The Impact of BlockchainTechnology on AdvancedSecurity Measures for E-Government

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ABSTRACT

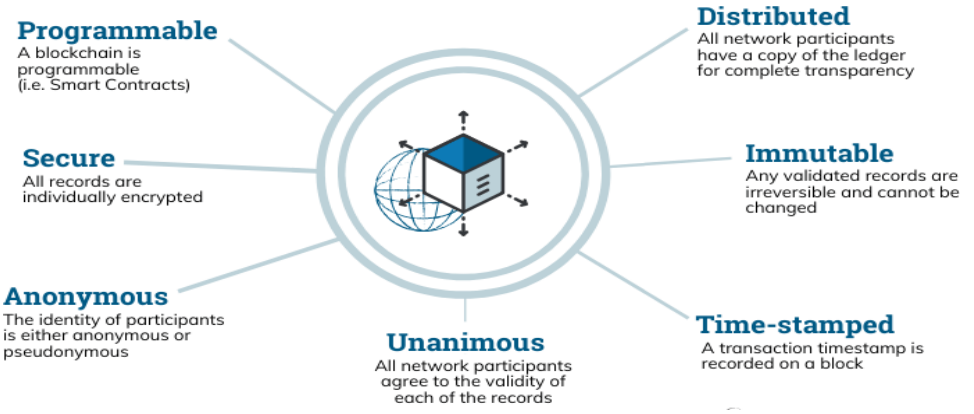
Implementation of blockchain with e-government has raised several complexities. When an area has satisfied the requirements for e-government implementation, new challenges will appear. As a result of the information technology revolution, governments and industries are being forced to deliver more effective and secure internet services. Every government in the world attempts to provide the public with electronic services that are fast, quick, and beneficial for the users. Blockchain is considered to have significant potential benefits for the government since it is a combination of technologies such as distributed ledgers, privacy, authentication, and consensus mechanisms. However, this advanced technology is still in its development, and e-government faces a number of difficulties and challenges. The goal of this chapter is to evaluate this advanced technology in the context of high-level e-government security and privacy implementation measures and other technical issues during the adaption of blockchain technology.

INTRODUCTION

New tactics are being developed to provide a better living for humanity. In a variety of ways, new initiatives and new technology are driving a new wave of innovation in city services. Nonetheless, despite the continual advancement of cities and digital technologies, certain problems relating to including citizens in social decisions remain unsolved and must be addressed (Alqahtani & Braun, 2021). E-governance appears as a critical tool and the first stage in this transition in this setting (Avina et al., 2017). The rise of e-governments and associated services has presented governments with new instruments to improve public life, service delivery, citizen engagement, and work procedures (Barrane et al., 2018). As a result of this development, there is now a risk of data leakage and illegal access to secret and private data associated with e-government apps. This could stymie the development and implementation of e-governments as a whole. As a result of these concerns, cyber security is crucial for the development and adoption of e-government (Chen et al., 2018). Most researchers emphasized security, privacy, and trust as essential elements that have a substantial impact on e-government adoption, acceptance, and implementation. Thus, in order to trust and encourage the public to embrace and utilize e-government systems and services, governments must appropriately handle security concerns (Choi et al., 2018). Understanding how organizational, psychological, and technical elements interact to affect the network security outcome of enterprises is one of the primary cyber security concerns in organizations. Although cybercriminals are frequently mentioned in the news for data breaches and attacks, evidence suggests that the majority of security breaches are caused by personnel within the organization, whether purposefully or accidentally, due to non-compliance with cyber security standards (Alqahtani & Braun, 2021). Compliance with cyber security measures has been given a lot of thought in order to achieve successful cyber security (Donalds & Osei-Bryson, 2020). In its simplest form, a blockchain is a decentralized ledger that keeps track of all transactions made by the system's users. This refers to a technology that stores data on the outcomes of all interactions between citizens and government entities in the context of electronic government. Importantly, all members of the system interlink, code, and store the data, which is then automatically updated to reflect the changes made (Harris & Martin, 2019). The egoistic impulses that drive some people to engage in corrupt actions to the harm of society and state sovereignty are controlled by blockchain technology. It also generates a compelling motivation to follow the rules that apply equally to all participants, promoting a sense of shared

responsibility (Hofbauer et al., 2019). Blockchain is a technologythat allows users to agree on nearly any topic without the need for an intermediary, laying the groundwork for decentralized governance, and a fair balance of interests that benefits society (Huang & Madnick, 2021). The security provided by traditional

Figure 1. Overview of propriety distributed ledger technology (Krishnaraju et al., 2016)



registers can be improved by a registration system based on blockchain technology. By eliminating the payment of governmental duties and middleman fees, transaction costs can be drastically lowered while transactions themselves can become faster, more transparent, and more secure figure 1 overview of propriety Distributed ledgerTechnology.

The chapter questions organize as follows:

1. What are the concerns and limitations of blockchain technology in terms ofsecurity?
2. What impact does blockchain technology have on e-governance?
3. How effective is blockchain technology in detecting cyber-threats?

LITERATURE REVIEW

The use of information and communication technology to combine government and public services for citizens is known as e-governance. The goals and objectives of e-governance are to provide citizens with more properly recognized services to attain overall social and economic leverage with high performance and capabilities in the major inspiring points. Since its birth in early 2009, Bitcoin's underlying technology, blockchain, has demonstrated strong application potential and capturedthe imagination of both academic and industrial. Blockchain approaches have inspired a slew of new applications and have been effectively embraced in a variety of areas, even if the financial industry is viewed as the blockchain's

primary beneficiary.

Security, decentralization, transparency, traceability, immutability, distributed ledgers, transparent logs, and irreversible data storage are all characteristics of blockchain (Galvez et al., 2018). The Blockchain is based on an ordered list of nodes that store data and are connected by chains. Investigate the role of Blockchain in the long-term viability and power of electronic services, particularly e-governance systems, without the need for centralized data storage (Li et al., 2019). One of the primary motives for doing this research is the governments and industries recent attention to SC associated concepts and initiatives. In order to illustrate how widely these notions have been adopted (Kim & Kim, 2021). The past government and former countries of our modern globe have always changed; now, with the currentglobalization of communication, we can consider citizens' opinions (Liu et al., 2020). Due to its extensive application for simple or more complicated transactions, the blockchain (BC) as a fresh and revolutionary technology concept is gaining traction in a variety of industries (Galvez et al., 2018). As a result, it has a wide range of applications, ranging from the corporate and financial sectors to the social sector, which includes healthcare, education, and government administration (Liu & Carter, 2018). One subject that is particularly confronted with complicated obstacles is public administration, where old processes, as well as trust, autonomy, and facilitators, are just a few examples of key issues (Ronchi, 2019). The BC, with its underlying complicated structure, is frequently mentioned as a possible e-Government development solution. The BC has the property of storing information that is dispersed across multiple nodes, with each node's consensus required (Muller & Lind, 2020). All transactions will be saved in a protocol, so they can't be changed, moved, or deleted. The required rules are originally described in so-called paymentsystems to create the legislative regime. (Simonova, 2020). This approach eliminates reliance on a single central party, the possibility of manipulation, and It allows for the collection of data and the execution of operations, exchanged, and regulated between the users in a decentralized network (Twizeyimana & Andersson, 2019). The attributes outlined above provide a convincing explanation for the BC's emergence as a possible technology to transform government procedures and transactions with enterprises or individuals by supporting key concepts like trust, privacy, inclusion, and participation (Yazdanmehr et al., 2020). Various BC systems and applications have already been implemented in a number of nations. While the BC implementation already provides for land and property registrations in Sweden and Brazil, it also helps to track real estate transactions in Dubai and India (Yoo et al., 2018). Whileblockchain technology (BCT) shows promise in terms of how it may be used to notjust digitalize but also revolutionize the public sector, there are

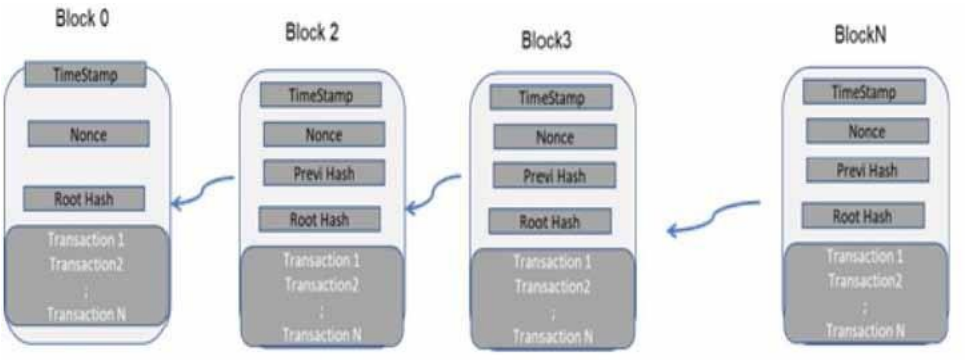
various obstacles tooovercome when it comes to applying and adopting BCT in this industry (Agbo et al., 2019). Guidelines and best practices must be defined and offered to ensure adequateand reliable implementation of BC solutions, as well as general acceptability within

the government sector and society. The majority of current research focuses on the qualities of BCT, and the several potential domains of request, but it continues to overlook the concerns in between, such as political and legal issues. Furthermore, there is little study on participation models and platforms in the current literature, with an emphasis on important driver values and procedures involving all relevant stakeholders. There are no implementation techniques or frameworks that support proactive engagement to modernize procedures between the government and citizens to understand and solve welfare concerns and generate additional public benefit (Salam & Kumar, 2021), (Bao et al., 2020), (De Filippi et al., 2020), (El Haddouti & El Kettani, 2019),(Fan et al., 2018), (Kim & Laskowski, 2018),(Han et al., 2018). The organization and division of government have a considerable impact on how new services and policies for citizens are implemented. The interconnectedness between central and local government is challenged by their various spheres of competence, as well as their divergent interests and political discretion. The normal connection between central and local government can be stated Local governments perform the role of the centralized administration, with the federal government deciding how much money, how quickly, and how prioritized local services should be produced and implemented (Han et al., 2018), (Mengelkamp et al., 2018), (Naik & Jenkins, 2020). Several journal publications and conference papers discuss the immaturity of this technical notion, citing its extremely sophisticated yet opaque underlying processes as well as the lack of well-proven best practices. Furthermore, society's general mistrust of new technologies is counterproductive. As a result, both the public sector and society bear responsibilities for establishing trust.

THE MOST SIGNIFICANT CHARACTERISTICSOF BLOCKCHAIN TECHNOLOGY

- There is no centralized organization or agency in charge of administering the blockchain and managing the keys to data rectification.
- It is always in action. Because the system's data is duplicated simultaneously to networks of nodes, 99% of them will be available even if 99% of them fall offline, and it will be updated automatically as soon as they reconnect to the internet. There is only one way to bring the system to a halt: shut off power and Internet access to all computers on the globe.
- Blockchain technology is based on open-source code that has never been hacked. The algorithm allows for cryptographic auditing, which is a mathematical test that determines whether or not evidence has been changed.

Figure 2. Overview of structure of blockchain (Su et al., 2018)



- The code facilitates the development of new services, software, and other goods, is not the property of any one agency or organization, and is not copyright protected.

OVERVIEW OF BLOCKCHAIN TECHNOLOGYAND APPLICATIONS

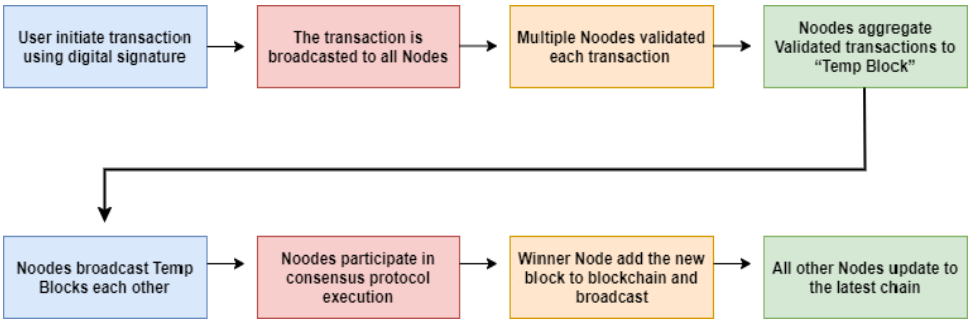
The blockchain is made up of a series of linked blocks, each of these has a shared public ledger that records all confirmed transactions across the whole network automatically. A linked list of blocks organizes the ledger, each of which maintainsa transaction log. (Nawari & Ravindran, 2019). Digital data transfer assets is represented by the transaction. Block chain nodes are run on computers donated byvolunteers all around the world. Blockchain is impervious to network attacks due to its decentralized architecture.

Asymmetric cryptography methods encrypt the transactions in a block chain, ensuring anonymity and confidentiality. The blockchain is made up of a series of blocks that are connected together as shown in figure 2.

Consensus procedures are another critical component for preserving blockchainintegrity. A distributed ledger maintained by all nodes in a decentralized network isknown as a block chain. The insertion of additional blocks and transaction verification require agreement among nodes, which is accomplished through distributed consensus methods. The majority of nodes in the network vote on whether or not to add a freshblock. After a consensus, a new block is added to the BC, and all nodes are broughtup to date with the most recent version of the ledger. The consensus protocol ensuresthat the integrity of the block chain is not affected by the compromise or failure of individual systems, further figure 3 describe.

Smart contracts allow participants to

Figure 3. Overview transaction execution of bloackchain



express the rules and penalties that govern a contract as a set of executable instructions that execute transactions automatically when certain criteria are met.

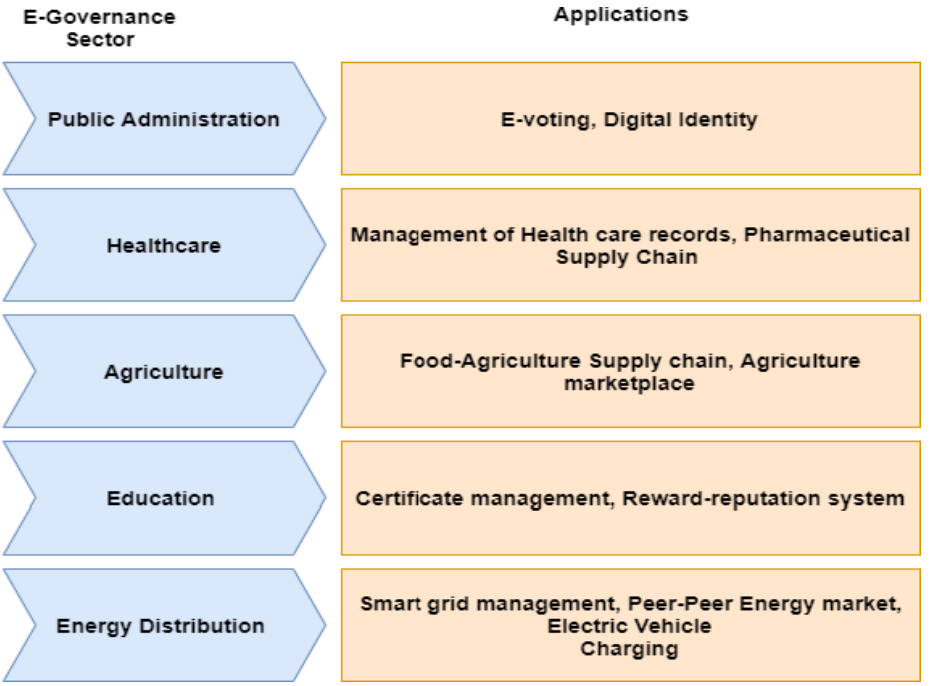
THE USE OF BLOCKCHAIN IN E-GOVERNMENT

Many official records of persons and businesses are managed and maintained by government entities. Individuals must put their trust in the government to safeguard the security and privacy of their personal information. Through digitalization, secure and immutable record keeping, blockchain-based apps have the potential to transform how these papers are managed. (United Nations, 2018). Through automation and accountability, blockchain can make government services more efficient and democratically accountable (Zheng et al., 2018). The goal of blockchain-based governance is to provide decentralized and efficient public services while retaining their integrity. This section examines how blockchain can be used in a variety of public settings.

Public Administration Applications

Existing e-voting systems, on the other hand, rely on centralized authorities, which may risk the voting system's confidence and confidentiality. From this perspective, blockchain-based e-voting solutions appear to be promising. South Africa, a West African country, was the first to use BCT to run a general election (Singh et al., 2020), (Kumar et al., 2021), (Ravi et al., 2021). It makes use of "message boards,"a permissioned blockchain. The bulletin board is made up of code-associated write-permissioned nodes for tracking individual votes, third-party witness nodes for witnessing votes, and read-only nodes for vote verification open to all users.

Figure 4. Overview sectors of e-governance and use cases



Health-Care Applications

In healthcare, blockchain can be used for a variety of things, including safe storing (Alamri et al., 2019).

Advances in digital technologies have had an impact on how health-care services are delivered and how data is stored. Hospital automation and the growing popularity of online patient consultations, among other things, have changed how electronic health records are stored and accessed (EHR) (Choi et al., 2019). Sharing an individual's health records between hospitals and verifying their accuracy is a complex task.

Agricultural Applications

The application cases of blockchain in agriculture are primarily divided into three categories: food and agricultural supply chain, business, and finance (Tosh et al., 2017). The blockchain-based supply chain apps provide provenance monitoring across multiple phases of agricultural products, preventing food fraud and contamination (Yang et al., 2017). The technology automates the entire commodity transfer process, including buyer and seller verification, quality assurance, and

shipping.

Educational Applications

The education sector has a lot of potential use cases for Blockchain technology (Tasca & Tessone, 2017). Design a blockchain-based mechanism for verifying educational records. Universities use a blockchain platform to create digitally signed certificates. The certificate can be shared with companies or other institutions, and verification can be done by following the transaction that records the certificate's issuance (Xia et al., 2017). The technology delivers self-verifiability and transparency, in addition to increased security. Blockchain-based educational incentive and reputation system

Energy-Related Applications

The growth of small-scale renewable energy generation puts existing centralized energy management systems to the test (Cachin & Vukolić, 2017). The widespread adoption of blockchain technology in the energy sector is due to dispersed energy resources and the integration of IoT technology for a distributed platform for energy management and exchange is required for metering energy output and consumption.

LIMITATIONS AND CHALLENGES

While being studied by practitioners and academia, concerns and challenges arise, just as they do with any other novel technology with the potential to disrupt particular industries. The resulting challenges limit blockchain (BC) enormous potential and widespread application across industries. As a result, this section examines the numerous technical and business limitations. Despite the fact that the characteristics show that the BC technological idea is very promising in terms of establishing exceptional data security, several technical issues must be investigated. The BC's security is enhanced by both hash algorithms and smart contracts, but the cryptographic technique is still vulnerable to attack (McKinney et al., 2017), (Millard, 2017). Time jacking is a third well-known cyber-attack in which a hacker attempts to change the timestamps of BC before they are recorded to the protocol in order to introduce inauthentic records and phoney BCs. One of the other issues that must be investigated is the loss of privacy. On the one hand, keeping the whole information and history of transaction data on each node seems to be useful from a security standpoint, but also raises doubts about the technology concept's general viability for use cases requiring greater anonymity. Furthermore, the

immutability of all transaction data highlights another shortcoming of this system, as some business use cases necessitate changes to specific transactions (Risius & Spohrer, 2017). There are significant concerns about the BC protocol's long-term viability,

particularly for blockchains that are utilized for public-facing applications. The mining grid's security measures and corresponding consensus methods squander a large amount of energy (Casino, Dasaklis & Patsakis, 2019; Yli-Huumo, 2016). Taking a closer look at China's energy use, the country that leads BC mining, exemplifies this. China consumes more electricity than 159 countries combined, according to the bitcoin energy consumption index (Index, 2017).This overall complexity is the source of a lack of acceptance, not only from the viewpoint of proper technological operation and handling by users, but also from the perspective of legal and regulatory compliance by authorities. The key drivers of BCTs' increasing acceptability are a lack of knowledge and faith in technology, the legality of the transaction, and general data protection (Hughes et al., 2019). Aspects to examine include, among other things, the horrific costs of implementation and energy usage, as well as the hazards of opening up the business model and infrastructure to third parties. Using this technology to bring additional economic value while still ensuring the integrity of the data will put the entire concept and implementation to the test (Seebacher &Schüritz, 2017; Hughes et al., 2019).

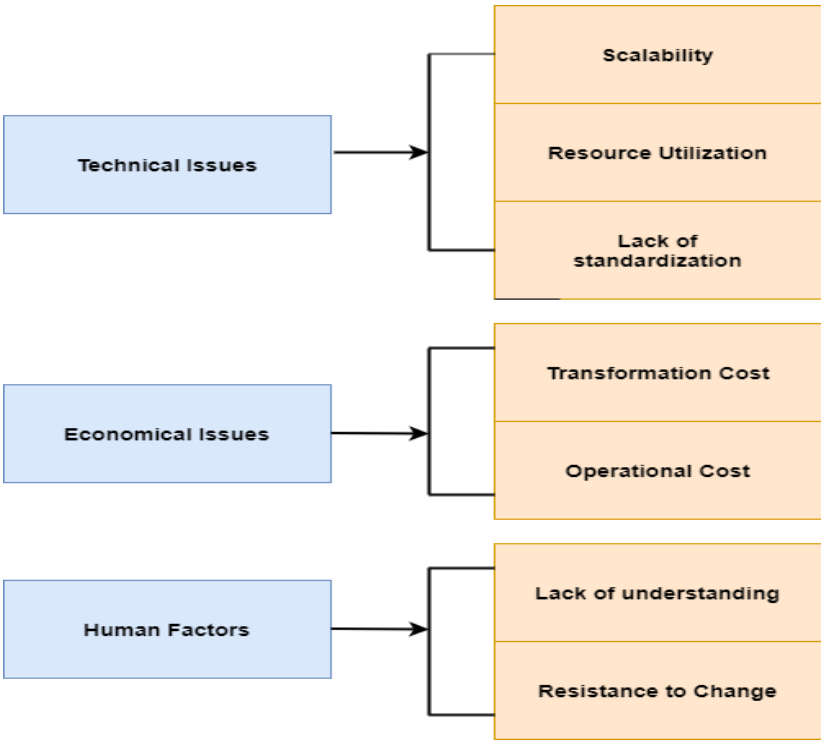
Concerns regarding the Block chain technology has limits in a variety of uses areas were raised in the literature linked to block chain application as explain in figure 5 the obstacles that limit blockchain adoption are primarily divided into threecategories: Technical, economic, and human factors issues.

DISCUSSION

From the perspective of current technology, the entire potential has yet to be realized. The combination of the internet and BC allows government institutions to fully exploit the revolutionary technology's full potential to align novel capacities to achieve individual citizen goals while simultaneously creating societal value (Paintner, 2021). Some of these ideas have already been implemented, but with a more basic premise. As a result, the maturity of the distribution channel must be considered while evaluating the type of service delivery. Services with a higher level of maturity address not just basic office concerns, but also more complex challenges involving multiple departments and organizational bodies (Ahmad & Shah, 2021). BCT and public administration, two distinct disciplines, have been thoroughly explored. Beyond the hurdles and constraints that practically any innovative innovation faces, there is a strong chance that BCT and BC-based systems can be used to enable multidimensional practices for a wide range of public administration applications. There has never been any interference between these two domains in the past. By combining them, new

multidisciplinary solutions for individuals, corporations, and other governments can be developed. Similarly, to propose and construct a new

Figure 5. Overview of Limitation of Blockchain



sector, namely “e-gov,” which consists of a collection of artefacts developed and built in accordance with essential normative structures and executive principles.

Our contribution to this chapter is that, in today’s information world, citizens have grown to demand an easy and effective government-to-citizen connection. Electronic government solutions, these systems, which are aimed at automating choice systems on a large basis, are assisting with meeting these goals while also improving government and social communications efficiency for all members of society. E-government significantly transforms the distributed governance system and has an impact on all document management and processing duties. Among the numerous technological alternatives available, which vary in speed, dependability, and data security, a few recent technology advancements stand out as being founded on radically new compatible principles and showing substantial promise for electronic administration. The logical outcome of blockchain-based solutions and their integration into electronic governance systems will be increased government efficacy, lower transaction costs, and a simpler, faster, more effective, and thus more convenient way of engaging the government with

citizens. An administrative procedure entails recording civil status, property rights, health information, and

other information in an official registry. As a result, blockchain technology may be considered a unique and universal technology that helps streamline and automate practically all administrative activities while boosting the transparency and efficacyof e-government.

CONCLUSION AND FUTURE WORK

Currently implementation of blockchain with e-government has raised several complexities. When an area has satisfied the requirements for e-government implementation, new challenges will appear. As a result of the information technology revolution, governments and industries are being forced to deliver more effective and secure internet services. Every government in the world attempts to provide the public with electronic services that are fast, quick, and beneficial for the users. Furthermore, a distributed ledger is described as a "blockchain" that is accessible among network participants and is used to record transactions that are authenticated by a consensus method that establishes network trust. Governments have begun to investigate the advantages and disadvantages of implementing blockchain technology inside the public sector. Blockchain is considered to have significant potential benefits for the government since it is a combination of technologies such as distributed ledgers, privacy, authentication, and consensus mechanisms. The useof blockchain technology in the public sector appears to benefit citizens and also organizations. However, this advanced technology is still in its development, and e-government faces a number of difficulties and challenges. Furthermore, more study can be conducted to determine the extent to which a single platform or ecosystem might aid in the intensification of collaboration between the government, society, and enterprises, as well as contribute to an increase in government confidence and capacities. Not least, further research is needed to determine the extent to which the government's digital services generate value through the usage of BCT while also increasing trust in the public sector.

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