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Providing a supply chain financing model based on block chain technology

Alireza Ouriat
PhD Student, in Industrial Management, Department of Industrial Management, Roudehen Branch, Islamic Azad University, Roudehen, Iran
(Email: a_ouriat@yahoo.com)

S. Alireza Mirarab Baygi
Assistant Professor, Department of Financial Management, Roudehen Branch, Islamic Azad University, Roudehen, Iran
(Email Mirarab_alireza@yahoo.com)

Saber Khandan Alamdari
Assistant professor, Department of Industrial Management, Roudehen Branch, Islamic Azad University, Roudehen, Iran
(Email: sabersum@yahoo.com)

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ABSTRACT

The purpose of this research is to provide a supply chain financing model based on block chain technology, relying on the views of experts related to the field of electronic education at the level of higher education institutions of the country. The current research is practical in terms of purpose; In terms of the method of data collection, it is descriptive-exploratory and in terms of the nature of the data, it is qualitative and quantitative. Based on this, first, with the aim of collecting qualitative data, after reviewing the literature related to the research topic, a framework for posing questions for interviews with experts was formulated. In the following, using the judgmental purposeful sampling method, the opinions of 15 experienced executive experts in Digi kala Company and academic experts familiar with block chain technology and financing were used until the theoretical saturation stage. The conducted interviews were coded with Clark and Brown's six-step inductive theme analysis method. Based on this, 63 cases of speech evidence identified from the text of the interviews were labeled in the form of 17 primary codes. Then, the primary codes were categorized into five sub-themes and finally, two main themes. In the following, in order to validate the results of the interviews and confirm the research components, from the questionnaire and the fuzzy Delphi method, and for the theoretical validation of the research model in terms of comprehensiveness, uniqueness, coherence and integrity, as well as appropriateness, from the questionnaire tool and direction Its analysis was done using t-test and SPSS software. Based on the results of the research in the Delphi section, all five sub-themes or questions of the Delphi questionnaire were approved by the research experts. The results of the sample T-Tech test also confirmed the theoretical validity of the research model in terms of the aforementioned four characteristics. Based on this and according to the characteristics counted in the mentioned stages and because the interviewees mentioned the registration and publication of the order in the block chain network, the process of digital financing, sending, data and also the smart contract, and also in Considering the main purpose of the research, the financing platform of the supply chain and the block structure, as the main themes of the research were determined and the final model was presented.

Keywords: financing, supply chain, block chain.

1. Introduction

Data analysis is done in order to understand the facts and concepts of the research. Analysis means classifying, organizing, processing, manipulating and summarizing data in order to find answers to research questions and research hypotheses. The purpose of analysis is to reduce the data in an understandable and interpretable form, so that the relationships of various variables related to the research problem can be studied. After the research problem is defined and the stages of the research method, specifying the appropriate data collection tools and using them, it is time to analyze the collected data. Data analysis is a multi-step process in which the data obtained through the use of collection tools; They are summarized, coded and categorized and finally processed to provide the basis for various analyzes and the connection between these data in order to answer the research questions.

The dominant factor in the success of the supply chain financing model is to enable the components of the chain to act in concert with each other and accelerate the flow of cash throughout the supply chain ecosystem (Delgi et al., 2020). In the meantime, block chain technology as a committed decentralized technology, without the need for peer-to-peer trust, can provide decentralized services and speed up business processes; Reduce financing costs and create more effective results (Wang et al., 2019). By creating a new perspective for cooperation between supply chain participants, block chain technology provides a mechanism for individuals and organizations to exchange information and transfer value through the Internet (Fan, 2018). With a supply chain financing program that uses the capabilities of block chain technology; information exchange across the chain; It is secure, verified and trusted, so that all members of the supply chain can access this information at any time. Also, the automatic validation mechanism and transaction execution using smart contracts can be implemented in the block chain platform (Delgi et al., 2020).

Considering the above-mentioned cases and since the competition is getting tougher and shareholders and stakeholders are constantly demanding better performance from the company's leaders than their peers, more opportunities to create value in the company's supply chain are needed. Along with tighter liquidity conditions, organizations increasingly insist on ensuring a stronger focus on supply chain financing and working capital optimization. However, there are challenges when implementing this hypothesis. On the one hand, the available traditional trade financing solutions are either costly themselves or are likely to be in the interests of a particular company, while the total costs and risk of the entire supply chain are rising and increasing, and on the other hand, the dominance of existing manual processes and paper methods of procurement Commercial finance in organizations and insisting on maintaining the status quo, introducing new solutions

2. Theoretical framework and literature review

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Panoparb (2019), in his research entitled "Cost-benefit analysis of block chain-based supply chain financial solution" using cost-benefit analysis, the net value of implementing block chain technology in financial order Checked the supply chain. For this purpose, a cost-benefit model was created and operational processes were proposed to analyze the parameters used in the model in 3 scenarios. Also, the model was applied to a case study in the real world. The results show that block chain technology may increase the net profit of parties involved in supply chain financing as a result of improving the efficiency of invoice processing. According to the supplier's point of view, if the amount they pay for the platform fee is less than the working capital profit, they will have an advantage. Therefore, the provider must carefully consider whether the net profit it earns is financially reasonable to pay for the platform. In the case study, the net profit of the supplier using the smart contract-based supply chain financing solution (scenario 2) is lower than the supplier using the traditional supply chain financing solution (scenario 1). This means that it is not logical to change the supplier source from the traditional system to a smart contract-based supply chain financing solution. However, the economic shift from the traditional system (Scenario 1) to the Internet of Things (IoT) system of block chain-based supply chain financing is cost-effective (Panoparb, 2019).

Imran et al. (2017), in a research entitled "Block chain-Based Supply Chain Finance: A Conceptual Framework from the Buyer's Perspective", showed how companies can use block chain technology to manage their financial flows through the supply chain. to benefit from the provision. In fact, the main goal of this research is to develop a conceptual framework for supply chain financing (SCF) solutions based on block chain, which strengthens the coordination in buyer and supplier relationships and the existing inefficiencies in the implementation of discrete tools of supply chain financing, such as It eliminates the reverse invoice and dynamic discount. A conceptual approach was taken to identify the drivers of value and the value drivers of block chain technology were introduced to provide unique characteristics for its application in the context of supply chain finance. In order to answer how these value drivers of block chain technology improve supply chain financing solutions, two methods in supply chain financing were investigated with reference to reverse factoring and dynamic discounting. As a result, a conceptual framework based on supply chain collaboration was developed to define the technological requirements for supply chain financing measures. The results showed that interoperability, trust and robustness are the main factors of block chain technology compared to conventional information technology (IT) infrastructure. In this research, with a close look at dynamic discounting, block chain technology was compared with conventional information and communication technologies (ICT) using the ability level of structure, functions and dynamics. While conventional and centralized technologies show higher efficiency in terms of quantitative factors, including responsiveness and speed, block chain technology enables more qualitative aspects in dynamic discounting. The choice for block chain technology or conventional solutions strongly depends on the individual supply chain configuration and the initial trade-off between quantitative and qualitative factors (Imran et al., 2017).

Fathullah and Najafi (2015), in a research entitled "Development of the financial management model of the supply chain and chain financing" to examine the evidence and practical experiences in this field and provide a framework for the effective use of the financial flow management system and also Its principles and basics were discussed. For this purpose and by using the fact-finding method, first by explaining the literature on the subject and also examining the experiences of some reputable banks regarding the use of supply chain financial management system and chain financing, the practical experiences of this subject were identified, explained and organized. Then, following the investigations carried out, a conceptual framework was presented to explain the function of the financial management system of the supply chain. Also, in order to check the accuracy and reliability of the results, the framework of the proposed system was evaluated in the form of specialized panels by experts and banking industry experts of the country (Fathullah and Najafi, 2015). Taleghani and others (2012), in a research entitled "Supply chain financing (SCF) as a new way of financing small and medium enterprises (SMEs)" mainly to examine and explain the importance of SCF and SME and How to solve the financing problem by financing the supply chain as a new method of financing through debt. And according to the results, they stated that considering that supply chain financing is a concept based on supply chain management,

effective supply chain management requires a different approach to business implementation compared to what companies did in the past. is Especially, the coordination and transfer of information between different departments that manage different elements of the supply chain is a key factor. A comprehensive approach to cash management increases process efficiency through the use of electronic invoicing and electronic payments. Financial departments should be innovative in providing ways to increase financing and liquidity management. Also, by using electronic data transfer, companies can increase their competitiveness, free up their working capital and reduce risk. Companies that are confident that their internal processes are in line with new opportunities will benefit from countless benefits (Taleghani et al., 2012).

3. Research Methods

The current research is applied in terms of purpose, descriptive-exploratory in terms of inference method, and qualitative and quantitative in terms of the nature of the data. The current research community consists of experts in the field of electronic education in higher education institutions. In this research, the non-probability snowball method is used to select the desired people. For this purpose, after a complete review and identification of managers and experts related to the research topic, the research expert community was determined by 15 people. In this research, a mixed method (qualitative and quantitative) was used. In the qualitative part, in order to collect data and information, interviews were used and theme analysis method was used for analysis. Based on this and in the first phase, with the aim of collecting qualitative data, after extensive review of the literature related to the research topic, a framework was developed for asking questions of interviews with experts. In the following, 15 experienced executive experts in higher education institutions of the country and familiar with e-learning were selected through the purposeful sampling method (snowball). After revising the initial questionnaire using the opinions of professors and experts, the final version was designed. And the research experts are asked to express their opinion regarding the indicators that were identified based on the interview, and were placed in the structure of the model, and also add other possible factors to the list. Accordingly, at this stage, the questionnaires distributed among the experts were first collected. After collecting the completed questionnaires, which were 15 questionnaires, the aggregation and de-fuzzified value of each question was calculated and analyzed. By examining the results of Delphi questionnaire calculations, it was determined that the diphasic value of all the research questions is greater than the threshold value (0.7 value), so all 12 sub-themes or questions of the Delphi questionnaire were approved by the research experts and a new variable was also added. Not suggested. Accordingly, the Delphi process was stopped and the validity of the research model was confirmed. At the end, in order to prioritize the components of the research model, the questionnaire and fuzzy hierarchical process (FAHP) were used. And finally, spss software and T test were used for data analysis.

4. Methodology

Research findings Deter mining the main themes and drawing the research model At this stage, the main theme of the research is determined, the results of which are summarized in the qualitative section (theme analysis) in Table 1. Table 1: Summary of the results of the current research in the qualitative section (theme analysis) The main theme is the sub-theme Initial code Verbal evidence (the number in parentheses indicates the code of the interviewee) The supply chain financing platform, order registration and publication in the block chain network, order registration in the block chain network, purchase or supply order registration, is registered on a smart contract platform and only in the block chain network (R1). Order registration in the block chain network is done using peer-to-peer (P2P) transactions (R4). In the off-chain registration in the block chain, the two parties to the contract (supplier and buyer) agree with each other outside the block chain space, and a third party is identified to confirm the transaction. These transactions must be registered in the block chain network and the third party is the guarantor of the contract (R7). By using a digital signature instead of a real name, a purchase or supply request is registered using a unique digital signature (R11). Dissemination of orders in the block chain network Dissemination of orders in the network indicates the lack of centralization of information and distribution of data among all stakeholders in the supply chain (R2). One of the characteristics of the block chain network is the absence of a central controlling entity. Therefore, orders are published in the entire supply chain, and control is done publicly by all members of the supply chain (R3). Any member of the supply chain, wherever he has access to the Internet, can be aware of new events in the supply chain at the moment (R9). The digital financing process of determining the cost and payment in an encrypted form due to the smartness of the network, the cost is transferred directly and without intermediaries to the members according to their level of supply (R5). Supply chain financial management platform includes several main components such as banks, suppliers and buyers. that by designing a network-based smart contract, the cash

flow related to payment can be managed (R6). Chain financing models by optimizing working capital through the management of three components of accounts payable, accounts receivable and inventory, affect the performance of the company and enable the members of a supply chain to access financial resources at a cost. It provides less and more speed as well as security through encrypted payment process (R7). Money transfer in this network is done only between two parties (supplier-buyer) and without any intermediary, this type of transaction is encrypted and untraceable (R7). Due to the specificity of the block chain network for the company, the cost of financial transactions and in general cash flows in the supply chain is zero (R10). By defining rules in the form of a smart contract, the cost of the provided goods can be received by the customer after receiving them, which must be agreed upon according to the required cash flow (R14).

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6. Presentation of the research model

At this stage, according to the results of the research in the qualitative part (Table 1) as well as the tide of the identified components, the research model is drawn. In the present research and in the qualitative part, in order to collect data and information, interviews were used and for analysis, the method of theme analysis was used. Based on this and with the aim of collecting qualitative data, after reviewing the literature related to the research topic, a framework was developed for asking questions of interviews with experts. In the following, 15 experienced executive experts in Digi Kala Company as well as academic experts familiar with block chain technology and financing were selected through a judgmental sampling method. In the second phase, the conducted interviews were coded using Clark and Brown's six-step inductive theme analysis method. Based on this and during the data familiarization stage, the identified speech evidences (63 cases) from the text of the interviews were labeled in the form of 17 primary codes. Then, the primary codes were categorized into five sub-themes and finally, two main themes. Further, the fuzzy Delphi method was used to validate the identified components. The results of the Delphi survey showed the confirmation of the identified factors. Finally, according to the results of the current research, the

supply chain financing model based on block chain technology has been presented according to Figure 1.

7. Findings

Theoretical validation of the research model using a sample t-test In this part, the results of the analysis related to the validity of the proposed structure of the research model are presented. In fact, these results include analyzes related to the structure of the research model (the supply chain financing model based on block chain technology). The questions in this section are designed to give respondents the space to use the options "very little", "little", "a lot" and "very much" in relation to the structure of the axes and constituent domains. They comment. The questions related to this section as well as the analysis of each answer are given below. First question: To what extent is the proposed model for supply chain financing based on block chain technology comprehensive (according to all indicators)? The results related to the validity of the comprehensiveness of the research model are presented in this section and the validation of this section is evaluated based on the relevant question. Out of fifteen respondents, 12 people gave a positive and very high answer and 3 people voted for the high option. As a result, the percentage of positive answers is equal to 80%. Table 3: Validity of comprehensiveness of the research model 0.95 confidence interval, the difference in the mean level of significance, df t, comprehensiveness of the research model up down 03/4 57/3 8/3 0000/35 14 546 In order to check the comprehensiveness of the research model, a sample has been used according to experts and the T-Tech test. The results show that at the error level of 0.05, the obtained t value is equal to 35.54 and the significance level is equal to 0.000. Based on this, the opinion that the research model is comprehensive is confirmed by the experts. to be Second question: To what extent is the presented model unique (assigning each index to a component)? The results related to the uniqueness of the research model are presented in this section and the validity of this section is evaluated based on the relevant question. Out of fifteen respondents, 11 people gave a positive and very high answer and 4 people voted for the high option. As a result, the percentage of positive answers is equal to 73%. Table 4: The results related to the uniqueness of the research model 0.95 confidence interval, the difference in the mean level of significance, df t, the uniqueness of the research model up down 3/99 3/48 31/588 31/14 0000/3 733

In order to check the uniqueness of the financing model of the supply chain based on block chain technology, according to the experts and the T-Tech test, a sample has been used. The results show that at the error level of 0.05, the obtained t value is equal to 31.58 and the significance level is equal to 0.000. Based on this, the statement that the research model has the unique feature of The opinion of experts is confirmed. Third question: To what extent does the presented model have internal coherence and uniformity (the homogeneity of the indicators of each component)? The results related to the coherence and uniformity of the research model are presented in this section and the validity of this section is evaluated based on the relevant question. Out of fifteen respondents, 11 people gave a positive and very high answer and 4 people voted for the high option. As a result, the percentage of positive answers is equal to 73%. Table 5: Results related to the coherence and uniformity of the research model The confidence interval is 0.95, the difference between the mean significance level of df t, coherence and uniformity up down 3/95 3/67 3/56 001/0 14 21/258 In order to check the coherence and uniformity of the supply chain financing model based on block chain technology, according to experts, a sample T-Tech test has been used. The results show that at the error level of 0.05, the obtained t value is equal to 21.25 and the significance level is equal to 0.001. Based on this, the statement that the research model has the characteristic of coherence and uniformity, The opinion of experts is confirmed. Question 4: To what extent is the model designed to finance the supply chain based on blockchain technology, appropriate to the current needs and vision of the organization being studied? The results related to the appropriateness of the research model with the current needs and the perspective of the studied organization are presented in this section and the validity of this section is evaluated based on the relevant question. Out of fifteen respondents, 12 people gave a positive and very high answer and 3 people voted for the high option. As a result, the percentage of positive answers is equal to 80%. Table 6: The results related to the appropriateness of the research model with the current needs and prospects of the studied organization 0.95 confidence interval, the difference in the mean significance level of df t fit with the studied organization up down 03/4 57/3 8/3 0000/35 14 546 In order to check the opinions of experts regarding the appropriateness of the research model with the current needs and prospects of the studied organization, a sample T-Tech test has been used. The results show that at the error level of 0.05, the t level obtained is equal to 35.46 and the significance level is equal to 0.000. Based on this, the comment that the research model is suitable for the current situation and organizational perspective. has, it is confirmed by experts. The results obtained from the implementation of a four-question questionnaire for the theoretical validation of the research model are such that

according to the data obtained from the questionnaire as well as the analysis resulting from it, all the questions and data are approved by the experts. Based on this, the research model is valid and can be used as a basis for financing the supply chain based on block chain technology.

8. Conclusion

In order to discuss and conclude; At first, the findings of this study are presented and the results are discussed by reviewing related and peripheral studies. In the present research and in the qualitative part, in order to collect data and information, from interviews and to analyze using the theme analysis method. (subject), used. Based on this and with the aim of collecting qualitative data, after reviewing the literature related to the research topic, a framework was developed for asking questions of interviews with experts. In the following, 15 experienced executive experts in Digi Kala Company as well as academic experts familiar with block chain technology and financing were selected through a judgmental sampling method. In the second phase, the conducted interviews were coded using Clark and Brown's six-step inductive theme analysis method. Based on this and during the data familiarization stage, the identified speech evidences (63 cases) from the text of the interviews were labeled in the form of 17 primary codes. Then, the primary codes in the form of five sub-themes including order registration and publication in the block chain network, digital financing process, sending, data and smart contract, and finally, two main themes with the titles of supply chain financing platform and block structure, classification became Next, the fuzzy Delphi method was used to validate the identified components. The results of the Delphi survey showed the confirmation of the identified factors. Finally, according to the results of the current research, the supply chain financing model based on block chain technology has been presented according to Figure 1.4. In the following, the theoretical validation of the research model in terms of comprehensiveness, uniqueness, coherence and integrity, proportionality, using the questionnaire tool and for its analysis from the sample T-Tech test and SPSS software, use, and the mentioned cases It was approved by experts. In the following, to explain the results of the research, the following materials are presented: The use of block chain technology in supply chain finance has the potential to change the way companies do business. The model presented in this research (Figure 1) shows how a block chain works or can work specifically in the field of supply chain financing. The blocks that make up the block chain contain the data that triggers a smart contract. Thus, the development of the block is created from the request of a new transaction through the addition of the completed block to the chain of previous blocks. According to what was said and as it is also stated in the research model (Figure 1), it can be concluded that a block chain-based supply chain financing program should have two main baselines between the supplier and the buyer. , consider: (1) Information exchange at any time in the supply chain that is secure, verified and reliable, so that all members of the supply network can access this information at any time. (ii) automatic validation and execution of trusted transactions influenced by certain criteria established by a smart contract; In this regard, the review of aligned and peripheral studies confirms that the uncertainty involved in decision-making and financing participation between supply chain members can be reduced by building trust (Gross and Treblemeyer, 2021).

Trust also facilitates more confrontation in goal setting and problem solving. Also, trust in supply chain members, as a cooperative governance mechanism in financing, can be used to create value as well (Kouah-Vas and others, 2015). In the meantime, block chain has the potential to create end-to-end transparency that gives companies in the supply chain the confidence they need to successfully finance. This is while block chain, by its very nature, removes the need to establish trust from the network because data cannot be faked. Block chain has actually been described as a trustless system (Glasser, 2017) because it uses smart contracts and distributed ledgers to ensure that processes occur and are done correctly. Block chain certainly makes it possible to distribute trust throughout the network because in it, the need for a high level of trust in the units involved in the supply chain process is confirmed and immutable as a block, and transactions are controlled by the system itself. (Zhou et al., 2019). Based on this, the researchers in this study tried to provide a practical model for the use of block chain and then, using the opinions of experts, confirm its potential, while addressing concerns and criticisms about the immaturity of the technology, etc. were paying attention Therefore, it is important that managers consider the imperatives of using block chain technology in the financing of their organization's supply chains. In this regard, using the model presented in this research can be helpful in the following cases: All members of the supply chain can see the status of resources, products, exchanges and financial transactions during the financing process from one company to another, and since information cannot be manipulated in the block chain and exchanges are made on the basis of smart contracts. there is no special mistake. Due to the ineffectiveness of information transfer in the supply chain, a lot of money is lost, and this issue is more important in industries whose products are damaged and spoiled.

Using the model presented in the research helps companies to identify high-cost items and use the methods of saving financing in a smart way. The supply chain financing model based on block chain technology presented in this research can also eliminate the cost of money transfer fees through banks and other money transfer methods. The cost of these fees is included in the calculation of the final price and profit of the products, and removing them increases the profit and lowers the final cost for the customer, and ultimately improves the efficiency of financing.

One of the most significant problems of the current supply chain is the inability to integrate and unify information for all members of the chain. Providing a supply chain financing model based on block chain technology is designed as a distribution system that provides a transparent and specific storage location for data storage. Each member of the chain adds new data to the block chain and its correctness and validity are confirmed with smart contracts. This means that all members of the supply chain financing in all companies and stores have access to the information and can confirm its validity and correctness at any stage. - Many companies in the supply chain use the electronic information exchange system to send business information to each other; However, this information is delayed and does not reach the companies at the same time as the products are sent. If product shipments are experiencing problems or prices are constantly changing, supply chain members receive this information in subsequent electronic information exchange packets. By using the supply chain financing model based on block chain technology, the information is continuously updated and can be transferred to the companies in the supply chain at any time. Having only one true version is very important for sharing supply chain documents. Necessary documents and contracts can be provided to people in providing supply chain financing based on block chain technology and the digital signature system in the smart contract; There for, as a result of this action, all partners have access to the original and original version of the contract and documents. Block chain ensures the immutability of contracts and agreements, and the terms of the contract can only be changed if all partners reach a collective agreement. Despite this system, companies and institutions spend less money and time on lawyers and going to the contract and negotiation table, and a large amount of paperwork is eliminated; As a result, companies can spend more time on further product development and business growth.

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