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How Blockchain Technology can add Value in Project Management Information System (PMIS)

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A R T I C L E   I N F O

A B S T R A C T

This paper focuses on one of the rapid evolving technologies – Blockchain technology. The blockchain technology is one of the efficient technologies that will help the organizations in managing the various industry challenges related to data management. This research focuses on the use of blockchain technology that works of the principle of decentralization in the PMIS. In this context, a qualitative research has been conducted with the help of interviewers. The findings of the qualitative research indicated that blockchain technology has now become a major need of the project based organizations with the increasing threat of data loss, data tempering and attacks etc. The blockchain technology in PMIS will help in ensuring the integrity and value of the data along with ensuring a systematic communication among the stakeholders involved in the project. The findings also indicate that the blockchain will equally distribute the power among the stakeholder and improving the effectiveness of project in terms of meeting the time, cost and quality objectives. Lastly, the paper recommends that there is a critical need of blockchain experts and personnel who can effectively use this technology not only in PMIS but other areas as well such as the banking and finance. The training and development of the people in the area of implementing and integrating the blockchain technology with the information systems has an important relevance.

1. INTRODUCTION

The blockchain is one of the undeniable ingenious inventions that are positively influencing a number of industries. A blockchain can be defined as the chain of blocks that are the list of records that are linked with the help of cryptography (Velmurugadass et al., 2020). Each of the blocks in the blockchain includes a cryptographic hash associated with the previous block or the transaction data. A cryptographic hash function can be referred to as the hash function that takes a

message (input) and returns an output that is a fixed-size alphanumeric string (Stevenson and Aitken, 2019). A string is also known as the 'message digest', 'hash value', 'digital fingerprint' etc. In context of design, blockchain is specifically resistant to data modification (Othman et al., 2020). Blockchain is a distributed ledger that is open and it efficiently records the transactions between two parties in a permanent way that is also verifiable (Kassem and Martinez, 2022; M. El

Khatib et al., 2021). Blockchain is a distributed ledger that is managed with the help of a peer-to-peer network that collectively adherers to a protocol for communication (inter node) and validation of new nodes. Once the data are recorded in the block, no retroactive alteration can be done in the same without altering the subsequent blocks (Pankratov et al., 2020). The records in a blockchain are unalterable and are also secured in terms of design along with being a distributed computing system (Al-Kassem et al., 2022; Kurpjuweit et al., 2021; Wei et al., 2020).

The blockchain technology is used in different industries. This technology is potential in terms of facilitating complex financial transactions, money transfer across borders (Coyne and McMickle, 2017). This research will therefore, focus on the usage of blockchain technology in the Project management information system. A project management information system (PMIS) can be defined as the consistent and logical organization of the information that is required for executing the project successfully (Papke-Shields and Boyer-Wright, 2017). PMIS is one of the software applications that use a methodological process for collecting and using the information (Caniëls and Bakens, 2012). Project managers can use the technology of blockchain for providing solution to a number of complex problems in a project. PMIS is an integrated approach that is used for managing and distributing the project information and is widely used by the project managers across the world (Al-Kassem, 2017; A I Aljumah et al., 2022a; Jung and Wang, 2006). The paper will particularly focus on the ways in which blockchain technology can be used in the PMIS so as to improve the efficiency and effectiveness of PMIS.

The research is divided into chapters such as - literature review, research methodology, data collection, data analysis, conclusion and recommendations. The literature review chapter will focus on the past studies and articles related to blockchain and blockchain in PMIS. The research methodology chapter will focus on the research methods and techniques that will be used in the research. The data collection chapter will highlight the data that will be collected for the research. The data analysis chapter will focus on analysing the data collected with the help of primary and secondary research. The last chapter will focus on concluding the research along with providing the

recommendations.

The major objectives of this research are listed below:

1. To explore the concept of Blockchain technology
2. To determine the benefits of Blockchain technology in PMIS.
3. To determine future challenges and recommendations related to implementation of Blockchain technology in PMIS.

The major research questions of this research are listed below:

1. What is Blockchain technology?
2. What are the major advantages of Blockchain technology in PMIS?
3. What are the future challenges and recommendations related to implementation of Blockchain technology in PMIS

2. LITERATURE REVIEW

This section of the research will focus on the past studies and articles related to the use of blockchain technology in different information systems and areas. (El Khatib, 2015; Gulseven and Ahmed, 2022; Hani Al-Kassem, 2021; Nuseir et al., 2020) conducted a study on blockchain technology. The authors in the study highlighted that the blockchain technology is the technology that manages the blocks that are uniquely identified and linked in a chain of records (M. Alshurideh et al., 2022; Aziz et al., 2023; Lee et al., 2023). The findings of the study also indicated that the blockchain technology is growing faster as a distributed and shared ledger of blocks that are sealed cryptographically (Almasaeid et al., 2022; M. T. Alshurideh et al., 2023c; Blooshi et al., 2023; Farrukh et al., 2023; T M Ghazal et al., 2023a). The authors in their study have highlighted a number of advantages of using blockchain technology in a system (M. T. Alshurideh et al., 2023d). For example: a system utilizing the blockchain technology is resilient and operates as decentralized systems that do not require any central server and the risk of single point failure is also eliminated (Al-Kassem, 2014). Such systems have integrity and there is no need of a third party for transaction execution. In addition, the blockchain functionality also offers a high degree of confidence as no alterations can be made in the

transactions.

(El Khatib et al., 2020b; Nadzri et al., 2023; Nuseir and Elrefae, 2022) also conducted a study on Blockchain Technology in Business and Information Systems Research. The authors in their study indicated that blockchain technology in future will become one of the valuable enabler of both the social and economic transaction (Al-Maroof et al., 2022a; Aljumah et al., 2021a; H. M. Alzoubi et al., 2022d; Gaytan et al., 2023; Khatib et al., 2022). The distributed transaction data along with the cryptographic logic makes this technology tamper-resistant extraordinarily (Akour et al., n.d.; A. Al-Maroof et al., 2021; Bawaneh et al., 2023; E. Khatib et al., 2021; Nuseir and Aljumah, 2020). In addition, the authors have also focused on the potential of blockchain technology for the social and business arrangements such as pharmaceuticals, shipping etc.

(T M Ghazal et al., 2023c) focused on the importance of blockchain in the project management. In this context, the author has focused on the importance of blockchain technology for the industries such as insurance, finance, supply chain management, information security etc (Al-Kassem et al., 2013; Khatib et al., 2016). The article however, indicates that the blockchain technology will disrupt the normal functioning of the project based industries (M. Alshurideh et al., 2023; Alzoubi and Ahmed, 2019; Louzi et al., 2022b).

(El Khatib and Ahmed, 2018) in his another article associated with the usage of blockchain as the platform for management focused on the point that the blockchain technology is extremly helpful in context of improving the communication between project managers and other stakeholders with the help of setting a private network (Ahmed and Nabeel Al Amiri, 2022; Muhammad Turki Alshurideh et al., 2022b; Mat Som and Kassem, 2013). The blockchain technology will help the manager in communicating the important aspects of a project such as – scope, requirements, budget, deliverables, deadlines etc (Abudaqa et al., 2021; I. Akour et al., 2022; Alzoubi et al., 2019; El Khatib et al., 2021; Mohammed T. Nuseir et al., 2022). In other words, the blockchain technology will help the project managers in solving the issues that involve – intermediation, arbitration and reconciliation.

(Al-Awamleh et al., 2022; Al-Kassem et al., 2012;

Alshawabkeh et al., 2021; Alzoubi et al., 2022; Ghazal et al., 2021) in their paper focused on the use of blockchain technology in the information system. The authors in the study have considered blockchain as one of the most impactful inventions of the century that is used in several industries (Aityassine et al., 2022; A I Aljumah et al., 2022b; El Khatib and Opulencia, 2015; M T Nuseir et al., 2022a). The authors however, focused on the use of blockchain technology in the information system. One of the most important feature of blockchain technology that was highlighted by the authors is its ability associated with decentralization of transactions (Ahmad Ibrahim Aljumah et al., 2022b; Emad Tariq et al., 2022). The authors in this context have focused on the drawback of traditional information systems that are centralized in nature (R. S. Al-Maroof et al., 2021a; Nuseir and Aljumah, 2022). This particular drawback can be eliminated with the use of blockchain technology in the information system that will make the information systems decentarlized in nature (Aljumah et al., 2021b; Alzoubi et al., 2022). Blockchain technology has resulted in several developments in the area of information systems such as the human resource management systems, logistic management systems, payroll management systems, medical information systems etc. The authors focused on the need of more research in the area of blockchain technology and information system (Abudaqa et al., 2022; H. M. Alzoubi et al., 2022a; Taher M. Ghazal et al., 2023).

(Al-Dmour et al., 2023; Varma et al., 2023) in his study also focused on the need of future information systems in context of the blockchain technology. The findings of study conducted by (M. El Khatib et al., 2021) are consistent with that of (E Tariq et al., 2022) in context of blockchain technology in the information systems. The traditional information systems have also been criticized because of the centralization involved in the same. The centralized database are criticized because they are dependent highly on the network connectivity and increased interdependence (Muhammad Turki Alshurideh et al., 2022c; Amiri et al., 2020).

(Muhammad Turki Alshurideh et al., 2022a; Alzoubi et al., 2020; Khatib, 2022)in his article also focused on the importance of blockchain technology in the process of information

management. The author indicated in his article that blockchain technology is redefining the traditional business models along with changing the paradigms around transparency, accountability and data security (Muhammad Turki Alshurideh et al., 2022d; El Khatib et al., 2022; Louzi et al., 2022a). This technology can be used to manage the information of the information management systems related to different areas such as human resources, project management logistics etc. In addition, the author focused on other advantages associated with using blockchain technology in the information systems. The blockchain technology helps in preserving the integrity of the data that is logged on in the information system. The traditional information system face the issue of corrupted or the tampered data (I. A. Akour et al., 2022; Nuseira and Aljumahb, 2020). The blockchain technology is potential enough to provide a cost efficient, independent and trusted mechanism that ensures that the entries cannot be altered or deleted. The blockchain technology will revolutionize the way in which information in the information system is protected against the malicious parties or administrators who have motive of modifying or tempering the information (Akour et al., 2023; Aljumah et al., 2020). In addition to the advantage of preserving the data integrity, the author has also focused on the advantage of cost savings. In this context the findings of (M. T. Alshurideh et al., 2023a; Arshad et al., 2023; Sakkthivel et al., 2022) are consistent with that of (El Khatib et al., 2020a). The authors indicated that the blockchain technology in a system can help in achieving three major types of efficiencies such as the operational efficiency, efficient services and the economic efficiency (El Khatib and Ahmed, 2020; M T Nuseir et al., 2022b; Nuseir et al., 2021; Yasir et al., 2022).

In context of the future growth and trends associated with the blockchain technology, the author (Alshurideh et al., 2020; Nuseir, 2020) stated that the blockchain technology in future will ensure the data integrity along with maintaining the compliance standards so as to ensure profitability and efficiency of the systems in future. The blockchain technology has the potential to revolutionize the process of information management with the help of information systems (Ahmed et al., 2022; H. M. Alzoubi et al., 2022g). The blockchain technology is a type of record

system or a ledger that helps in keeping the record straight. This technology helps in maintaining the records along with preserving the integrity of the information. An unbiased blockchain also has potential to improve the trust between the parties along with strengthening the relationships (Ahmad Ibrahim Aljumah et al., 2022a; H. M. Alzoubi et al., 2022f; Mubeen et al., 2022).

The above literature review has critically focused on the blockchain technology that is used in a number of industries. The articles discussed in the literature review indicate that blockchain technology is one of the effective strategies that can be used in the information systems so as to eliminate the major disadvantages of traditional information system such as cost and centralization. The blockchain technology has also been identified as the useful technology in context of protecting the information present in the information system (Al-Maroof et al., 2022b; H. M. Alzoubi et al., 2022e). The above literature review has provided important information and deep insights related to the blockchain technology in the information systems and other areas of the organization. The findings of this section will be combined with the findings of primary research so as to answer the research questions and achieve the objectives of research.

3. METHODOLOGY

This chapter focuses on the research methodology and the techniques that will be utilized in this research. For example - research method, data collection methods, sampling design and the process followed for conducting the research.

3.1. Research method - Qualitative versus Quantitative techniques

There are two types of research methods – qualitative research and quantitative research method.

- *Qualitative research:* is the research method that focuses on developing the understanding on social and human sciences along with determining the feelings and thinking of people. Qualitative research relies on the written data or the verbal narratives. Qualitative research is the research that provides an in -depth understanding and insight of a problem setting. Qualitative research is an

exploratory and unstructured method of research. The qualitative researches help in generating the hypothesis or ideas for quantitative research. In this form of research, more weightage is given to participant's views (Key Differences, 2016).

- *Quantitative research:* is the research method that focuses on generating the hard facts and numerical data with the help of mathematical technique, logical and statistical techniques. The research method focuses on establishing a relationship between the variables of the study, specifically the cause and effect relationship with the help of statistical methods, computational and the mathematical models. Quantitative research is also known as the empirical research in which the data are presented in the form of tables and graphs. In a quantitative research, tables and graphs are used for analysing the results (R. S. Al-Maroof et al., 2021b; Aljumah et al., 2023).

For this particular research, where the focus is on exploring the concept of blockchain technology in Project Management Information System, qualitative research will be used. Qualitative research will help in gaining an in- depth knowledge and information about the use of blockchain technology in the Project Management Information System. Qualitative research has also been chosen for this research because it is flexible in nature and is suitable for the research objectives that do not focus on finding a relationship between the variables (El Khatib et al., 2019; Nuseir, 2021). A qualitative research method has been chosen for this research because of its open- ended structure that will help in extracting the maximum information from the participants involved in the research. A qualitative research method has also been chosen because the sample size of this study is small but, there was a need of a complete description and analysis of the blockchain technology in PMIS (AlDhaheri et al., 2023; Khan et al., 2022).

3.2. Sampling design
A sample can be defined as the number of individuals selected from the overall population for the research purpose. Sampling method is the method that is used for determining the sample of the research. There are two major methods of sampling- probability sampling and the non-probability sampling. A probability sampling is the one in which the probability of inclusion of all the units of the population is equal. In the non-probability sampling, on the other hand, the probability of inclusion of all the units of the population is not equal.

In this particular research, a non-probability sampling method will be used – purposive sampling. Purposive sampling has been chosen according to the research objectives that focus on gaining deep knowledge about the research topic i.e. blockchain technology in the PMIS. A purposive sampling method is a non- probability sampling in which the sample is chosen on the basis of characteristics of the population. The purposive sampling is also known as the subjective or selective sampling. The overall goal of this type of sampling method is to focus on the population characteristics that can answer the research questions in the best manner.

The purposive sampling in this research is used so as to choose the Blockchain technology experts and the project management managers and the information system managers. These people are the core people who have a deep knowledge about the blockchain technology and its implementation. The sample size of this study is 10 experts in field of Blockchain technology.

3.3. Research Process
The experts were contacted with the help of emails. The experts were then requested to participate in the research that is related to the blockchain technology. The experts were explained about the objectives, nature and scope of the research in detail. The experts were given a choice to either accept or reject their participation in the research that would be conducted with the help of interviews. The mail was sent to 10 experts and 5 of them accepted the participation in the research. In other words, these are the participants who were willing to share their knowledge and experience related to blockchain technology. The notes were kept during the process of interview with the experts so as to critically analyse the data and achieve major objectives of research.

3.4. Data Collection

The data collection can be defined as the process of gathering as well as measuring the data for the research that will be used to answer the research questions and achieve the research objectives. In the process of data collection, the information from all the relevant sources is collected for the research. The methods of data collection can be divided into two categories- primary methods of data collection and secondary methods of data collection. In this research, both the primary and secondary methods of data collection have been used. The description of these methods is given below:

- *Primary data collection:* The primary data is the original or the first hand data that is collected particularly for the research on the basis of its research objectives. The primary data are collected by the researchers who are conducting the research. In this, the primary data from the respondents is collected with the help of interviews. Interviews can be defined as the face to face or telephonic interaction with the interviewees regarding the research objectives and research questions. The primary data were an effective means of eliciting the important information related to blockchain technology in the Project Management Information System.

- *Secondary data collection:* The secondary data are the second hand data that are collected by other researchers. The secondary data helps in providing a theoretical background to the research along with providing the knowledge about its basic concepts and theories. The secondary data included in this research also helps in increasing the overall level of research validity and reliability. In this research, the secondary data have been collected from a wide range of sources such as journal articles, website articles, books and reports.

4. ANALYSIS

This chapter of the section focuses on the analysis of the data that are collected with the help of qualitative research. Data analysis can be defined as the process of application of statistical or the logical techniques for describing and evaluating the data. (M T Alshurideh et al., 2022) in their study defined data analysis as the procedures that are used for drawing the inferences from a particular set of data. Data analysis is one of the important aspects that ensure the integrity of data in terms of accurate analysis of the findings of the research. An improper analysis of the data in research may lead to distortion of findings and may mislead the readers as well (M. T. Alshurideh et al., 2023b; T M Ghazal et al., 2023b). The methods used for analysis of qualitative and quantitative research data are different. The quantitative data are analysed with the help of statistical techniques and the qualitative data are analysed with the help of logical methods (H. M. Alzoubi et al., 2022c).

In this research, qualitative research was conducted so as to gather the qualitative data related to blockchain technology. There are different ways in which qualitative research data can be analysed such as the content analysis and the frame work analysis. In this particular research, the data collected with the help of interviews will be analysed with the help of thematic analysis. Thematic analysis is the analysis that is used for analysing the qualitative data (H. M. Alzoubi et al., 2022b; El Khatib and Ahmed, 2019). The method of thematic analysis focuses on examining and recording the patterns or the themes in a given set of qualitative data. Themes across the data are identified and described so as to answer the research questions and achieve the objectives of research. According to (Aljumah et al., 2023; Alzoubi et al., 2021) defined thematic analysis as the method that is used for identifying, analysing and reporting the patterns in the given set of data.

A thematic analysis has been chosen for this research because it is one of the simple and effective ways of analysing the data without any complexity. This data analysis method is flexible and allows to gain an in -depth knowledge of the research topic. The thematic analysis will help in gaining a deep knowledge about blockchain technology in PMIS, its benefits, challenges and other aspects.

The discussion below will focus on the detail description of the themes that have been determined from the data collected from the interview of blockchain experts. The responses of the interviewees have been divided into several themes so to analyse the data with help of a thematic analysis.

4.1. Blockchain Technology and Information Management

One of the first themes that were obtained from the interview data is the blockchain technology and the information management. The interviewees were asked about the role of blockchain technology in managing the information. The responses of the interviewees were consistent in terms of the benefits for using the blockchain technology in managing the information. One of the respondents Mr Abdulla Abass working in Abu Dhabi Islamic Bank (ADIB) in this context stated following:

"*Yes, Blockchain technology is one of the revolutionizing technologies that can be used in number of industries including the information management. This is because it offers an ability to encrypt the data and ensure the integrity of data.*"

Another respondent Mr. Emad Al sherbaji working in Al Mashreq Bank for the same question stated following:

"*There is no doubt that blockchain technology that evolved from the bitcoins has revolutionized the way in which information is managed and stored. This technology helps in storing the data in the form of ledger along with preventing the issues such as hacks and data leaks.*"

Mr. Ahmed AlJasmi is one of the respondents of interview whose working in Dubai municipality provided important and deep insights associated with the role of blockchain technology in managing the data. The respondent stated that:

"*yeah Blockchain technology is revolutionizing because of its "sweet spots". One of the most important and useful sweet spots is its ability to offer an integrity and confidence related to data. In addition, this technology also improves the traceability of data.*"

4.2. Principle of blockchain technology

The interviewees were then asked about the major principles of the blockchain technology that are making it a revolutionary technology. In this context, the interviewees provided a view of the major principles of this technology. One of the interviewees focused on the principle of decentralization. The principle of integrity was highlighted in the responses of interviewees in the above questions. In this question, respondents focused on other principles related to blockchain technology. One of the respondents Mr.

Mohammed Obaid Al Ramithi who's working in National Electronic Security Authority (NESA) stated that:

"*There are number of principles on which the blockchain technology works. One of which is "decentralization". Decentralization in simple words indicates that the blockchain technology works on the mechanism of decentralization that free from hacks and frauds. The power in a decentralized system is distributed among the participants in the network. This is the reason this technology is best for the information systems*".

Another respondent Mr. Emad stated that:

"*I think one of the most important principles of blockchain technology is the high level of security as well as authenticity offered by the blockchain technology. This is possible with the power of cryptography. This technology is fair for everyone using it.*"

Once the principles of decentralization and integrity have been highlighted by the interviewees another principle highlighted by an interviewee was the principle of security.

Mr Mohammed stated that:

"*There is no central point in a blockchain technology system that is the major cause of failures, fraud and damage. A single point could damage the overall system or the chain of network. The data in the system involving a blockchain technology is protected with the help of encryption mechanism.*"

The above questions helped in gaining a clear understanding of the basic concepts and principles associated with the blockchain technology especially, in terms of managing the data. The questions were further asked about the efficiency and application of the technology in PMIS (Project Management information system). The respondents were asked that why blockchain technology is a trusted technology. In this context, one of the interviewees Mr. Abdulla Abass stated that:

"*Undoubtedly, blockchain technology is a trusted approach that is gaining momentum and will soon become a technology that will be accepted worldwide. This is because the blockchain offers the advantage of transparency, storage and privacy.*"

Another interviewee Mr. Ahmed Al Jasmi for the same question indicated that:

"*Yes of course blockchain technology is a trusted approach because it offers that advantages such as decentralization that are demanded since long. The*

role and importance of data and information has increased significantly. The organizations are using the management information systems for different departments such as the human resource management system, project management system etc. The blockchain technology is extremely beneficial for such organizations."

The interviewees were further asked about the use of blockchain technology in the PMIS (Project Management information system). The interviewees offered different insights associated with the same. One of the interviewees indicated that blockchain technology can be used successfully in the PMIS.

In this context, Mr. Ali Alhammadi is one of the respondents working in Department of Urban Planning and Municipalities in Abu Dhabi stated that:

"Blockchain technology is a technology that is used in a number of areas and industries and it can be used in the project management information system too. The technology is known for its abilities associated with offering the data security, integration, transparency etc. These abilities will help in managing the project information system effectively according to the needs to customers and without the fear of data tampering and leakage. In addition I think the blockchain technology will also help in improving the quality of governance in the information system along with minimizing bureaucracy."

Another respondent Mr. Ahmed Aljasmi in the same context stated that the blockchain technology is an effective platform for the project management information system. In this context, the respondent stated that:

"I think that in context of project information blockchain technology can offer a technical superiority along with an operational efficiency. Technically the technology is resilient and none of the stakeholders of the project can tamper the information present in the PMIS. The blockchain technology will also help the project managers in saving the costs and reducing the time and risks in managing the information present in the PMIS."

The interview with the blockchain experts provided deep insights about the use of blockchain technology in PMIS. In this Mr. Ali stated that:

"The project managers can focus on setting a private blockchain network in the PMIS so as to communicate effectively with the stakeholders or

participants without a fear of data loss or data tampering. A timely and efficient communication between the participants of project will help in controlling the cost, quality and time of the project. Blockchain technology also helps in defining the requirements, budget, deliverables, scope and verifying and validating the transactions related to project."

The technology can help simplify any issues that involve reconciliation and arbitration. The respondents further focused on the benefits of using blockchain technology and stated that: intermediation. But, it will always be the project manager who can talk with any person regarding their concerns and provide the needed explanations. And in the end, it is the project manager who delivers the news that the project has been completed, and that the customers are happy.

4.3. Benefits of Blockchain technology

Moving further, the interviewees were asked about the benefits of blockchain technology especially in context of PMIS. The interviewees provided different but consistent responses regarding the same. Mr. Mohammed Obaid indicated that:

"If blockchain technology will be used in the PMIS it will help in creating a robust cloud storage system with important information related multiple projects without a fear or threat of human errors, data loss, attacks etc. In addition a project involves number of transactions between the parties that can be managed effectively with the help of blockchain technology. A permanent decentralized system along with the documented records will help project managers in monitoring all the factors that can have impact on the project."

"The blockchain technology is extremely beneficial in PMIS in terms of simplifying the issues related to – intermediation and arbitration. This is because the technology offers the ability to project managers to define their concerns along with providing the explanation for the same to the stakeholders. This will also help in increasing the satisfaction of the customers."

Once the basic concept and benefits of blockchain technology were determined, the focus was on exploring the major challenges associated with using the technology in PMIS. The interviewees provided an in- depth view of the challenges associated with implementing blockchain technology in PMIS. In this context, Mr.Ali stated

that:

"It is true *that the blockchain technology offers number of benefits if implemented effectively in the PMIS. There are however some challenges that should be considered before adopting the blockchain technology for the PMIS. The initial cost of adopting this technology is high. The software that is used for run the blockchain technology has to be customized and therefore it becomes expensive. The blockchain technology not only requires the expensive software but also hardware."*

In the same context, another interviewee Mr.Ahmed stated that:

"Like every coin has two faces "head" and "tail" there are two aspects of the blockchain technology – positive and negative. I have already focused on the positive aspects of the technology but we should not forget to consider their negative aspects or the challenges associated with the blockchain technology. One of which is to find the people or personnel who can manage and integrate the blockchain technology in the organization or a system such as PMIS."

Further, some other challenges associated with blockchain technology in PMIS were also highlighted by the interviewees. MR.Abdulla Abass indicated that:

"The cost of implementing such as technology is extremely high as it is difficult to find the personnel or the blockchain experts and once an organization finds such people it has to pay them extraordinarily large salaries."

Mr. Mohammed Obaid also stated that:

"it is difficult to integrate the blockchain technology with the existing information system of the organization. If an organization wants to integrate its existing PMIS with blockchain then it has to completely overhaul its existing system or it need to find an innovative ways of integrating the information system with the blockchain solution."

Lastly, the focus on interview was on determining some major recommendations for the implementation of blockchain technology in PMIS. In this context, one of the interviewees Mr. Ali stated that:

"There are many technical ways that can help in managing the challenges associated with this technology but firstly there is a crucial need of using a collaborative approach for the same, In other words the integration of PMIS and blockchain technology should be done in across the project based industries."

Another interviewee Mr.Ahmed in the same context stated that:

"A pilot project should be implemented before actually integrating the PMIS with the blockchain technology. A test on a smaller scale will help in validating the benefits and outcomes of the integration."

The above discussion has clearly presented the data collected with the help of interviews from the blockchain experts. The discussion has provided a deep insight associated with the blockchain technology along with benefits and challenges associated with integrating PMIS with the blockchain technology. The findings obtained from the interview are consistent with that of the secondary research.

5. CONCLUSIONS AND RECOMMENDATIONS

The above paper has critically focused on the blockchain technology along with its integration with the PMIS (Project management information system). In this context, qualitative research was conducted with help of interviews that were conducted with the blockchain experts. In addition, a secondary research done on this topic also helped in providing deep insights associated with the use of blockchain technology in PMIS.

The overall findings of the study indicated that blockchain technology is one of the revolutionary technologies that can help organizations across the industries in context of helping them in managing and protecting their data along with improving their overall efficiency. The findings of primary and secondary research are consistent in terms of benefits of blockchain technology in PMIS. (M. El Khatib et al., 2021) indicated that blockchain technology is a revolutionary technology in context the way it manages and protects the data from external threats such as frauds, attacks etc. One of the interviewees also indicated in the interview that blockchain technology is the trust worthy approach. There are some major challenge associated with the implementation or integration of this technology with the PMIS, but once implemented/integrated it will provide a number of benefits to the organization.

Qualitative research conducted in this paper clearly indicated that the blockchain technology is setting the pace for using the technology that is distributed in nature rather than the traditional

centralized technology. The technological advancements and rapid changes in the information technology make it essential for the industries to adopt a decentralized or distributed system for managing their information systems that involve crucial information about the organization and stakeholders. Blockchain technology in the PMIS will help in providing a database that is secured, shared and provides a true view of the organization.

Some of the major recommendations that can help in managing some of the challenges associated with the blockchain technology are discussed below:

In order to integrate blockchain technology with the PMIS, it is essential to find the blockchains from across the world who have varying degree of knowledge and experience related to the same. In addition, the industries or the organizations should focus on developing the experts of blockchain technology with the help of training and development. The challenges that have been highlighted in this research are the long-term challanges that need long- term solutions.

Further, there is a need of industry standards regarding the use of blockchain technology. The industry standards will help in encouraging the organizations in integrating their PMIS with the blockchain technology effectively along with making sure that all the regulations and compliances have been adhered.

Another important recommendation associated with blockchain technology is that the engagement with internal stakeholders should be high. This can be achieved with the help of different communication channels and engagement strategies.

In addition, it is also recommended that the future researchers should focus on the ways that can help in integrating the Blockchain technology with PMIS in the best possible manner.

The above research paper has provided deep insights associated with the blockchain technology in the PMIS along with providing an overview of the challenges associated with the same. The recommendation offered in this research can help the organizations in integrating their PMIS with the blockchain technology in the most effective manner. The challenges however, have to be managed with the help of continuous research in the area of blockchain technology. The rapidly transforming information technology world will continue to pose several challenges before the blockchain experts. Enough potential and skills should be developed in context of managing these challenges and developing new leaders and experts in the area of blockchain technology.

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