



Blockchain Technology's Status of Implementation in Oman: Empirical Study

Raqiya Ahmed Al Hilali¹ and Hothefa Shaker²

¹ Directorate of Information Technology, Department of Projects and Technical Studies, Muscat Municipality, Muscat, Oman

² Department of Information Technology, Modern College of Business & Science, muscat, Oman

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Abstract: The amount of data is increasing very fast annually due to the rapid changes in modern technology. The data becomes very huge in each organization which led to the emergence of the new concept called Big Data. Big Data creates a valuable chance for companies to maximize their outcomes by analyzing this type of data. However, there is a concern regarding user privacy in the centralized systems as they have limited control over their personal stored information and how to use it. Added to that is the need for third-party availability which is considered another security issue. Recently, new accountable systems have emerged called Bitcoin. The world started using blockchain technology by deploying the first application namely bitcoin. It is a digital currency used for trading things over the web like money in the real world. Due to the success of Bitcoin, blockchain technology has gained trust from users as it is used in various fields and services, for example, monetary institutions, Internet of Things (IoT), supply chain, election, medicinal handling, and stockpiling. The main idea of the blockchain is to establish distributed agreement in the digital online world. It opens a great opportunity for the digital economy to be more scalable than the current centralized one. There are huge wonderful features and chances upcoming with this novel technology, and the uprising in this area has just commenced. Due to the importance of this technology, this paper aims to assess the current status of implementing blockchain technology in Oman. The statistical results clearly show the weak implementation of this technology in Oman's sectors.

Keywords: Blockchain, Bitcoin, Supply Chain.

1. INTRODUCTION

Blockchain technology (BCT) is worth to be used in different industries' projects. However, the financial industry is the most beneficial of blockchain amazing outputs[1]. On the other hand, hackers or cybercriminals make use of every chance they get to practice cybercrimes[2]. There exist clear gaps between implementing blockchain as a cryptocurrency that takes into account privacy decentralization, its libertarian-rooted principles, and being a comprehensive technology that completely convinces the security, business, and the regulation needs[3].

The concept of Blockchain is not a standalone technique, but it is an integrated infrastructure that combines the Cryptography, mathematical algorithms, and economic pattern. It is a mix of a client-to-client network model and using a publicized agreement algorithm to overcome the old issue of distributed database synchronization[4].

The blockchain technologies consist of six main characteristics as below[2], [5]:

Decentralized: It is the core characteristic of blockchain, and it means that blockchain does not use any centralized nodes to operate data, as the data is recorded, stored, and updated distributed.

Transparent: It is the reason of the blockchain being trusted as each data's record is transparent to all nodes, as well as it is transparent to the update of data.

Open Source: Almost all the blockchain is open source and even the record can be examined publicly. So, blockchain technologies can be reused by programmers to create other applications.

Autonomy: As a consequence of the consensus rule, all nodes can transform or upgrade the data without any risk, the aim is to have a single trusted party to the entire system and cannot be interfered with it from any other nodes.

Immutable: All records are reserved evermore, and no one can modify them, unless one can dominate more than 51 % nodes simultaneously.

Anonymity: Blockchain technologies overcome the trust issue while transferring data from one node to another, as the



transformation can be done using only the person's blockchain address.

The previous discussion highlights the significance of BCT, and because of that, this study focuses on evaluating the status of applying this technology in the Sultanate of Oman.

Our paper is arranged in this manner; Section 2 offers an overview about blockchain and displays the major blockchain innovations in the gulf. Section 3 describes the blockchain implementation in the Sultanate of Oman, , and then it extensively describes the current blockchain innovations and the future plans. Section 4 presents the research objectives, and the sampling approach. Section 5 presents, discusses, analysis and concludes the statistical collected data. Section 6 concludes the study by displaying the limitations and the future recommendations.

2. BLOCKCHAIN IMPLEMENTATION HISTORY

Despite scholars' acknowledgment of the high significance of blockchain technology, it is still considered as an under-examined area, and not yet implemented as an imperative corporate policy across some countries' regulations. This section introduces the beginning era of blockchain technology and some major innovations in the in gulf countries:

A. *The Blockchain-based Innovations in the Gulf Cooperation Council (GCC)*

Gulf Cooperation Council (GCC) is an economic centre in the Middle East that groups six Arab countries which include Saudi Arabia, Bahrain, Qatar, Kuwait, the United Arab Emirates and Oman. The contract of GCC had been signed in 1981 and its purpose is to establish socio-economic and socio-political cooperation[6].

The interest in blockchain technology began in the Gulf countries in 2016, specifically in the UAE, Bahrain and Saudi Arabia noticeably in the field of financial and government services in different aspects, where the focus Bahrain was on studying legal aspects, and preparing the needed regulatory frameworks and legislation before launching the use of blockchain in financial services and digital documents, while UAE and Saudi Arabia focused on discovering the current and future applications of blockchain systems in the area of governmental, financial and commercial services.

This interest has recently resulted in a series of developments in the financial field and the issuance of government strategies and plans for new development projects and legislation based on the nature of blockchain technology and its effects on administrative procedures and processes used in these sectors, which means that BCT will play an influential role in the development processes in the government, commercial and financial sectors in the coming years in the Gulf states.

The blockchain-based projects that have been announced in GCC are still in initial or establishment stages and a few of them are in the experimentation and testing stage, due to the

novelty of the technology and the related need of core changes, rules, laws, business structure, and relationships between sectors. Despite this, the implementations of blockchain applications are expected to increase and expand in the coming years, especially in UAE, Saudi Arabia, and Bahrain, as a result of the currently available achievements, like the rise in indicators of infrastructure readiness of information technology and the development of electronic governments in the gulf countries according to the reports of the United Nations.

This section delivers the major blockchain innovations in GCC:

Saudi Arabia is the 61st in Global Innovation Index in 2018 and the 9th rank among 47 countries in 2019 E-Government Development Index. Following are the major blockchain related innovations:

- The blockchain-based innovation of the Saudi Arabian Monetary Authority (SAMA):

Recently, the Saudi Arabian Monetary Authority (SAMA) announced the deployment of blockchain in transmitting the money to save a portion of fluidity that has been injected for the banking sector. By enrolling such technology, SAMA aims to be in line with the current trends of global banks. Such a move will allow SAMA to continue its effort in exploring and examining the new technologies and their impact on the financial scope. SAMA is one of the first central banks that examine blockchain in financial transactions. The aim of this initiative is to encourage the fintech in the Kingdom. Another initiative has been launched in cooperation between Fintech Saudi, the Capital Market Authority, SAMA Regulatory Sandbox, and an array of digital banking services and payments.

Also, Saudi Arabia has partnered with IBM and Elm to discuss the strategy for providing governmental and commercial services via blockchain. Some entities have already begun testing the use of blockchain platforms in business activities, such as the "Customs Administration" in Saudi Arabia conducting a pilot study for the blockchain in the imports systems through the marine ports using the TradeLens platform developed by IBM and Maersk. The system connects Maritime ports with factories, suppliers, exporters, and commercial parties at the local, regional, and global levels.

Moreover, the King Abdulaziz City for Science and Technology organizes and presents introductory courses and specialized training programs in blockchain applications. More ongoing plans in Saudi Arabian are on the table for discussion. The 2030 vision of KSA includes the economic reform plan using blockchain to remove the bureaucracy and increase the availability of digital services. As mentioned by Fiorenzo Manganiello, Professor in Blockchain at the Geneva Business School, KSA is the best opportunity to mine the cryptocurrency and the suitable place for applying the mining farms and cryptocurrency data centers due to the availability of the huge amount of energy which means low consumption



of electricity, more deployed mining farms and maximized profitable and ROI.

Bahrain is the 7th in Global Innovation Index in 2019 and 26th in E-Government Development Index in 2018. In collaboration with the Information and eGovernment Authority, the Economic Development Board is building a national plan for Bahrain to put the key directions for the adoption of blockchain in the public and private sectors. Examples of blockchain applications in Bahrain are:

- The General Directorate of Traffic's blockchain-based application:

It is a blockchain-based vehicle registration project. This innovation is a step towards achieving Bahrain's 2030 vision. It opens the opportunities to have a robust sustainable infrastructure, and a maintainable comprehensive production by employing the latest technologies and providing high-quality services in vehicle registration. It is a significant step for Bahrain to continue its plan of displaying the role of the private sector and being beside the technical countries. This registration system results in minimizing the cost of maintaining the basic vehicle data, providing more effective information management, and greater transparency.

- The blockchain-based academic certificates awarding system:

Recently, the University of Bahrain (UOB) launched a new blockchain application to be one of the first academic institutions that award certificates to the graduates using blockchain technology in the region. By the new system, the university achieves greater safety, and make the process of verifying the credibility of the certificate easy and applicable from anywhere in the world without the need to go back to the university. In addition, by this technology, the certificates will be protected from being falsified. This technology will provide certified digital certificates which can be easily shared with employers and even universities. It provides the organizations and individuals with lifetime ownership of the certificates without the need for registration and verification program.

- The blockchain-based customs authority system:

The Application Performance Management (APM) terminals in cooperation with operators of Khalifa Bin Salman Port (KBSP) are working in adopting the blockchain, with other different customs authorities and stakeholders. KBSP is configured with the required systems and the moment the customs authority is ready with its blockchain needs Bahrain will be enrolled at the map of Blockchain technology which is anticipated to be happening nearby.

The most important event for Bahrain is being the first country in the world to enact a law on the Negotiable electronic records which was issued by Decree-Law No. (54) of 2018. The law establishes the appropriate legal framework that supports the use of blockchain and other modern technologies in the transactions of the government and commercial sectors in Bahrain.

Additionally, the public and private institutions' infrastructures are cloud-based infrastructures, and these sectors have advanced services provided by the Amazon headquarters of the Internet Services Company located in Dubai and Bahrain. The existence of regulatory laws supports its activities in the ICT sector, such as the law providing cloud computing services to foreign parties in Bahrain according to Decree-Law No. (56) of 2018. Also, there have been notable efforts of the Economic Development Council since 2018 to develop a national strategy for blockchain applications in the field of governmental services and private sector institutions. Moreover, Bahrain institute for Banking and Financial Studies arranges specialized blockchain programs in order to increase the awareness in that area.

Qatar is the 65th in Global Innovation Index in 2019 and 51st in E-Government Development Index in 2018. Following are the major blockchain related innovations:

- Ooredoo's blockchain initiative:

The Qatar-based telecommunications group (Ooredoo) has launched the first blockchain initiative in 2019. Its objective is to support the organizations willing to adopt this technology. Ooredoo has 12 branches in different countries in the Middle East, North Africa, and South-East Asia. It is a rich company as it gained about \$8 billion in 2018. Along with customer services, Ooredoo offers broadband, cloud storage, and a 4G network for businesses and enterprises. Soon, it will launch the 5G network which plans to join with IoT and blockchain.

One article describes this initiative as "open call" since it opens the door for companies to introduce their blockchain innovations.

- The Commercial Bank initiative:

The Commercial Bank has joined the collaboration with enterprise software firm R3 to develop blockchain solutions on R3's platform namely "Corda". By Corda, the institutions can directly transact using smart contracts in high security and privacy policies. This membership shows that the commercial bank is Keen to apply modern technologies to improve customer services. It also confirms the bank's readiness to cooperate with other financial institutions to identify new ways of benefiting from blockchain technology.

Kuwait is the 60th in Global Innovation Index in 2019 and 41st in E-Government Development Index in 2018. Following are the major blockchain related innovations:

- Kuwait Petroleum Company's readiness towards blockchain implementation:

Recently, an article published by MENAFN stated that one member of Kuwait Petroleum Company (KPC) confirmed that the company is getting ready for applying blockchain to achieve security, growing productivity, as well as exploration, refining, the sale of crude oil and its derivatives. The KPC's source adds that the company will employ technical consultants in order to apply the



blockchain's pilot which will identify the quantity of the produced oil gas and the daily exchanged oil gas between companies. Then, KPS will be considered as the first firm that uses blockchain in the area of oil and gas production. KPS pursues to minimize the manufacturing time, enhance the operational quality, and maximize data transparency through the supply chain.

- Kuwait Finance House's initiative using blockchain:

Kuwait Finance House (KFH) is one of the major banks that operate Islamic banking, and it was established in 1977. Nowadays, KFH is one of the famous Islamic banking in the world. As an initiative to be in line with the developed technologies, KFH employs the blockchain system. It implemented this technology in instant cross-border remittance service using Ripple's blockchain technology. This emphasizes that KFH is catching the chances to provide the most advanced services using the highest standards of efficiency. Blockchain supports KFH to enhance customer services and achieve the bank's vision.

- E-mail blockchain-based system:

Kuwait also has opened the door for BCT to be applied by launching an email application that protects the transactions and assures its security and privacy[7].

United Arab Emirates is the 36th in Global Innovation Index in 2019 and 21st in E-Government Development Index in 2018. The UAE government had launched the blockchain strategy 2021 in April 2018. This strategy aims to transfer about 50 percent of the government transaction into the blockchain platform by 2021. This digital transaction will provide each customer with a unique number that indicates his information in the chain. Using blockchain will result in saving the time, reducing tension, easing decision-making processes, and simplify the transactions' processes for people[8]. Furthermore, Dubai government is the first gulf government that legalized the use of blockchain environment in 2018. It is one of the principles of the vision to build UAE paperless government by 2021. It integrates various digitized services to facilitate its use even by normal people. It is not a strange thing for Dubai as it is the pioneer in the developed technology[9].

Following are the major blockchain related innovations:

- Dubai's Food Watch:

From the principle of ensuring food safety, in 2017, Dubai has prefaced another important blockchain application called "Food Watch". The objective of this watch is to enable customers and quality assurance people to check and assure the food's authenticity. As the initial stage, all the institutions which offer high-risk food have to enter the related information on that platform. The future plan is to track and monitor all food from the plantation to the food table by integrating blockchain, big data, and IoT technologies[10].

- Vehicle history blockchain project:

Roads and Transport Authority (RTA) is working in a blockchain system that will allow for saving and managing the vehicle lifecycle. This project aims to provide a clear record of the vehicles' histories from manufacturing until scrapping, for the sellers, buyers, and any stakeholder. This blockchain-based program will lead to enhance transparency, provide trusted vehicle transactions, avoid disputes, and minimize services' costs. The system is a portion of Dubai 10X initiatives and is predicated to be ready by the end of 2020.

- Issuing, certifying, and auditing scientific degrees:

In the educational field, some universities and educational institutions have benefited from the blockchain applications in the development of the process of issuing, certifying, and auditing scientific degrees, As the British University of Dubai issued certificates via blockchain in 2018, with the aim of facilitating the process of certification and audit for educational institutions and business parties. This is done fast by scanning the code in the certificate through a special link (Digital Certificate) and is available on the university's website so that all information appears to be certified and verified within the blockchain network.

- Blockchain-based financial transactions:

The Abu Dhabi Securities Market signed a memorandum with central depository institutions in order to clarify the ways of implementing the blockchain and take advantage of the common transaction log in post-trading scenarios. For example, addressing institutional activities such as voting and voting by proxy, and supporting existing common standards such as ISO 2022. This agreement will contribute to setting the rules and standards required for the success of the implementation of the blockchain in the post-trading environment, leading to improve the speed and security of financial market transactions in the UAE and the gulf region. Furthermore, in 2018, Al Hilal Bank in Abu Dhabi started using the Blockchain system to sell legal instruments, some of which have reached \$500 million, which is considered the first Sukuk converting process in the world done through the blockchain in compliance with the Islamic Shari'a. This opens the way for all Islamic financial institutions in the Gulf region to integrate blockchain into their systems for development and facilitation of their financial transactions.

In addition to the announcement by telecommunications companies in the Gulf states, studying the adoption of blockchain systems in digital payments is included within their future plans to develop their services and processes. Table I summarizes the cases of currently announced projects in the field of blockchain in the Gulf states between the year (2016-2019) by sector.

3. THE BLOCKCHAIN TECHNOLOGIES IMPLEMENTATION AND PLAN IN OMAN

This section presents a brief history of Oman and then explains in details Oman's blockchain-based current implementations and the future plans:



A. About Oman

Define Oman is a member of Gulf Cooperation Council (GCC). It is located in Southwest Asia and it has strategic significant boundaries, Overlooking the Arabian Sea, Gulf of Oman, and the Persian Gulf. It is the 80th in Global Innovation Index in 2019 and 63 in E-Government Development Index in 2018. Oman is an effective member of the Greater Arab Free Trade Agreement (GAFTA) and the World Trade Organization (WTO). Furthermore, Oman's government has continued efforts to develop local and foreign investments by signing a Free Trade Agreement (FTA) with the USA. Oman plays a significant role in investments due to its strategic location connected to the markets in the Gulf, the Middle East, Asia, and Africa.

There are two sectors in Oman, the public sector which involves all organizations owned by the government, and the private sector firms that are owned by individuals. Mainly, there are 69 organizations that belong to the public sector, and more than 100 private companies.

Oman's vision is to involve all new technologies to be always beside the developed countries. To achieve that, Oman established The Government Innovation Initiative to encourage government entities in creativity and introduce their suggestions to enhance governmental performance and enhance the efficiency in different fields. This is realized by involving modern technologies like the Internet of Things (IoT), Artificial Intelligence (AI), Cloud Computing, Virtual Reality Applications, and Blockchain.

Since this paper is about blockchain technology, the following section presents Oman's blockchain-based initiatives in detail.

B. Blockchain initiatives in Oman

Sultanate of Oman has embarked on its blockchain initiative by launching Blockchain Solutions & Services Co (BSS) in November 2017 during the Oman Blockchain Symposium. The objective of this company is to encourage innovation and improve the services by using the best distributed ledger platforms and in a secure manner.

Oman has been working diligently to implement a comprehensive digitization strategy for the country. The competitions are going on to involve the blockchain applications even in the private sector as Banks in Oman, such as Bank Dhofar, are working on Blockchain with

Ripple, and BSS is in collaboration with Oman's Banking Association as well for blockchain projects. As the next important step towards a comprehensive e-Oman government, the establishment of the Omani Information Technology and Communications Group had been advertised by the Ministry of Transport and Communications (MoTC). The owner of this entity is the State General Reserve Fund. The new group consists of four entities namely Oman Broadband Company, Oman Towers Company, Blockchain Company, Space Communication Technologies Company. It also opens the door for any other related IT&C private institutions to compete and then involve as a partner if accepted by the government.

The main objective of this group is to create and build a robust investment entity for the government with a partnership of the private sector to implement IU&C strategies, as well as the 4th industrial revolution initiatives. The Group will provide a strategic and financial subsidy[11].

TABLE I. THE THREE SECTORS OF THE BLOCKCHAIN PROJECTS AND THEIR CURRENT PHASES IN THE GULF STATES.

| Sector | Under consideration | In testing / implementation | Closed / Implemented |
|------------|--|--|--|
| Government | Providing government services. (Saudi Arabia, Bahrain and UAE) | Emirates' strategy for digital transactions 2021 (blockchain). A national blockchain strategy (Economic Development Board (Bahrain)). Use blockchain platforms in managements of Customs in seaports and in coordination with Commercial sector partners. Dubai has prefaced an important blockchain application called "Food Watch". Roads and Transport Authority (RTA) in Dubai is working in a blockchain system that will allow for saving and managing the vehicle lifecycle. Kuwait Petroleum Company's (KPC) readiness towards blockchain implementation aiming to employ it in exploration, refining, the sale of crude oil and its derivatives. The blockchain-based customs | Issuing legislation and laws to support the use of blockchain platforms and transacting digital documents (Bahrain). Kuwait launched a blockchain-based E-mail system to protect the transactions and assure its security and privacy. The Qatar-based telecommunications group (Ooredoo) has launched the first blockchain initiative in 2019. Its objective is to support the organizations willing to adopt this technology. The General Directorate of Traffic started using a blockchain-based vehicle registration project. (Bahrain) |



| Sector | Under consideration | In testing / implementation | Closed / Implemented |
|-----------------------|---|---|--|
| | | authority system. (Bahrain) | |
| Financial and banking | A common Saudi Emirati digital currency for payments between banks. | Confirming the customers' data in banking services. (Know Your Customer KYC) | Issuing the license for using the blockchain platforms and joining its banking alliances in central banks and monetary institutions. |
| Financial and banking | <ul style="list-style-type: none"> - Review laws and regulations related to virtual currencies. Corporate usage of blockchain platforms in digital payments. | | <ul style="list-style-type: none"> - The Bank of Bahrain issued executive regulation for encrypted assets and an experimental environment for testing its mechanisms and systems. - The use of blockchain platforms in money transfers, banking transactions, and financial markets. - Issuing license for companies that transact virtual currencies. (UAE) - Kuwait Finance House (KFH) employs the blockchain system in instant cross-border remittance service using Ripple's blockchain technology. - The Commercial Bank has joined the collaboration with enterprise software firm R3 to develop blockchain solutions on R3's platform namely "Corda" to allow institutions directly transact using smart contracts in high security and privacy policies. (Qatar) |
| Educational | | Issuance of university degrees. (Emirates) | <ul style="list-style-type: none"> - Training programs in blockchain systems. The University of Bahrain (UOB) launched a new blockchain application to be one of the first academic institutions that award certificates to the graduates using blockchain technology in the region. |

Following are notable blockchain-based initiatives in Oman:

- The Establishment of Oman Blockchain Solutions and Applications company:
- Oman government had advertised the establishment of the first blockchain company in 2017 in Oman. This initiative is aiming to achieve Oman's vision in adopting modern technologies towards a completely digitized economy. The current blockchain solutions are key to fuel the uptake of distributed ledger technology in the future.
- This significant announcement had been at the opening of the Oman Blockchain Symposium which involves the presence of a number of important government persons, some of his majesty advisors, and members of the royal family which reflects the importance of the blockchain in Oman. This company namely, Oman Blockchain Solutions and Applications, is not an independent

company to implement its blockchain solutions but it is the vehicle for any person willing to test his initiative to have the right funding, and access for regulators and decision-makers to make his dream true.

- Salalah's port digital shipping platform:
- As a step to improve customer digital experience, Salalah port recently joined TradeLens, the blockchain-enabled digital shipping platform. The TradeLens ecosystem consists of more than 100 various organizations including ports, carriers, terminal operators, 3PLs, and freight forwarders. Presently, the platform is holding 10 million actions and over 100,000 weekly documents. This joining allows Salalah Port System (SPS) and its clients to have more secure end-to-end supply chain information, smooth data exchange, and novel collaboration ways which lead to enhance port's trade. The Chief Executive Officer of Salalah port, Mark Hardiman, said that this initiative is a forward step towards modernizing the trade ecosystem. In addition,



adopting BCT in all supply chain-related aspects will support the development of new trade models that benefit from the strategic location of Salalah. Thomas Sproat, Director of Network Development at Maersk GTD noted that integrating data with such important customer like Salalah port is a significant milestone for TradeLens and considered it as the basement stone for further novel upcoming ways in supply chain ecosystem leading to clear visibility and enhanced efficiency.

- The Blockchain Pilot Transaction of the Oman Oil, Orpic Group and HSBC:
- The Oman Oil and Orpic Group and HSBC Bank Oman had successfully launched the first pilot monetary transaction in the 49th national day in the group's head office in Muscat. This transaction involves the issuing of a complete digitized letter of credit (LC) produced at the distributed ledger platform with advising bank HSBC Oman and Oman Oil and Orpic Group as the beneficiary of the LC. It also involves the charge of polypropylene which is utilized in many applications.
- CEO of HSBC Oman stated that HSBC is actively providing support in involving modern technologies like blockchain to make the trade simpler, faster, and more secure. This transaction opens the door for the involvement of the new digital technologies in Oman's financial sector. Central Bank of Oman had a critical role in accelerating the execution of the transaction from concept to implementation. This initiative emphasizes the role of blockchain in the commercial and operational aspects as an alternative for the traditional paper-based exchanges.
- The first blockchain crowdfunding Islamic Waqf platform:
- Oman witnessed the launch of the first blockchain-based platform for the crowdfunding of Waqf charities and sharia-based investments in the Gulf region in 2019. It had been launched by Singapore-based Finterra which is a famous blockchain social solutions provider. The founder of Finterra said this initiative opens the door for waqf's management to automate various processes of its Islamic funding solutions which are accomplished paper wise. He added that blockchain is the right way for more transparent and trusted Islamic banking.
- Bank Dhofar Joined with Ripple for Instant Payments:
- Recently, Bank Dhofar had announced his usage of Ripple for cross-border payment, as the first bank in Oman utilizing the RippleNet, the worldwide corporate Blockchain network convenient for money order services. This initiative enables the bank to reach more than 100 banks and institutions members that use blockchain for instant payments. It also allows the bank to offer immediate, frictionless, secure cross border money within seconds and a transparent payment process. It is a step towards the achievement of bank

vision to the digital transformation and it improves customer experience.

From the foregoing, it appears that the Sultanate is a pioneer in implementing blockchain before other countries. In the next few years, many investments will appear in Oman towards making its strategy true to enhance the savings and improve customer satisfaction through trustful, secure, and transparent processes. Table II summarizes the above-mentioned initiatives.

C. Oman's plans towards implementing the blockchain integrated solutions

The technical world is now developing at a rapid pace; thus, Oman is intensifying demand for modern information technology services and capabilities to keep pace with this development. Both the private and government sectors face the challenge of developing and delivering new products and services to take advantage of the latest IT developments and trends.

As a result, Oman's government is determined to change the face of IT services domestically towards a complete smart country. On 8th of February 2020, Muscat Municipality and Oman Telecommunications Company Omantel signed an agreement to provide IT solutions and services to the Municipality of Muscat within the framework of the municipality's endeavour to develop the services it provides to beneficiaries, and to transform the areas that it supervises in service (Muscat Governorate and Sohar State) into smart, sustainable, and liveable cities.

The agreement was signed by His Excellency Eng. Issam bin Saud Al-Zadjali, the mayor of Muscat municipality, and Talal bin Saeed Al-Ma'amari, CEO of Omantel. This was attended by the chairman of the board of directors of Omantel and in the presence of a number of senior officials from both sides.

At that moment, Omantel's CEO stated, "Omantel is pleased to offer its services to Muscat Municipality (MM) for its blockchain requirements and needs. We look forward to building a strong and long-lasting business relationship by offering state of the art and reliable service as the first managed service provider in Oman, our vision is to transform the market to provide the future requirements where IT services are available on-demand".

The agreement states to provide many solutions and services for information and communication technology and smart city services in the municipal work sectors, and the employment of blockchain services and the services of smart and cloud communication centers to integrate the system of customer services management with the call centre. In addition to that, the agreement supports taking advantage of big data to provide better services and upgrade the quality of MM services towards strategies of technical and digital transformation in accordance with the pillars of the vision of "Oman 2040".

This agreement was followed by a meeting at Muscat Municipality on 18th of March 2020 between MM technical team, Omantel, and Blockchain Solutions and Services (BSS) to draw the blueprint of the future plan.

The proposed solution aims to design, develop, implement, and provide maintenance of Blockchain Solutions based on state of art Blockchain Technologies as a backbone of the proposed solution.

The long-life objectives of this initiative are:

- Creating Smart Systems by utilizing emerging technologies.
- Securing most of Rental contracts by detecting unregistered contracts.
- Hashing all related processes and protecting them against fraud.
- Hashing documents for the past 15 years.
- Clean data which will give the opportunity for running trusted data analysis for future plans, projects and trustful decisions on strategies.

The proposed way to develop a Blockchain Solution is to include components that are flexible and are executed at runtime as an integrated part of the MM environment. Building such applications is a challenging task. The practicability of the proposed solution is rationalized based on MM's well-defined business requirements.

The proposed infrastructure architecture design is built with scalability and security in mind. The illustration below Figure 1 highlights the different components of the proposed Production Environment (PRD).

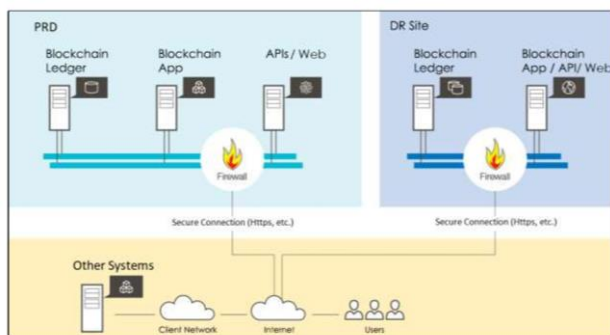


Figure 1. Architecture design.

The infrastructure landscape consists of four main layers: Hosting, Blockchain Platform, Web Portals, and Mobile Applications. Below is a brief about each layer:

- Hosting.
- Hosting location and performance are critical for scalability and operations. Thus, MM plans to run Blockchain Solutions on the existing National Blockchain Platform.
- During the development phase, MM will utilize Omantel's DEV environment to speed up the project execution which can be moved to Omantel's Production Environment in later stages based on the future approvals.
- Blockchain Platform.
- MM will be provided with licensed accounts to run MM applications on the National Blockchain Platform. The platform consists of different components to allow modular architecture and a scalable foundation for future expansion and projects.
- Web Portals.
- Omantel will develop a web portal for administrators and users to access various services through their web browsers. MM administrators are solely responsible for administrating the portal and managing its master data sets where users will have role-based access to their own data and activities. In addition, all users of the solution will have a unique representation in the Blockchain solution in the form of accounts with a specific set of privileges according to their role. All assets managed through the proposed solutions will also be uniquely identifiable and can be linked to their generator and activities.
- Mobile Applications.
- Omantel will develop mobile applications for iOS and Android to allow MM and authorized users to interact with provided services. In addition, users will be able to perform operations from within mobile applications. Then MM can integrate the newly introduced services within existing MM mobile applications.

Blockchain solution configurations will utilize the built-in Fabric CA component to allow MM to create identity certificates in the form of X.509 certificates. Those identities will be used for identifying clients, applications, integration endpoints and specific type of users (e.g. administrators, etc.)

In addition, it is possible to integrate identity layer with a public or commercial root or intermediate CA to provide identification for MM blockchain solution (e.g. MTC PKI).

The most important thing in any project is the disaster recovery plan. Omantel will configure both D2D and D2T backups. In addition, DR site will maintain a hot-standby copy of the solution for full geographical disaster recovery purposes. In case of total failure of all blockchain nodes, MM will be able to utilize the DR site for operations or restore backups into temporary servers.



TABLE II. SUMMARIZES THE ABOVE-MENTIONED INITIATIVES.

| No | Initiative | Participants | Goal | Other Stakeholders | Sector |
|----|---|---|---|--|------------|
| 1 | Establishment of Blockchain Solutions and Applications company. | Oman’s government. | -Provide a vehicle for any person willing to test his initiative, funding them, and provide access for regulators and decision-makers to make his dream true. | Citizens, residents and organizations. | Public. |
| 2 | Salalah's port digital shipping platform. | TradeLens and Salalah Port System(SPS). | -A step towards modernizing the trade ecosystem. -More secure end-to-end supply chain information, smooth data exchange, and novel collaboration ways which lead to enhance port's trade | The port customers. | Logistics. |
| 3 | Pilot Transaction of the Oman Oil, Orpic Group and HSBC. | The Oman Oil and Orpic Group and HSBC Bank Oman | -The charge of polypropylene which is utilized in many applications. -Make the trade simpler, faster, and more secure. -Opens the door for the involvement of the new digital technologies in Oman’s financial sector. | Bank customers and Central Bank of Oman. | Financial. |
| 4 | The crowdfunding Islamic Waqf platform. | Oman government and Singapore-based Finterra. | -Automate various processes of its Islamic funding solutions which are accomplished paper wise. -Provide more transparent and trusted Islamic banking. | Waqf charities and sharia-based investments. | Financial. |
| 5 | Bank Dhofar Instant Payments. | Bank Dhofar and RippleNet. | -Reach more than 100 banks and institutions members that use blockchain for instant payments. -The bank offers immediate, frictionless, secure cross border money within seconds and a transparent payment process. -It is a step towards the achievement of bank vision to the digital transformation and it improves customer experience. | Bank customers. | Financial. |

4. METHODOLOGY

This section presents the research technique employed to achieve the research objective, research design listing the overall steps and phases that were followed and pursued by the research type to conduct this study. It also discusses the sampling technique along with minimum sample size and displays the characteristics of the participants who volunteered to participate in this study. Finally, the summary section highlights the important points of all previously mentioned subsections.

A. Research Objective

The overarching aim of this study can be outlined as follows:

Evaluating the present status of implementing blockchain technology and future plans in the public and private sectors in Oman.

This main aim will be achieved by examining the status and the future plans of the implementation of BCT in various Oman's institutions through a questionnaire and then the analysis of gathered data to find the desired results.

B. Sample and data

This study relies on a convenience sampling technique. Convenience sampling is helpful because the researcher can collect the data from non-random participants who are reachable and are ready to volunteer[12].The selected participants are skilled IT staff who are willing and available to contribute to the study.

In order to avoid the missing data, the researcher focused on interviewing the IT staff participants who work for the public sector, as well as private-sector agencies, and then enrol their answers at the online survey for the analysing purpose.

To determine the sample size (N) of the targeted participants, the researcher depended on an online calculator tool from the website (www.surveysystem.com) which uses the below formula:

$$\sigma\sigma = \frac{Z2 * (\pi) * (1-\pi)}{\chi^2} \tag{1}$$

Where:



$Z = Z$ value (e.g., 1.96 for 95% confidence level)
 p = percentage picking a choice, expressed as decimal (.5 used for sample size needed)
 x = confidence interval, expressed as decimal (e.g., .04 = ± 4)

Therefore, the minimum targeted sample size was 383 participants. In determining the sample size, it has been accepted that there could be 5% margin of error, 95% confidence level, and the total size of population is 93525 according to thumb of rules. In addition, the study employed 50% response distribution.

5. DISCUSSIONS, FINDINGS AND CONCLUSION

This section shows the results of the empirical study in details and the conclusions outputted from it.

A. Study's general information results

Table III displays the distribution of questions in each part of the questionnaire, as there are 7 questions for General Information and 19 questions for the actual study.

TABLE III. DISTRIBUTION OF QUESTIONS IN EACH DIMENSION IN THE QUESTIONNAIRE

| No. | Dimension | No of Questions | Percentage % |
|-----|---------------------|-----------------|--------------|
| 1 | General Information | 7 | 26.9% |

TABLE V. DEMOGRAPHIC CHARACTERISTICS OF THE STUDY SAMPLE

| | Variable | Frequency | Percent |
|-----------------|--------------------|-----------|---------|
| Gender | Male | 74 | 74.0% |
| | Female | 26 | 26.0% |
| Total | | 100 | 100.0% |
| Age | 20 years or less | 1 | 1.0% |
| | 21-25 years | 10 | 10.0% |
| | 26-30 years | 13 | 13.0% |
| | 31-35 years | 29 | 29.0% |
| | 36-40 years | 27 | 27.0% |
| | 41-45 years | 15 | 15.0% |
| | 46-50 years | 3 | 3.0% |
| | more than 50 years | 2 | 2.0% |
| Total | | 100 | 100.0% |
| Education Level | Diploma | 9 | 9% |
| | Bachelor | 61 | 61% |
| | Masters | 26 | 26% |

| | | | |
|-----------------------|-------------------------|----|--------|
| 2 | Questionnaire questions | 19 | 73.1% |
| Overall questionnaire | | 26 | 100.0% |

The study sample consists of 100 employees from different sectors. Male participants were 74 (74.0%) compared to 26 females (26.0%), with different age groups, education level, area of employment, work experience, role function, and job level. This is clear in Table V which illustrates the demographic characteristics of the Study

| | | |
|-------------------------------------|----------------------|-------|
| Gender | Male | 74.0% |
| Age | 31-35 years | 29.0% |
| Education Level | Bachelor | 61.0% |
| In which area are you employed | Educational Services | 28.0% |
| Work Experience | 6-10 years | 32.0% |
| Your Role Function at work | Project Management | 18.0% |
| Your Job Level in your organization | Staff | 23.0% |

Sample.

Table IV displays the highest percentages from the values in each variable. There are (74.0%) male and (29.0%) with age between (31-35) year. 61.0% of them with bachelor's qualification. A percentage of (28.0%) of participants work in Educational Services. Most of the participants possess Work Experience that ranges from 6 to 10 representing 32.0% of the total sample.

TABLE IV. THE HIGHEST PERCENTILES OF EACH VALUE IN EACH



| | | | |
|--------------------------------|---|------|-------|
| | PhD | 3 | 3% |
| | Other | 1 | 1% |
| | Total | 100 | 100% |
| In which area you are employed | Commerce & Industry | 6 | 6.0% |
| | Municipal Services | 3 | 3.0% |
| | Banking & Finance | 15 | 15.0% |
| | Information Technology Services | 27 | 27.0% |
| | Military Services | 7 | 7.0% |
| | Academic & Researcher | 4 | 4.0% |
| | Educational Services | 28 | 28.0% |
| | Health Care | 2 | 2.0% |
| | Civil/Manpower Services | 2 | 2.0% |
| | Agriculture/Fisheries | 1 | 1.0% |
| | Utilities Services (electricity, natural gas, water, sewage, telephone, and transportation) | 2 | 2.0% |
| | Other (please specify) | 3 | 3.0% |
| | Total | 100 | 100% |
| Work experience | 5 years or less | 14 | 14.0% |
| | 6-10 years | 32 | 32.0% |
| | 11-15 years | 24 | 24.0% |
| | 16-20 years | 18 | 18.0% |
| | 21-25 years | 7 | 7.0% |
| | 26-30 years | 3 | 3.0% |
| | more than 30 years | 2 | 2.0% |
| | Total | 100 | 100% |
| Your Role Function at work | Project Stewardship/Administration | 17 | 17.0% |
| | Project Policies and Standards | 2 | 2.0% |
| | Project Management | 18 | 18.0% |
| | Knowledge exchange and education | 14 | 14.0% |
| | Data Assessment and Monitoring | 6 | 6.0% |
| | Information Security | 6 | 6.0% |
| | Systems Analysis | 6 | 6.0% |
| | Systems Development | 3 | 3.0% |
| | Systems Support | 6 | 6.0% |
| | Systems Administration | 6 | 6.0% |
| | IT Infrastructure | 7 | 7.0% |
| | Other (please specify) | 9 | 9.0% |
| | Systems Administration | 6 | 6.0% |
| IT Infrastructure | 7 | 7.0% | |



| | | | |
|-------------------------------------|------------------------|-----|-------|
| | Other (please specify) | 9 | 9.0% |
| | Total | 100 | 100% |
| Your Job Level in your organization | Strategic | 7 | 7.0% |
| | Managerial | 19 | 19.0% |
| | Consultant | 5 | 5.0% |
| | Specialist (Expert) | 11 | 11.0% |
| | Team Lead (Supervisor) | 16 | 16.0% |
| | Project Management | 7 | 7.0% |
| | Technician | 9 | 9.0% |
| | Coordinator Level | 2 | 2.0% |
| | Staff | 23 | 23.0% |
| | Other (please specify) | 1 | 1.0% |
| | Total | 100 | 100% |

B. Reliability test

Cronbach's Alpha was used to examine the internal consistency of the questionnaire used in this study. Table VI shows Cronbach's Alpha values in the questionnaire. As it is clear, Cronbach's Alpha values of the questionnaire's questions was 0.962, which suggests an excellent level of internal consistency of the questionnaire.

TABLE VI. CRONBACH'S ALPHA VALUES FOR EACH

| No. | N of Items | Cronbach's Alpha |
|-----|------------|------------------|
| 1 | 19 | 0.962 |

DIMENSION IN THE QUESTIONNAIRE

C. Descriptive statistics

Because the questionnaire's responses are scored on a five-point Likert scale (ranging from strongly disagree =1, to strongly agree= 5) evaluation criteria for judging the level of respondents' scores (respondents' attitudes levels) were developed. Table VII illustrates the means groups and the decisions beside each group.

TABLE VII. EVALUATION CRITERIA USED FOR MEASURING ATTITUDES' LEVELS

| Code | Likert Scale | Means | Decision |
|------|-------------------|-------------|-----------|
| 1 | Strongly Disagree | 1.00 - 1.79 | Very low |
| 2 | Disagree | 1.80 - 2.59 | Low |
| 3 | Neutral | 2.60 - 3.39 | Medium |
| 4 | Agree | 3.40 - 4.19 | High |
| 5 | Strongly Agree | 4.20 - 5.00 | Very high |

In table VIII (and refer to appendix1 for the detailed survey), the statistical descriptions of the blockchain solutions in the organization are specified, which consist of 19 questions (10 of them showed low-level satisfaction and 9 with Medium level). The statement "There is a specified team that will take the lead on your organization's Blockchain initiative(s)" had the highest mean (2.80) and a standard deviation of (1.073). However, the question, "Does your company sell or license software, hardware, or services for implementing Blockchain technology and applications?" scored the lowest mean of (2.32) and a standard deviation of (1.081). The overall average mean was (2.57) and the average standard deviation was (1.121) with a low level of satisfaction.

Table IX displays the internal consistency of the questions. The correlation between Blockchain Solutions in the organization and the overall of the questions was high except one question: Do you think that Blockchain technology will dramatically disrupt the industry or line of business that your company or organization operates in? which was medium. It is considered statistically significant at level (0.01) (Sig. (2-tailed) less than 0.01).



TABLE VIII. DESCRIPTIVE STATISTICS OF THE BLOCK CHAIN SOLUTIONS IN THE ORGANIZATION

| The Questions No. | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree | Mean | Std. Deviation | Decision | Order |
|-------------------|-------------------|----------|---------|-------|----------------|-------|----------------|----------|-------|
| 1 | 22.0% | 27.0% | 22.0% | 24.0% | 5.0% | 2.63 | 1.212 | Medium | 6 |
| 2 | 26.0% | 19.0% | 31.0% | 24.0% | 0.0% | 2.53 | 1.123 | Low | 10 |
| 3 | 29.0% | 24.0% | 25.0% | 20.0% | 2.0% | 2.42 | 1.165 | Low | 15 |
| 4 | 27.0% | 23.0% | 30.0% | 20.0% | 0.0% | 2.43 | 1.094 | Low | 14 |
| 5 | 23.0% | 23.0% | 26.0% | 25.0% | 3.0% | 2.62 | 1.179 | Medium | 7 |
| 6 | 16.0% | 25.0% | 29.0% | 25.0% | 5.0% | 2.78 | 1.142 | Medium | 2 |
| 7 | 17.0% | 26.0% | 35.0% | 20.0% | 2.0% | 2.64 | 1.049 | Medium | 5 |
| 8 | 16.0% | 19.0% | 36.0% | 27.0% | 2.0% | 2.80 | 1.073 | Medium | 1 |
| 9 | 27.0% | 29.0% | 24.0% | 20.0% | 0.0% | 2.37 | 1.089 | Low | 16 |
| 10 | 25.0% | 25.0% | 30.0% | 18.0% | 2.0% | 2.47 | 1.114 | Low | 12 |
| 11 | 21.0% | 24.0% | 32.0% | 21.0% | 2.0% | 2.59 | 1.102 | Low | 8 |
| 12 | 20.0% | 25.0% | 27.0% | 24.0% | 4.0% | 2.67 | 1.164 | Medium | 3 |
| 13 | 28.0% | 29.0% | 28.0% | 13.0% | 2.0% | 2.32 | 1.081 | Low | 17 |
| 14 | 19.0% | 25.0% | 30.0% | 24.0% | 2.0% | 2.65 | 1.104 | Medium | 4 |
| 15 | 19.0% | 24.0% | 32.0% | 23.0% | 2.0% | 2.65 | 1.095 | Medium | 4 |
| 16 | 22.0% | 17.0% | 38.0% | 21.0% | 2.0% | 2.64 | 1.106 | Medium | 5 |
| 17 | 24.0% | 20.0% | 35.0% | 17.0% | 4.0% | 2.57 | 1.148 | Low | 9 |
| 18 | 27.0% | 22.0% | 31.0% | 20.0% | 0.0% | 2.44 | 1.095 | Low | 13 |
| 19 | 26.0% | 22.0% | 29.0% | 20.0% | 3.0% | 2.52 | 1.168 | Low | 11 |
| 22.8% | 23.6% | 30.0% | 21.4% | 2.2% | 2.57 | 1.121 | Low | | |

TABLE IX. CORRELATION BETWEEN OVERALL QUESTION AND THE QUESTIONS

| The Questions No. | Correlation Coefficient | Sig. (2-tailed) | N |
|-------------------|-------------------------|-----------------|-----|
| 1 | .722** | .000 | 100 |
| 2 | .791** | .000 | 100 |
| 3 | .836** | .000 | 100 |
| 4 | .864** | .000 | 100 |



| | | | |
|----|--------|------|-----|
| 5 | .774** | .000 | 100 |
| 6 | .641** | .000 | 100 |
| 7 | .457** | .000 | 100 |
| 8 | .747** | .000 | 100 |
| 9 | .775** | .000 | 100 |
| 10 | .816** | .000 | 100 |
| 11 | .811** | .000 | 100 |
| 12 | .841** | .000 | 100 |
| 13 | .679** | .000 | 100 |
| 14 | .765** | .000 | 100 |
| 15 | .770** | .000 | 100 |
| 16 | .815** | .000 | 100 |
| 17 | .849** | .000 | 100 |
| 18 | .812** | .000 | 100 |
| 19 | .888** | .000 | 100 |

By analysing the results, the researcher realizes that blockchain technology is applied in a small number of institutions in different sectors in Oman. From table VIII, since the average responses of the participants in the Blockchain Solutions in the organization is 2.57, less than the general average (3) from the Likert scale, it is demonstrated that this technology is used little in Oman. It is still a new technology that needs more effort to be applied as a formal technology in all sectors in Oman.

Below are the most important recommendations for the organizations reflected from the responses:

- Highlight the reasons that inforce the organization not to implement blockchain.
- Establish a group to support BCT initiatives.
- Dedicate budget for the BCT to simplify and encourage its implementation.
- Use an open source blockchain as a begin then move forward to improvement.
- Establish a future plan for implementing BCT with detailed requirements.

6. LIMITATIONS AND FUTURE WORK AND RECOMMENDATIONS

While this study offers promising insights, it has as well few limitations. First of all, the sample size was small enough (100) to fit the research objectives as the researcher could not involve the targeted number of 383 participants due to the current preventive precautions of COVID 19. Larger sample sizes and different surveying organizations could yield more accurate results. This research was conducted in Oman, and hence, results are mainly relevant to this context. An additional limitation could be that some participants may have had an unclear understanding of the concepts of some BCT solutions such as smart contracts. Accordingly, this lack of awareness and understanding may have affected their responses. Moreover, some participants may have considered some of the questions to be confidential to their organization and, hence, could not disclose their responses to the researcher. Despite these limitations, it is worth mentioning that this study offers methodological and theoretical insights. Future studies could further investigate the other possible blockchain solutions and engage other than IT employees. Moreover, more research are required to improve the ideas in blockchain applications with a necessity of cooperation between the research, industrial, and governmental institutions.

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Raqiya Ahmed Al-Hilali is a master student in the Information Technology-Project Management Field in Modern College of Business and Science. She is working in the government sector at Muscat Municipality in the Department of Projects and Technical Studies. Two of her important roles are writing tenders, and evaluating the bids in the tenders related to IT. Her research interest includes projects, project governance, data governance, network, and its protocols, and blockchain. She is an authorized reviewer in one of the international journals.



Associate Prof. Dr Hothefa Shaker Jassim received his PhD in Computer and Communication Engineering from the College of Engineering, Universiti Tenaga Nasional (UNITEN), Malaysia in 2012. He has also done his post-doctorate fellowship at National University of Malaysia (UKM). Currently, He is associate dean for postgraduate studies and research in modern college of business and science, Muscat, Oman. His research interests focus on IoT, routing protocols, network security and blockchain.



APPENDEX 1

The Questionnaire

The first section: Demographic Questions

* Required

Gender *

- Male
 Female

Age *

- 20 years or less
 21-25 years
 26-30 years
 31-35 years
 36-40 years
 41-45 years
 46-50 years
 more than 50 years

Education Level *

- Diploma
 Bachelor
 Masters
 PhD
 Other: _____



In which area are you employed? *

- Commerce & Industry
- Municipal Services
- Tourist & Hospitality
- Banking & Finance
- Information Technology Services
- Military Services
- Academic & Researcher
- Educational Services
- Health Care
- Law
- Civil/Man Power Services
- Agriculture/Fisheries
- Media
- Utilities Services (electricity, natural gas, water, sewage, telephone, and transportation)
- Other: _____

Work Experience *

- 5 years or less
- 6-10 years
- 11-15 years
- 16-20 years
- 21-25 years
- 26-30 years
- more than 30 years



Your Role Function at work (you may click several options as applicable) *

- Project Stewardship/Administration
- Project Policies and Standards
- Project Management
- Knowledge exchange and education
- Data Assessment and Monitoring
- Information Security
- Systems Analysis
- Systems Development
- Systems Support
- Systems Administration
- IT Infrastructure
- Other: _____

Your Job Level in your organization (you may click more than one option if applicable) *

- Strategic
- Managerial
- Consultant
- Specialist (Expert)
- Team Lead (Supervisor)
- Project Management
- Technician
- Coordinator Level
- Staff

Next



The second section – Blockchain Solutions in the organization

My organization currently implementing—or does it plan to implement—Blockchain technology. *

| | | | | | |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | strongly disagree | disagree | netural | agree | strongly agree |
| 1 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

To what extent is your organization currently using Blockchain technology? *

| | | | | | |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | Strongly disagree | disagree | netural | agree | Strongly agree |
| 2 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Has your organization established a dedicated group to support a Blockchain initiative? *

| | | | | | |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | Strongly disagree | disagree | netural | agree | Strongly agree |
| 3 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Has your organization developed a budget for its Blockchain efforts? *

| | | | | | |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | Strongly disagree | disagree | netural | agree | Strongly agree |
| 4 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

There is source of funding for your organization's current/future Blockchain initiatives *

| | | | | | |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | Strongly disagree | disagree | netural | agree | Strongly agree |
| 5 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |



Clear benefits specified in your organization/industry to obtain from using Blockchains *

| | Strongly disagree | Disagree | Neutral | Agree | Strongly agree |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 6 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Do you think that Blockchain technology will dramatically disrupt the industry or line of business that your company or organization operates in. *

| | Strongly disagree | disagree | netural | agree | Strongly agree |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 7 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

There is a specified team will take the lead on your organization's Blockchain initiative(s) *

| | Strongly disagree | disagree | netural | agree | Strongly agree |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 8 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Does your organization currently use open-source Blockchain technology (e.g., Linux Foundation's Hyperledger Project) for its Blockchain effort *

| | Strongly disagree | disagree | netural | agree | Strongly agree |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 9 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Does your organization currently use a solution from a commercial Blockchain solutions provider *

| | Strongly disagree | disagree | netural | agree | Strongly agree |
|----|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 10 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |



Your organization designing or planning to design and implement its Blockchain applications in house, or will you utilize outside consulting firms specializing in Blockchain implementation. *

| | | | | | |
|----|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | Strongly disagree | disagree | netural | agree | Strongly agree |
| 11 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

What level of importance do you attach to the development of industry standards and practices for supporting Blockchain platforms, applications, and commercial products. *

| | | | | | |
|----|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | Strongly disagree | disagree | netural | agree | Strongly agree |
| 12 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Do you foresee the benefits of Blockchain as eventually living up to all the hype *

| | | | | | |
|----|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | Strongly disagree | disagree | netural | agree | Strongly agree |
| 13 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Does your company sell or license software, hardware, or services for implementing Blockchain technology and applications? *

| | | | | | |
|----|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | Strongly disagree | disagree | netural | agree | Strongly agree |
| 14 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

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The third section: The Integrated Blockchain Solutions in the organization

The role of Blockchain in the organization is clear. *

| | | | | | |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | Strongly disagree | disagree | Neutral | agree | Strongly agree |
| 1 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |



Define clear policies and standards for implementing blockchain applications in the organization. *

| | Strongly disagree | disagree | Neutral | agree | Strongly agree |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 2 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

There are effective enterprise blockchain practices. *

| | Strongly disagree | disagree | Neutral | agree | Strongly agree |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 3 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

There are Procedures for evaluating blockchain's projects in the organization. *

| | Strongly disagree | disagree | Neutral | agree | Strongly agree |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 4 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

All possible blockchain integrated solutions are implemented in the organization. *

| | Strongly disagree | disagree | Neutral | agree | Strongly agree |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 5 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Well organizational planning for the future recommendations regarding the blockchain. *

| | Strongly disagree | Disagree | Neutral | Agree | Strongly agree |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 6 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

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Submit