts related to knowledge, knowledge owner and knowledge user. Knowledgeable people upload their knowledge and experience to a repository in the cloud and determine which users have access to which knowledge and which privileges the user should enjoy. On the other hand, the knowledge user requests the use of knowledge and after successful confirmation, the request is accepted.

Knowledge Processing Unit: This unit includes a key exporter, a verification unit, and a role-determining unit. The exporter is responsible for generating cryptographic keys related to user profiles and used for network transactions. Some common trades include requesting knowledge, using knowledge, and so on. The verification unit, on the other hand, verifies all users on the network. Once the keys are generated and given to users by the issuer, all users must go through the authentication process before gaining knowledge. With the help of the verification unit, efficient access control is

guaranteed. The assignment unit provides the role of system interaction rules. This determines what the role of each creature is and the privileges that each user enjoys.

Knowledge Management Center: This is the brain unit of the system. It includes a network processing node and a smart contract unit. Processing nodes are responsible for processing requests on the network and managing other processes in the blockchain. This works in tandem with the smart contract, which is responsible for generating knowledge policies. When requests are processed, the processing nodes receive the requests from the knowledge processing center and act on them. After processing, it closes the result and the final output is displayed to the user.

Blockchain function: This technology in the system is a growing list of all knowledge records (knowledge blocks) that are cryptically related to each other. In each block, there is a hash from the previous block, a time stamp and a transaction. Transactions are added to a block when the processing nodes complete their tasks and use them to connect to the internal communication and authentication protocol. After recording, the knowledge item must be changed in all subsequent blocks, which is necessary to reach an agreement.

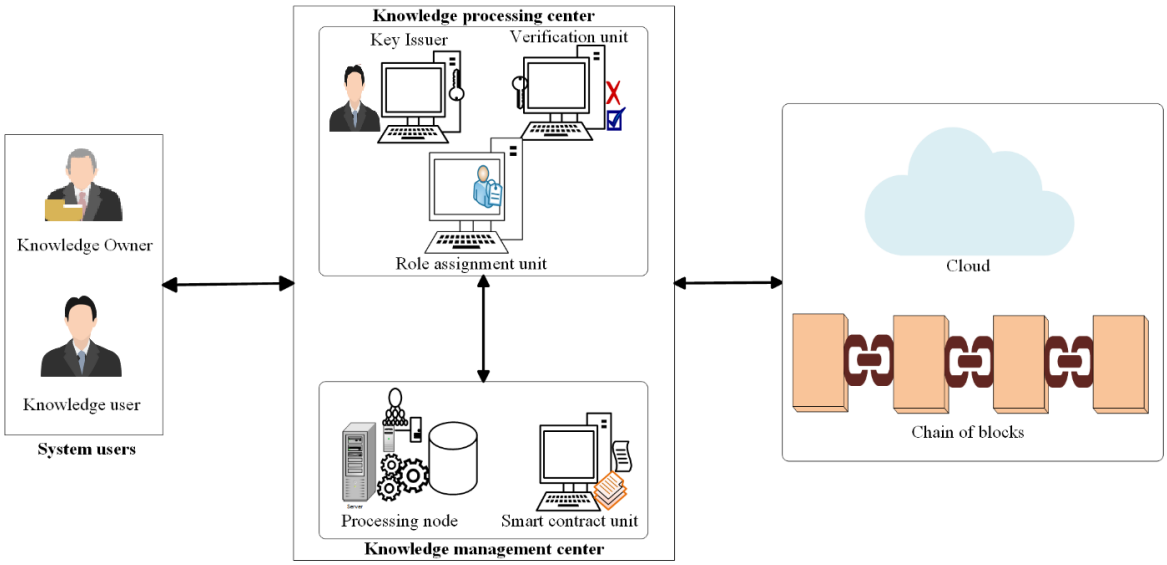

Figure 3. Proposed knowledge management system architecture

To create a knowledge block, the knowledge owner must enter their knowledge into the system (validation) and this becomes a block (not yet validated), and each block has a hash value. This hash is a string of characters that is encrypted. Therefore, the blocks are reliable and any owner can trust the knowledge of the next use. Block validation is performed by all nodes in the knowledge collaboration network and the organization's knowledge management system. All knowledge in the network is a transaction that is stored between at least two entities involved in the process. All previous transactions related to this knowledge will be available to the person who needs the knowledge. With blockchain, knowledge is maintained and ownership is maintained and tracked in a secure environment.

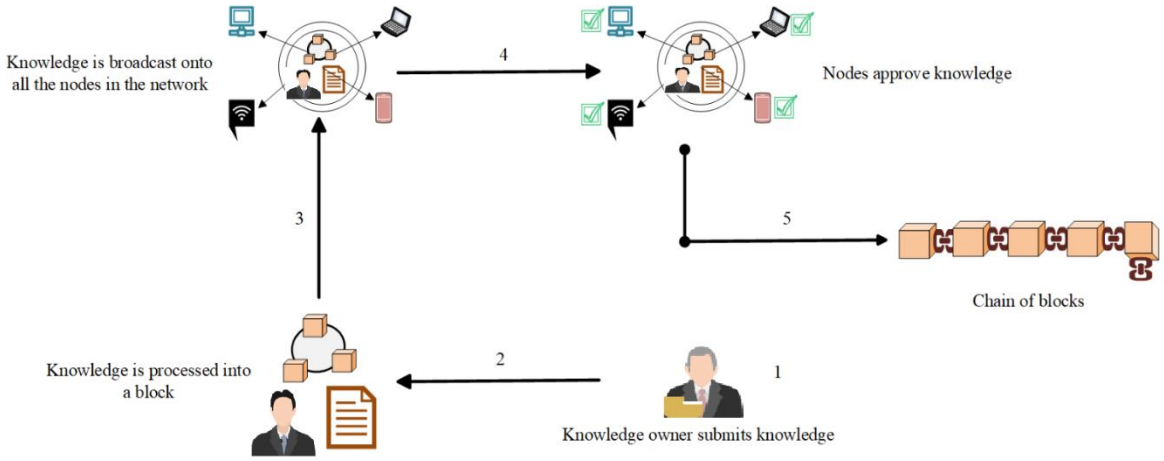

Figure 4. Creation of a knowledge block

5. Conclusion

The main purpose of this manuscript is to explain the value chain management model with emphasis on intellectual capital in knowledge-based organizations using blockchain technology Change due to blockchain requires readiness, and this readiness can facilitate the acceptance and implementation of blockchain. These preparations include structuring rules and regulations, stakeholder cooperation, and system readiness for adaptation and flexibility. Without examining the infrastructure preparation framework required to welcome blockchain, one cannot expect that different areas of activity in the area of the organization's value chain will receive a good or appropriate response from the implementation of blockchain projects. Therefore, the main issue of the present study is that a framework for preparing different areas for the acceptance of blockchain can be designed to evaluate the activities of companies in the field of knowledge management and intellectual capital and determine which areas from the activities in the supply chain sector, the project-oriented organizations of the country can operate faster than other sectors. For this purpose, blockchain acceptance readiness assessment indicators were extracted and then the 5 main areas of activity of companies in the energy sector were evaluated. The results showed that the activity in the field of the value chain of the organization at the level of sustainability of collaborations has the highest readiness to accept blockchain. After that, knowledge management is in the second place at the level of policies. In third place are operational strategies such as integrated knowledge management processes in the field of blockchain-based knowledge management chain. The fourth position is related to structures, rules and regulations such as incentive alignment, and the last rank is in terms of readiness to accept blockchain in the field of knowledge management and intellectual capital and the network of partners related to information sharing.

Based on the obtained results as well as the mentioned experiences, it is suggested that the active departments in the field of knowledge management in organizations, especially knowledge-based organizations, increase their readiness to accept blockchain. This readiness through the development of partnerships, identification of actors and increased interaction with them, monitoring of technology and events in the global community for companies and similar areas, flexibility and legality, regulatory and structural regulation, as well as strengthening infrastructure it will be possible to increase operational capacity and identify and nurture talented and relevant people.

Also, based on the research (Nyame et al., 2020) and applying changes and improving its processes in completing the above operations, a model was presented in the form of a roadmap for implementing blockchain in the value chain and knowledge management of knowledge-based organizations.

References

Adula, M., Kant, S., & Birbirsa, Z. A. (2022). Systematic Literature Review on Human Resource Management Effect on Organization Performance. *Annals of Human Resource Management Research,* 2(2), 131-146.

Al-Mamun, A., Li, T., Sadoghi, M., & Zhao, D. (2018). *In-memory blockchain: Toward efficient and trustworthy data provenance for hpc systems.* Paper presented at the 2018 IEEE International Conference on Big Data (Big Data).

Al Saifi, S. A., Dillon, S., & McQueen, R. (2016). The relationship between face to face social networks and knowledge sharing: an exploratory study of manufacturing firms. *Journal of knowledge management*.

Amiri, M., Hashemi-Tabatabaei, M., Ghahremanloo, M., Keshavarz-Ghorabaee, M., Zavadskas, E. K., & Antucheviciene, J. (2020). A new fuzzy approach based on BWM and fuzzy preference programming for hospital performance evaluation: A case study. *Applied Soft Computing,* 92, 106279.

Andoni, M., Robu, V., Flynn, D., Abram, S., Geach, D., Jenkins, D., . . . Peacock, A. (2019). Blockchain technology in the energy sector: A systematic review of challenges and opportunities. *Renewable and Sustainable Energy Reviews,* 100, 143-174.

Anochiwa, L. (2021). A contribution to the human capital investment debate vis-à-vis economic growth: the case for Nigeria. *Annals of Human Resource Management Research,* 1(1), 15-28.

Asrar-ul-Haq, M., & Anwar, S. (2016). A systematic review of knowledge management and knowledge sharing: Trends, issues, and challenges. *Cogent Business & Management,* 3(1), 1127744.

Bell, L., Buchanan, W. J., Cameron, J., & Lo, O. (2018). Applications of blockchain within healthcare. *Blockchain in healthcare today,* 1(8).

Benchoufi, M., Altman, D., & Ravaud, P. (2019). From clinical trials to highly trustable clinical trials: Blockchain in clinical trials, a game changer for improving transparency? *Frontiers in Blockchain,* 2, 23.

Berryhill, J., Bourgery, T., & Hanson, A. (2018). Blockchains unchained: Blockchain technology and its use in the public sector.

Chen, Y. (2018). Blockchain tokens and the potential democratization of entrepreneurship and innovation. *Business Horizons,* 61(4), 567-575.

Chude, I. D., Chude, N. P., & Egbunike, C. F. (2022). Intellectual Capital and Financial Performance of Quoted Manufacturing Firms. *Annals of Human Resource Management Research,* 2(2), 147-160.

Fernández-Caramés, T. M., Blanco-Novoa, O., Froiz-Míguez, I., & Fraga-Lamas, P. (2019). Towards an autonomous industry 4.0 warehouse: A UAV and blockchain-based system for inventory and traceability applications in big data-driven supply chain management. *Sensors,* 19(10), 2394.

Finucane, B. P. (2018). *Creating with blockchain technology: the" provably rare" possibilities of crypto art.* University of British Columbia.

Fu, B., Shu, Z., & Liu, X. (2018). Blockchain enhanced emission trading framework in fashion apparel manufacturing industry. *Sustainability,* 10(4), 1105.

Ghorbani, S., & Khanachah, S. N. (2020). Investigating the reasons for failures and delays in R&D projects with the project management approach. *Annals of Management and Organization Research,* 1(4), 319-334.

Ghorbani, S., & Khanachah, S. N. (2021). Providing a framework for knowledge sharing in knowledge-based organizations according to social capital indicators. *Annals of Management and Organization Research,* 1(4), 271-284.

Kouhizadeh, M., Saberi, S., & Sarkis, J. (2021). Blockchain technology and the sustainable supply chain: Theoretically exploring adoption barriers. *International Journal of Production Economics,* 231, 107831.

Kshetri, N. (2017). Will blockchain emerge as a tool to break the poverty chain in the Global South? *Third World Quarterly,* 38(8), 1710-1732.

Kshetri, N. (2018). 1 Blockchain's roles in meeting key supply chain management objectives. *International Journal of Information Management,* 39, 80-89.

Lohmer, J., Bugert, N., & Lasch, R. (2020). Analysis of resilience strategies and ripple effect in blockchain-coordinated supply chains: An agent-based simulation study. *International Journal of Production Economics*, 228, 107882.
Mainelli, M., & Smith, M. (2015). Sharing ledgers for sharing economies: an exploration of mutual distributed ledgers (aka blockchain technology). *Journal of financial perspectives*, 3(3).
Malik, S. Y., Cao, Y., Mughal, Y. H., Kundi, G. M., Mughal, M. H., & Ramayah, T. (2020). Pathways towards sustainability in organizations: Empirical evidence on the role of green human resource management practices and green intellectual capital. *Sustainability*, 12(8), 3228.
Maroun, E. A., Daniel, J., & Fynes, B. (2019). Adoption of blockchain technology in supply chain transparency: Australian manufacturer case study.
Meinert, E., Alturkistani, A., Foley, K. A., Osama, T., Car, J., Majeed, A., . . . Brindley, D. (2019). Blockchain implementation in health care: Protocol for a systematic review. *JMIR research protocols*, 8(2), e10994.
Min, H. (2019). Blockchain technology for enhancing supply chain resilience. *Business horizons*, 62(1), 35-45.
Moşteanu, N., & Faccia, A. (2020). Digital Systems and New Challenges of Financial Management–FinTech, XBRL, Blockchain and Cryptocurrencies. *Quality-Access to Success Journal*, 21(174), 159-166.
Mubarok, B. (2022). Pengaruh Motivasi dan Disiplin Kerja terhadap Kinerja Pegawai pada Badan Pengelola Pajak dan Retribusi Daerah Kabupaten Lampung Utara. *Jurnal Relevansi: Ekonomi, Manajemen dan Bisnis*, 6(2), 1-13.
Murray, A., Kuban, S., Josefy, M., & Anderson, J. (2019). Contracting in the smart era: The implications of blockchain and decentralized autonomous organizations for contracting and corporate governance. *Academy of Management Perspectives*(ja).
Navimipour, N. J., Milani, F. S., & Hossenzadeh, M. (2018). A model for examining the role of effective factors on the performance of organizations. *Technology in Society*, 55, 166-174.
Nyame, G., Qin, Z., Obour Agyekum, K. O.-B., & Sifah, E. B. (2020). An ECDSA approach to access control in knowledge management systems using blockchain. *Information*, 11(2), 111.
Parela, E. (2022). Pengaruh Pengembangan kompetensi dan Pengembangan Kompetensi terhadap Budaya Kerja Pegawai pada Kantor Kecamatan Semaka Kabupaten Tanggamus. *Jurnal Relevansi: Ekonomi, Manajemen dan Bisnis*, 6(1), 42-56.
Perera, S., Nanayakkara, S., Rodrigo, M., Senaratne, S., & Weinand, R. (2020). Blockchain technology: Is it hype or real in the construction industry? *Journal of Industrial Information Integration*, 17, 100125.
Peters, G. W., & Panayi, E. (2016). Understanding modern banking ledgers through blockchain technologies: Future of transaction processing and smart contracts on the internet of money *Banking beyond banks and money* (pp. 239-278): Springer.
Pramono, A., & Safarini, N. (2022). Pengaruh Pengembangan Karir dan Motivasi Kerja Terhadap Kinerja Pegawai pada Kantor Kecamatan Kota Agung Kabupaten Tanggamus. *Jurnal Relevansi : Ekonomi, Manajemen dan Bisnis*, 6(2).
Putra, N. P. (2022). Pengaruh Kepemimpinan dan Motivasi Kerja terhadap Kinerja Pegawai pada Dinas Pengendalian Penduduk dan Keluarga Berencana Kota Bandar Lampung. *Jurnal Relevansi: Ekonomi, Manajemen dan Bisnis*, 6(2), 14-29.
Rezaee, M. (2019). Opportunities of blockchain technologies in closed-loop supply chain management.
Savelyev, A. (2017). Contract law 2.0:'Smart'contracts as the beginning of the end of classic contract law. *Information & communications technology law*, 26(2), 116-134.
Seppälä, J. (2016). The role of trust in understanding the effects of blockchain on business models.
Smith, W. K., Gonin, M., & Besharov, M. L. (2013). Managing social-business tensions: A review and research agenda for social enterprise. *Business Ethics Quarterly*, 407-442.
Sulkowski, A. (2018). Blockchain, business supply chains, sustainability, and law: The future of governance, legal frameworks, and lawyers. *Del. J. Corp. L.*, 43, 303.
Wang, Y., Singgih, M., Wang, J., & Rit, M. (2019). Making sense of blockchain technology: How will it transform supply chains? *International Journal of Production Economics*, 211, 221-236.

Zahedi, M., Akhavan, P., & Naghdi Khanachah, S. (2020). Identifying the Key Barriers to Knowledge Management and Lessons Learned in the Project-Based Military Organizations. *MILITARY MANAGEMENT QUARTERLY*, 19(76), 29-68.

Zahedi, M. R., & Khanachah, S. N. (2019). The impact of customer assisted knowledge production capacity on customer capital in a knowledge-based center. *Annals of Management and Organization Research*, 1(2), 107-121.

Zahedi, M. R., & Khanachah, S. N. (2020). The effect of knowledge management processes on organizational innovation through intellectual capital development in Iranian industrial organizations. *Journal of Science and Technology Policy Management*.