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The Role of Blockchain Technology in ¹E-Government Capability

Darius Antoni
E-Government Research Group
Faculty of Computer Science
Universitas Bina Darma
Palembang, Indonesia
darius.antoni@binadarma.ac.id

Febriansyah
E-Government Research Group
Faculty of Computer Science
Universitas Bina Darma
Palembang, Indonesia
febriansyahh1213@gmail.com

¹Endang Lestari
Decision Support System Research Group
Faculty of Computer Science
Universitas Sriwijaya
Palembang, Indonesia
endanglestari@unsri.ac.id

E-government implementation is arduous. When a region has met the requirements to implement e-government, new challenges will arise. The advent of IT revolution forces governments and businesses to provide more effective and safe online services. Research of Dien Novita [7] revealed that the e-government implementation in South Sumatra still suffers from several problems, and as a result, the public fails to comprehend the usage and benefits of the applied e-government in the province. To overcome this problem, there is a need for new technology to improve efficacy in the use of e-Government. The solution is the utilisation of *Blockchain* technology. Five *Blockchain* capabilities can be applied to enhance the effectiveness of E-Government. They are Simplification, Digital verification, Data sharing, public security, and low cost. This study suggests a framework or concept of better strategies and policies for the development of sustainable *E-Government* in the province of South Sumatra.

Keywords— E-Government; Development; IT infrastructure; Indonesian

I. INTRODUCTION

E-government is an electronic-based government tool offering public services accessible at any time and anywhere [1]. E-government also allows government officials to serve the public without face-to-face interactions. This eventually will maximise efficiency and minimise the possibility of maladministration practices in public services [2].

Indonesian presidential Regulation No. 95/2018 concerning Electronic-Based Government Systems (SPBE) is a manifestation of the government's determination in performing its functions through the utilisation of information technology (IT) infrastructures with the principles of efficacy, integration, sustainability, efficiency, accountability, interoperability, and security. The Indonesian authorities instructed several government agency officials, including governors and regents/mayors, to initiate the implementation of the National SPBE Plan Map contained in Presidential Regulation No. 95/2018 in coordination with the State Minister for Communication and Information. The government further ordered the state officials to execute the instructions excellently.

Nonetheless, e-government implementation is arduous. When a region has met the requirements to implement e-government, new challenges will arise. The advent of IT revolution forces governments and businesses to provide more effective and safe online services. Such provision

needs thorough and prudent consideration and implementation. Otherwise, through e-government applications, irresponsible parties may manipulate or steal the public's data and information [3]. Also, unsafe e-governments are vulnerable to hackings and cybercrimes.

One of the solutions to provide safety and efficacy in e-government is through the usage of data processing technology with blockchain. Such technology is resistant toward cyberattack and highly active. It also offers fast and straightforward processes. Further, blockchain provides accurate information in which the government can use to assist the public more effectively and monitor the stream of information [4].

Based on the above explanation, this study aims to develop e-government using blockchain technology in the provincial government of South Sumatra. The results of this study will help the government of South Sumatra to improve service quality and public safety in using e-government. In addition, the results of developing e-government with blockchain technology may also be imitated by other regions whose similar problems.

II. RESEARCH METHODOLOGY

The use of literature review creates a solid foundation for advancing knowledge and theory development. This study aims to develop a more profound and more explicit conceptualisation of Blockchain Technology in E-Government Development. Therefore, to meet the objective, this study employed a systematic literature review method in which there are input, process, and output activities [5].

The literature reviews in this study included all the viewpoints of academic, practical, technical, social, and IT processes. This study identified relevant articles and journals from Google Scholar and several databases from e-Resources.Perpusnas (i.e., *Science Direct*, *Cengage Learning*, *Britannica Library*, and *Springer Link*). The terms used for the search were "*Blockchain Technology in E-Government*" and "*Development of E-Government Using Blockchain Technology*".

Table 1 shows the results of the search for articles or journals. The exploration for "*blockchain technology in e-government*" and "*Development Of E-Government Using Blockchain Technology*" obtained 32,325 and 3,994 articles from journals and books, respectively. These figures suggest that blockchain technology is a topic of interest in scientific discussion.

After the identification, the procedure advanced to read the abstracts of the articles. If the explanation was relevant, the process continued to analyse the whole article contents.

In the course of literature reviews, the key concepts focused on "*Blockchain Technology in E-Government*". In the final stage, this study found less than 100 applicable articles. These then were deployed as references to build and develop the concept of e-government using blockchain technology.

TABLE I. TOTAL ARTICLES PER DATABASE

Total Articles in Database	Blockchain Technology in E-Government	Development of E-Government Using Blockchain Technology
Google Scholar	30.600	2.730
Science Direct	1.000	877
Cengage Learning	366	366
Britannica Library	19	1
Springer Link	340	20
Total	32.325	3.994

III. E-GOVERNMENT DEVELOPMENT IN THE PROVINCE OF SOUTH SUMATRA

According to Darius Antoni [6] the implementation of E-Government adapts to the political, geographic, and individual condition of a government. In addition, it also can be used as a manifestation of transparency in every aspect of a government audit. Such a feature is likely to reduce corruption opportunities. This eventually will foster a public perception of clean governance. This further affirms that information and communication technology, especially in the form of E-Government, is one of the factors in the realisation of a transparent government.

In his research, Igif F. Prianto [7] measured the level of e-government implementation in the province of South Sumatra based on several criteria. The outcomes of the measurement were as follows: Policy=1.83, Institutional=1.90, Infrastructure=2.57, Application=1.90, and Planning=2.50. Meanwhile, the average implementation of E-Government in all Provinces in Indonesia based on Policy=1.87 (51.18%), Institutional=2.07 (62.9%), Infrastructure=1.95 (59.3%), Application=2.01 (55.6%), and Planning=1.75 (40.8%). These statistics indicate that the e-government implementation in all provinces in Indonesia remains substandard.

However, specifically in South Sumatra, e-government implementation shows positive trends. In 2017, measured using the Alexa parameters, there were increases in the parameters of bounce rate (by 37.25%), global rank (with an average of 544,143 rankings), and total link (13 links averagely). These evidence that in 2017 the government websites in South Sumatra were more popular than the previous year [8].

Although the prospect is encouraging, in her research, Dien Novita [9]) stated that the e-government implementation in South Sumatra still suffers from several problems. Such inconvenience emerges due to the underlying factors such as weak leadership, inadequate human resources, digital divide, lack of coordination, and poor regulations. As a result, the public fails to comprehend the usage and benefits of the applied e-government in the province.

IV. BLOCKCHAIN TECHNOLOGY IN E-GOVERNMENT

One study uncovered [4] that governments are attempting to apply blockchain technology in their public services (e-government), such as in health, education, financial, and management services.

a. Data Sharing

Blockchain technology can share all stored data among all participants (e.g., organisations and citizens). The principal benefits of implementing Blockchain technology for public services include reducing the complexity in exchanging information among organisations, as well as sharing processes and ensuring the keeping of confidential records [12] [13]. Particularly for the health sector, the digitalisation of information/records has brought significant changes. The utilisation of Blockchain technology forms a safe and flexible public service system that can be used to exchange electronic health record data. In this technology, the system stores all health-related data, such as organs and blood condition, medicinal history, and medical licences/certificates. Such feature transforms the health service to be more comprehensive and explicit, and can also prevent the practice of counterfeit doctors. Further, blockchain technology can also optimise the delivery of public data by assisting the coordination process among public service agencies [4]. As a result of such optimisation, data are more traceable [10].

b. Digital Verification

Interaction based on Blockchain technology occurs between two individuals using cryptography, where their identities are covered using a pseudonym [12]. This way, user privacy is better protected than in classic electronic transactions. Moreover, according to one study [14], through Blockchain technology, outgoing and new data are stored in closed block compartments (i.e., ledgers) which are distributed across the network in a verifiable and irreversible manner. In another study [15], in the United States, only MIT Media Lab has developed a full-scale Blockchain-based credential education system using Blockchain wallets to store Blockcerts. The Privat Key is used to generate user cryptographic signatures (truly and fully digital IDs) needed to verify every transaction. Further, a study on health sector [16] revealed that medical records, through permission management on the blockchain, allow patient-initiated data exchange in the system.

In the education sector, data of certificates, students, and faculty are essential. Such data must be valid, the contributors of them also are numerous, and the origin of the records needs to be appropriately known. Blockchain technology applications can facilitate such importance. It can protect the educational certificates as well as students and schools' data. Additionally, it can effectively validate and verify the creators and origin of the certificates and data [4].

c. Public Security

The public data security system is the process of protecting public data from misuse, modification or destruction, and protection of computer systems from

irresponsible users [17]. The reliability and security of E-Government and its technology is an important concern for the public, primarily if they have never implemented it.

Blockchain technology has high-level security features [18]. First, it can discover the origin of cases' evidence in the system [4]. Second, the availability and fault tolerance of the system is exceptional, as all nodes keep copies of records and check each other [19]. Third, blockchain provides transparency with anonymity. Fourth, privacy is not addressed but can be enforced. Fifth, it can improve information security and privacy through data encryption and distribution across the network [14]. Sixth, Blockchain technology cannot (illegally) be removed or manipulated once written [20]. Therefore, as a result of the features, the system under blockchain technology can function properly, independently, and transparently forever, without external interference. Also, the management of documents on the blockchain is more convenient and secure. A study of e-voting has proved the benefits of blockchain technology [20]. It proved that blockchain can handle almost all security issues, such as voter privacy, integrity, verification and non-rejection of votes, and transparency of counting

d. Simple

Blockchain is a simple method of conveying information that can include financial transactions from party A to B to C to ... Z in an automated and secure fashion without the need for intermediaries, where the final recipient Z has direct access to complete web-based transactional records and cannot be adulterated, tracing all the way to party origin A [21]. The simplicity of Blockchain technology enables business transactions using "smart contracts" - although critics claim that "smart contracts" can reduce intelligence (Derousseau, 2017). This further proves that the old manual system needs to be enhanced [15].

Another study [22], on digital document storage, revealed that Blockchain technology provides a simple alternative model for proving the existence and ownership of legal documents. Proof of Existence is a simple service that allows one to store online the proof of the existence of any document anonymously and securely.

e. Low Cost

The more straightforward a complex system will undoubtedly have an impact on reducing operational or infrastructure costs. In terms of blockchain technology implementation, the use of Blockchain-based solutions can lower software costs as most of the Blockchain bundles are Open Source projects that are equipped with customisable APIs [19]. Furthermore, Ojo & Adebayo stated that blockchain can increase support for non-repudiation, governance, as well as fraud prevention and reporting. From a technical point of view, this allows users to recognise opportunities to integrate trusted third-party ecosystems to reduce their global platform costs, increase customer and market reach, and develop new propositions. Another study [15], concerning the benefits of blockchain in the sphere of education, declared that Blockchain technology creates an infrastructure to document, store, and manage credible data and keep records of educational achievement that they can control. This reduces

administrative and bureaucratic costs which ultimately benefits the university/educational institution.

Another study [23] clarified that a registration system based on Blockchain technology can improve protection. This can reduce transaction costs due to the elimination of payment of state duties and brokerage fees. On the other hand, the transaction itself can save time and is also more transparent and safer.

TABLE II. BLOCKCHAIN CAPABILITIES FOR E-GOVERNMENT

No	Dimensions	Indicators	Ref.
1	Data Sharing	Range of government applications in use. E-Government Application Capability to share resources and data in government networks.	[4], [10], [11], [12], [24], [25], [26], [27], [28], [29]
2	Public Security	The level of network security of E-Government applications within the scope of government, protection of privacy of public data.	[4], [18], [19], [14], [20], [24], [25], [30], [31], [26]
3	Digital Verification	Centralised personal data, control over personal data, account and verification, account authentication.	[4], [12], [14], [15], [16], [24], [25], [32], [31], [26]
4	Simple	Short service time, easy administration, low error rate.	[15], [22], [21], [24], [32], [33], [27], [34], [35]
5	Low Cost	Cost-Effectiveness and Efficiency of Application Maintenance and Services. The number of third parties involved in E-Government servers.	[19], [36], [15], [23], [24], [25], [32], [30], [37], [26]

V. E-GOVERNMENT FRAMEWORK CONCEPT USING BLOCKCHAIN TECHNOLOGY

This study aims to create innovation for the E-Government in South Sumatra. It attempts to offer a safer and more user-friendly application for the public. Based on the explanation above, this research produces an E-Government development framework using Blockchain technology which can be seen in Figure 1.

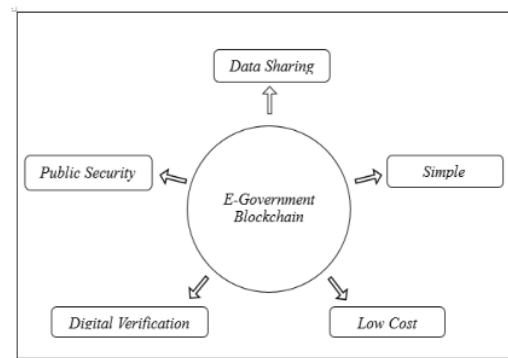


Fig. 1. E-Government Concept Framework Using Blockchain

The implementation of Blockchain Technology in E-Government has 5 main factors that need to be developed. They are (1) Data Sharing, (2) Digital Verification, (3) Public Security, (4) Simple, and (5) Low Cost. Through the use of Blockchain technology in e-government, the government can improve the quality of security, reduce operational costs, optimise work so that it will increase public trust in E-Government services. Ultimately, these efforts will improve service quality and use of e-government in South Sumatra.

VI. CONCLUSION

E-Government development using Blockchain technology is a topic of interest to discuss. Through a comprehensive review of the literature and previous reports, this study highlights several findings on the role of IT infrastructure capabilities. This research reveals 5 capabilities of Blockchain Technology as follows: Simplification, Data Sharing, Digital Verification, Security, and Cost Relief. The government of South Sumatra requires these capabilities to enhance the effectiveness and safety usage of E-Government applications.

This concept was developed to address various problems, including security issues, public trust, minimal budgets, as well as problematic data distribution for E-Government development in several cities and districts in Indonesia. The utilisation of Blockchain technology will have a positive influence on the performance of city governments, both in terms of technology and costs concerning what the government expects.

This research contributes to the E-Government research domain for both a theoretical and practical perspective. From a theoretical standpoint, this study provides a better understanding of the concept of E-Government which is developed from the perspective of IT infrastructure capabilities.

From a practical perspective, this study presents relevant references and recommendations to the South Sumatra Provincial government on how to maximise the use of E-Government to improve service performance. Thus, this study suggests a better strategic and policy framework or concept for the development of sustainable E-Government in the province of South Sumatra.

RECOGNITION

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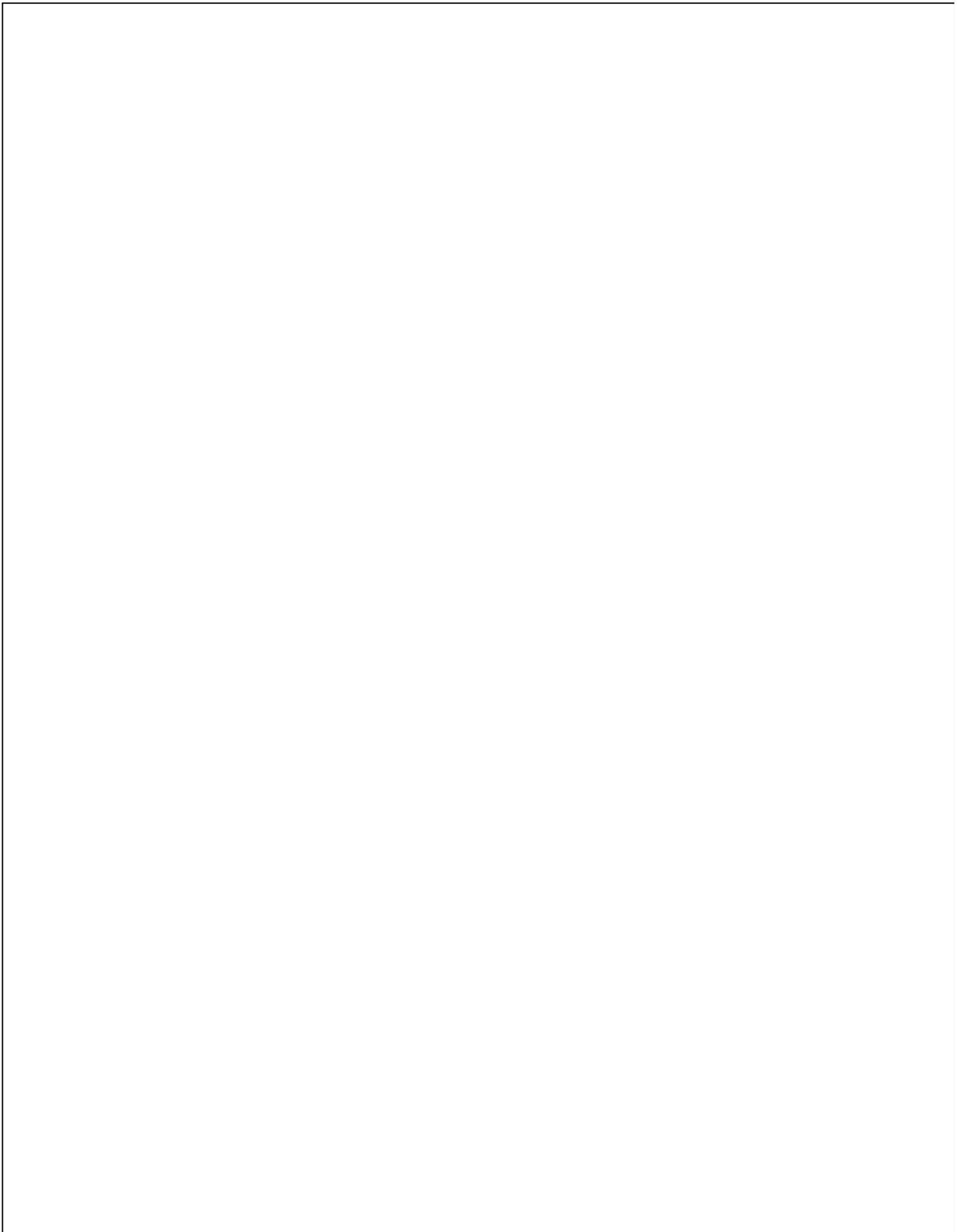
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