

Identifying and prioritizing the advantages of implementing blockchain technology in public-private enterprises

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Abstract

Purpose: Identifying and prioritizing the benefits of implementing blockchain technology in public-private enterprises.

Research Methodology: A comprehensive literature review on this topic revealed a variety of benefits associated with the implementation of blockchain technology. These identified benefits were then presented to experts for prioritization through the use of the DEMATEL questionnaire, leading to the development of the DANP decision matrix.

Results: The benefits were systematically ranked, resulting in the prioritization of tracking, security, and sustainability. Regarding the importance of the identified benefits, the experts ranked "Improving the Quantity and Quality of Services" as the most important and highest-priority benefit of implementing blockchain technology.

Conclusions: Implementing blockchain technology has many important benefits for public-private companies.

Limitations: Due to the research timeframe and limited interactions, only a few organizations and a medium number of personnel were examined.

Contribution: Recommendations are provided for the effective application of blockchain technology to managers of public-private enterprises. This research offers valuable insights into the key benefits and priorities for implementing blockchain technology in state-owned companies. These findings can inform strategic decision-making and guide the effective adoption of this transformative technology.

Keywords: *Blockchain, Benefits, Public-Private Companies*

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1. Introduction

Blockchain is recognized as a key innovative and transformative technology within the framework of "Industry 4.0." The adoption of Industry 4.0 technologies has enabled numerous manufacturing units to enhance their capabilities and performance of manufacturing units. The emergence of technologies such as blockchain has prompted both private and public organizations to explore their potential applications in various fields. However, many grapple with the critical question of whether adopting this technology aligns with their strategic interests. What are the business advantages of utilizing blockchain, and how can these benefits be quantified?

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strategic interests. What are the business advantages of utilizing blockchain, and how can these benefits be quantified?

In recent years, a wave of innovative technologies known as "Industry 4.0" have emerged across various sectors. The adoption of these transformative technologies has allowed many manufacturing units to improve their capabilities and overall performance. Beyond manufacturing, numerous service industries, including telecommunications and banking, expect to gain significant advantages from the digital advancements associated with industry 4.0. These technologies have enabled the development of new business models that utilize AI. Currently, the service sector represents the largest share of GDP in most advanced economies worldwide. Private and public companies in these industries are either actively implementing or experimenting with these technologies to enhance their business operations.

The Industry 4.0 revolution includes a diverse range of technologies such as cloud computing, 3D printing, the Internet of Things (IoT), cyber-physical systems (CPS), artificial intelligence (AI), and blockchain. These emerging technologies have not only increased market competition but also introduced uncertainty into the business environment. The traditional business landscape, once characterized by stability, minimal competition, and straightforward processes, has transformed into a dynamic and highly competitive ecosystem defined by fluid processes and technology-driven strategies (Chong, Lim, ua, Zheng, & Tan, 2019).

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Research shows that individuals often assess the availability and effectiveness of potential benefits when facing specific challenges. According to the value-expectancy theory, individuals tend to favor actions that produce positive outcomes while avoiding those that lead to negative consequences. Consequently, decisions made to address threats are influenced by the perceived benefits of those actions. In the rational decision-making process, individuals typically perform a cost-benefit analysis before choosing a particular approach (Hamida, Brousmiche, Levard, & Thea, 2017). Therefore, to promote the adoption of blockchain-based applications, it is crucial to communicate and explain the benefits of this technology to consumers. The infrastructure of blockchain technology has the potential to provide a trusted user interface. This study aims to identify and analyze the benefits of implementing blockchain technology in private and public organizations.

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2. Literature Review

A blockchain is a distributed database organized as an ordered list of immutable blocks. This structure not only improves transparency but also enhances transaction auditability. Organizations are increasingly investing in this technology, recognizing its potential to decentralize architecture and reduce transaction costs. By utilizing blockchain, companies can operate in a manner that is inherently more secure, transparent, and, in some cases, faster. Therefore, blockchain is more than just a marketing trend. Blockchains can be classified into three generations based on their applications:

- First-generation blockchains: These primarily facilitate cryptocurrency transaction.
- Second-generation blockchains: These include a wider array of applications beyond cryptocurrency, such as smart contracts.
- Third-generation blockchains: These expand into various fields, including government services, healthcare, scientific research, and the Internet of Things (IoT).

Blockchain technologies combine cryptography, mathematics, algorithms, and economic models, utilizing peer-to-peer networks and distributed consensus algorithms to tackle the challenges of synchronizing traditionally distributed databases (Yue, Junqin, Shengzhi, & Ruijin, 2017). In this field, blockchain has the potential to improve society's views on privacy and security issues. It is anticipated to have a positive impact on various aspects of smart cities, such as banking and payment transactions, population growth forecasting, medical records and healthcare, voting, digital government services, financial services, and other fields (Laroiya, Saxena, & Komalavalli, 2020).

Blockchain provides a secure and distributed framework that facilitates the sharing, exchange, and integration of information among users and third parties. It is essential for planners and decision-makers to assess the relevance of this technology to their specific industries and business models. Blockchain should be adopted only when it is practical and can offer enhanced security, increased revenue opportunities, and cost savings (Lepore et al., 2020). Moreover, blockchain technology can create reliable mechanisms for transactions between private and public entities. Each stakeholder has full control over their assets through private keys, ensuring that no one else can access another person's assets. The use of asymmetric cryptography also allows authentication, verification, and prevention of unauthorized retransmission of transactions and data within the blockchain network. Overall, adopting blockchain increases trust in the system, addressing one of the key challenges businesses face today (Mukkamala, Vatrappu, Ray, Sengupta & Halder, 2018).

The public nature of blockchains allows anyone to connect to the network, upload content, and verify the information. Transparency is a key feature of blockchains that ensures that information can be verified. This openness fosters significant transparency in the operations of businesses and sectors in both the private and public realms (Greenspan 2015). Importantly, a high level of transparency does not necessarily compromise the privacy of the user. Blockchain-based applications enable users to conduct quasi-anonymous transactions without revealing their personal information. In decentralized peer-to-peer networks, blockchains, and cryptocurrencies, traceable pseudonymous techniques are used for communication and transactions (Christidis & Devetsikiotis, 2016).

Although blockchain offers a promising approach to transforming existing systems, processes, and businesses, several challenges must be addressed to fully harness its potential across different sectors. Some authors have highlighted the various challenges and opportunities associated with blockchain technology (Lopes, Castro, & Russo, 2024; Mendling et al., 2018), which we outline in Table 1.

Table 1. Challenges and opportunities facing blockchain technology

Challenges	Opportunities
The speed of technological advancement in the blockchain sector does not keep pace with legislative progress, leading to cumbersome regulations and laws that present significant challenges for the adoption of blockchain technology.	Blockchain has transformed the current Internet from an "Internet of Information Sharing" to an "Internet of Value Exchange".
Locked Funds, Funds are secured within each path. Selecting a partner for collaboration on a given path signifies a commitment to that particular side. Closing the path and transferring funds to a new path with a different partner necessitates costly blockchain transactions, which introduces a level of risk. Consequently, it is essential to choose partners judiciously.	Improving market efficiency through the elimination of intermediaries.
Insufficient levels of anonymity (Laroiya et al., 2020).	Possibility of using smart contracts (Yang et al., 2020)
Blockchain relies on permanent encryption, necessitating a mining system that consumes substantial energy (Bruhl, 2017; Chong et al., 2019)	Protection of personal information (Tafuro, Dammacco, & Costa, 2023)

Casino, Dasaklis, and Patsakis (2019), who reviewed multiple sources, argued that blockchain technology can play a crucial role in the healthcare industry, with numerous applications in areas such as public healthcare management, electronic health (records, online patient access, sharing of patient medical data, user-centric medical research, counterfeit drug detection, clinical trials, and precision medicine. Approximately 90% of the world's data has been generated in the past two years alone, and this growth rate is expected to accelerate owing to a) the emergence of the Internet of Things (IoT) and b) population growth. While the potential for the expansion of blockchain and IoT technologies is significant, their synergetic relationship is even more profound. The increasing focus on and investment in the implementation of decentralized IoT platforms can be largely attributed to blockchain technology and its inherent capabilities.

Global trade is primarily a response to evolving needs rather than systematic expansion. Given the global production process and the necessity for transparency among suppliers, attention to the supply chain is crucial. Blockchain serves as an ideal tool for supply chain management, enabling real-time tracking of goods, and is particularly advantageous for companies with multiple supply chains. The implementation of blockchain can effectively eliminate inefficient and inadequate supply chains. Businesses are transforming through blockchain-based supply chain solutions that provide end-to-end decentralized processes via distributed ledger technology and digital ledgers (Adams, Parry, Godsiff, & Ward, 2017; Swan, 2015).

Blockchain has the potential to become a significant source of disruptive innovation in business and management by enhancing, optimizing, and automating processes. Numerous e-business models that leverage the IoT and blockchain are emerging. This study focuses on the benefits of implementing blockchain technology in private and public companies, which are summarized in Table 2. In addition to the literature review, a qualitative approach was employed to identify and localize the benefits of blockchain implementation in private and public enterprises. During the interviews, experts were

presented with the identified benefits, leading to the recognition of 14 distinct advantages (Ismail & Materwala, 2019) (Lin & Liao, 2017).

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Table 2. Identified benefits of implementing blockchain technology in private public companies to improve the business environment

(Weber et al., 2017; Zhao, Fan, & Yan, 2016)	Blockchain can enhance public service delivery by improving interoperability, increasing service speed, and enhancing predictive capabilities	Improvement of A1 Service Quality and Customer Loyalty.
(Avital, 2018; M Forozandeh, Teimoury, & Makui, 2019; Reijers, O'Brolcháin, & Haynes, 2016; Viriyasitavat & Hoonsopon, 2019; Zikratov, Kuzmin, Akimenko, Niculichev, & Yalansky, 2017)	By accelerating essential subprocesses, blockchain strengthens the operations of public and private companies, as access to information is simplified and expedited through this technology.	Process Management A2 and Simplification
(Mohammad Forozandeh, 2021; Kim & Laskowski, 2018)	Transactions and historical transaction data are publicly visible within a blockchain and are immutable, thereby increasing transparency in governmental processes.	Transparency A3

(Faria & Correia, 2019; Li, Cai, Deng, Yao, & Wang, 2019; Morande & Marzullo, 2019; Verma & Garg, 2017)	Information is stored on an open blockchain and is accessible to anyone.	Accessibility and Reduction of Record Compression and Storage	A4
(M Forozandeh et al., 2019; Pilkington, 2016; Zheng, Xie, Dai, Chen, & Wang, 2017)	Data stored on a blockchain can be easily shared among all stakeholders when necessary	Information Sharing and Immutability	A5
(Grover, Kar, & Vigneswara Ilavarasan, 2018; Morande & Marzullo, 2019; Tapscott & Tapscott, 2018)	The use of consensus mechanisms in blockchain ensures the integrity of the chain (data).	Data Security	A6
(Mohammad Forozandeh, 2021; Johng, Kim, Hill, & Chung, 2018; Kokina, Mancha, & Pachamanova, 2017; Nguyen, 2016; Pal, Tiwari, & Haldar, 2021)	Transaction costs are reduced through blockchain technology, as the need for intermediaries (third parties) is eliminated.	Cost Reduction	A7
(Casino et al., 2019; Farah, 2018; Wang, Luo, Hua, & Wang, 2019; Zheng, Xie, Dai, Chen, & Wang, 2018)	Blockchain-based platforms can be utilized to provide citizens with reliable access to government information, thereby enhancing citizen trust in government.	Increased Credibility	A8
(Notheisen, Cholewa, & Shanmugam, 2017; Shardeo, Patil, & Madaan, 2020)	Automating transactions and their verification significantly decreases the likelihood of human errors	Reduction of Human Errors.	A9
(Aras & Kulkarni, 2017; Cai & Zhu, 2016; Dumitrescu, 2017)	Users can remain anonymous by providing encrypted keys, preventing unauthorized access to individuals' personal information in government systems.	Privacy Preservation	A10
(Beck & Müller-Bloch, 2017; Crosby, Pattanayak, Verma, & Kalyanaraman, 2016; Dai & Vasarhelyi, 2017)	Hacking or unauthorized alterations within a blockchain are challenging without leaving a trace, as data is stored across multiple distributed ledgers.	Prevention of Fraud and Data Manipulation	A11
(Kewell, Adams, & Parry, 2017; Knezevic, 2018; Mitiku & Nega, 2021; Paternoster & Pogarsky, 2009; Upadhyay, 2020)	Storing information in distributed ledgers facilitates the prevention of corruption and enhances traceability.	Reduction of Corruption and Traceability	A12

(Mohammad Forozandeh, 2022; Goldenfein & Leiter, 2018; Kaijun, Ya, Linbo, Han-Chi, & Van Nieuwenhuyse, 2018; Mbamalu, Chike, Oguanobi, & Egbunike, 2023; Narayanan, Bonneau, Felten, Miller, & Goldfeder, 2017)	Blockchain technology increases flexibility, resulting in clearer and faster communication within the supply chain	Improved Supply Chain Management.	A13
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3. Research Methodology

This study aims to identify and prioritize the various benefits of implementing blockchain technology in private and public companies, thus classifying it as applied research. Methodologically, the study employs a descriptive survey approach and is categorized as a case study. Both interviews and questionnaires were used for the empirical investigation. The implementation process is qualitative in nature and is classified as cross-sectional research in terms of its temporal framework. The steps of this study are illustrated in Figure 1.

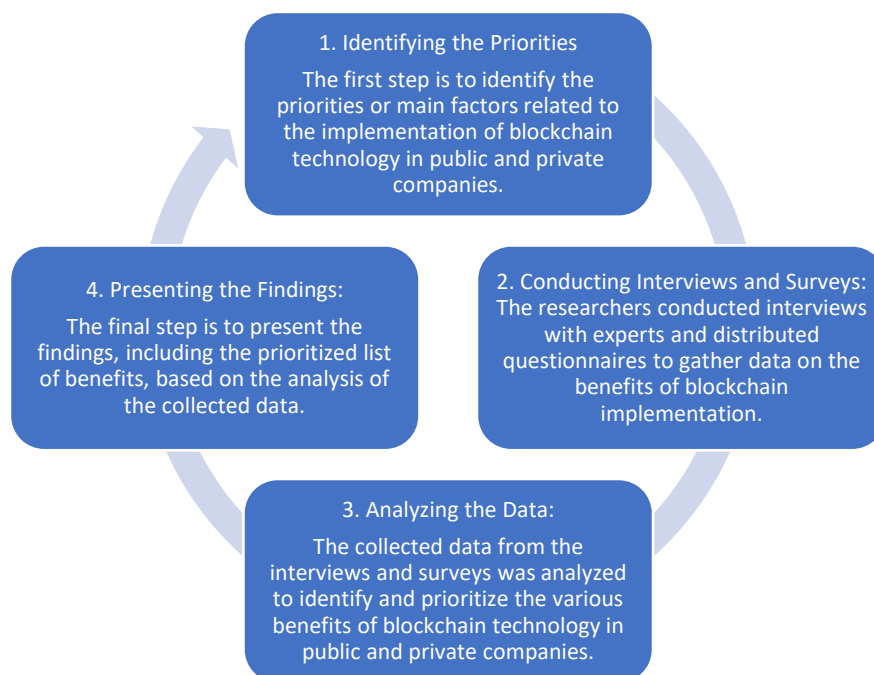


Figure 1. The research methodology

The image suggests a cyclical process, where the identified priorities and analyzed data are used to refine the understanding of the benefits, leading to an iterative process of data collection and analysis. The population under investigation in the present study comprises experts and specialists active in the field of blockchain technology, as well as managers and subject-matter experts in private and public sector companies. Given the small sample size, the number of samples in the statistical population was considered equal to the total number of the statistical population, resulting in a total of 20 questionnaires. The sampling method used in this study was non-random and purposive. Two methods were employed to collect data: library research and field interviews. To review the theoretical foundations and existing literature, articles, books, and online scientific databases were utilized. To gather field data, individual interviews were conducted with experts and practitioners active in private and public blockchain companies.

In this study, the following formula was used to assess the reliability of the data:

$$g = \frac{1}{n(n-1)} \sum_{i=1}^n \sum_{j=1}^n \frac{|t_{ij}^p - t_{ij}^{p-1}|}{t_{ij}^p} \times 100 \quad 1 -$$

Where:

$$g = \frac{\sum (t_{ij}^p - t_{ij}^{p-1})^2}{(n * (n-1))}$$

Where:

- g represents the inconsistency rate
- t_{ij}^p denotes the elements of the matrix of the average opinions of all experts
- t_{ij}^{p-1} represents the elements of the matrix of the average opinions of experts excluding the i-th expert
- n is the number of criteria

The reliability of the data was calculated using the following formula:

$$\text{reliability of the data} = 1 - \frac{g}{2}$$

If the value of 'g' is less than 5% (reliability above 95%), the reliability (validity) of the data is confirmed. In the present study, the calculated value for the reliability of the data was approximately 0.04, which was within the acceptable range. In this study, the DEMATEL-based ANP (DANP) technique was used. The combination of the DEMATEL and ANP methods can provide a useful tool for identifying the critical features of an implementation policy and calculating the weights of the business environment criteria. The step-by-step execution of the DANP method is discussed in the following subsections.

Step 1: Defining the Goal, Criteria, and Sub-criteria: In first step, the goal, criteria, and sub-criteria of the model were defined using the existing literature, expert opinions, and other relevant methods.

Step 2: Creating the Direct-Relation Matrix using DEMATEL: For comparing the relative importance of the elements, a scale from 0 to 4 was used, where 0 represents "no influence," 1 represents "low influence," 2 represents "medium influence," 3 represents "high influence," and 4 represents "very high influence." The experts evaluated the influence of the criteria on each other using this scale. If the experts believe that criterion i has an influence on criterion j, they assign a corresponding value a_c^{ij} to represent the degree of influence. The resulting matrix $A = [a_c^{ij}]$ represents a direct relationship matrix.

Step 3: Normalizing the Direct-Relation Matrix: The direct-relation matrix A is transformed into the normalized direct-relation matrix M using the following relationships:

$$M = k \times A \quad 3$$

$$k = \min \left(\frac{1}{\sum_{j=1}^n |a_{ij}|}, \frac{1}{\sum_{i=1}^n |a_{ij}|} \right) \quad i, j \in \{1, 2, 3, \dots, n\} \quad 4$$

Step 4: Calculating the Total-Relation Matrix: After calculating the normalized direct-relation matrix M, the total-relation matrix S is computed using the following relationship: The total-relation matrix S represents the overall influence and dependence among the criteria.

$$S = M + M^2 + M^3 + \dots = \sum_{i=1}^{\infty} M^i = M(I - M)^{-1} \quad 5$$

$$S = M + M^2 + M^3 + \dots = \sum_{i=1}^{\infty} M^i = M(I - M)^{-1} \quad 6$$

$$S = [S_{ij}]_{n \times n}, i, j \in \{1, 2, 3, \dots, n\} \quad 7$$

$$D = \sum_{j=1}^n S_{ij} \quad 8$$

$$R = \sum_{i=1}^n S_{ij}$$

9

Step 5: Constructing the Influence Diagram: By influence diagram is created by plotting the (D+R, D-R) data. The obtained data represent the influence and importance of each criterion in the model. Criteria with positive (D-R) values are considered influential, whereas those with negative (D-R) values are considered influenced. Additionally, the (D+R) values indicate the level of interaction and importance of the criteria, where higher (D+R) values correspond to higher interaction and importance and lower (D+R) values indicate lower interaction and importance.

Step 6: Normalizing the Total-Relation Matrix of Dimensions S_D^α . The S_D matrix is obtained by averaging the S_C^{ij} elements. This matrix was then normalized according to the following procedure: the sum of each row was calculated, and each element was divided by the sum of the elements in its corresponding row. The normalized total-relation matrix of dimensions S_D is denoted as S_D^α .

Step 7: Normalize the total relation matrix of criteria S_C^α . To normalize S_C and obtain S_C^α , the normalization occurs within the sub-matrices of the super-matrix S_C .

$$d_{ci}^{11} = \sum_{j=1}^{m_1} s_{cij}^{11}, i = 1, 2, \dots, m_1 \quad 10$$

$$S_C^{\alpha 11} = \begin{bmatrix} s_{c11}^{11}/d_{c1}^{11} & \dots & s_{c1j}^{11}/d_{c1}^{11} & \dots & s_{c1m_1}^{11}/d_{c1}^{11} \\ \vdots & & \vdots & & \vdots \\ s_{ci1}^{11}/d_{ci}^{11} & \dots & s_{cij}^{11}/d_{ci}^{11} & \dots & s_{cim_1}^{11}/d_{ci}^{11} \\ \vdots & & \vdots & & \vdots \\ s_{cm_11}^{11}/d_{cm_1}^{11} & \dots & s_{cm_1j}^{11}/d_{cm_1}^{11} & \dots & s_{cm_1m_1}^{11}/d_{cm_1}^{11} \end{bmatrix} \quad 11$$

Step 8: Forming the Unweighted Super-Matrix W: In this step, the transpose of the normalized total-relation matrix S_C^α is calculated, resulting in the matrix W. If a submatrix within W, such as W^{11} , is empty or zero, it indicates that the corresponding matrix is independent.

Step 9: Forming the Weighted Super-Matrix: To form the weighted super-matrix, the transpose of the normalized total-relation matrix of dimensions is multiplied by the unweighted super-matrix W.

Step 10: Limiting the Super-Matrix: The super-matrix is defined as a partitioned matrix in which each sub-matrix represents the relationships between two clusters. The local priority vectors are presented in the corresponding columns of the supermatrix. Initially, the supermatrix is created randomly. Therefore, the weighted super-matrix is raised to limiting powers until the weight convergence reaches a stable state, resulting in a limited super-matrix. The final priorities are obtained. *by normalizing the matrix blocks*

4. Result and Discussion

Through the calculations performed in the previous steps using the DANP methodology, the total relation matrices of the dimensions S_d and sub-criteria S_c were obtained. These matrices provide valuable insights into the influence and dependence relationships among the various elements of the system being studied. By analyzing these calculated values and constructing influence diagrams, researchers can gain a deeper understanding of the complex relationships and interdependencies among the various elements of the system. This information is crucial for informed decision-making and developing effective strategies.

This table presents the total matrix with the calculated values of D, R, D + R, and D-R for each criterion. The D values represent the degree of influence of each criterion, and the R values represent the degree

of dependence. The D+R values indicate the overall importance and level of interaction of the criteria, and the D-R values represent the net influence of the criteria, with positive values suggesting influential criteria and negative values indicating influenced criteria. This table provides a comprehensive overview of the relationships and interdependencies among the criteria, which are crucial for informed decision-making and the development of effective strategies.

Table 3. Total matrix with D+R and D-R values

	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13
D+	2.07	1.2	2.3	1.28	1.7	1.8	0.95	2.34	1.74	1.63	2.07	2.32	1.1
R		8	2		5	8							2
D-R	0.15	0.1	0.2	0.027	0.4	0.0	0.35	0.08	0.35	0.08	0.08	0.03	0.2
	-	4	6	-	5	7	-	-	-	-	-	-	2

Finally, using the calculated values, the influence and impact diagrams of the factors and subfactors were drawn. In the drawn diagrams, the horizontal axis displays D + R, and the vertical axis displays D-R.

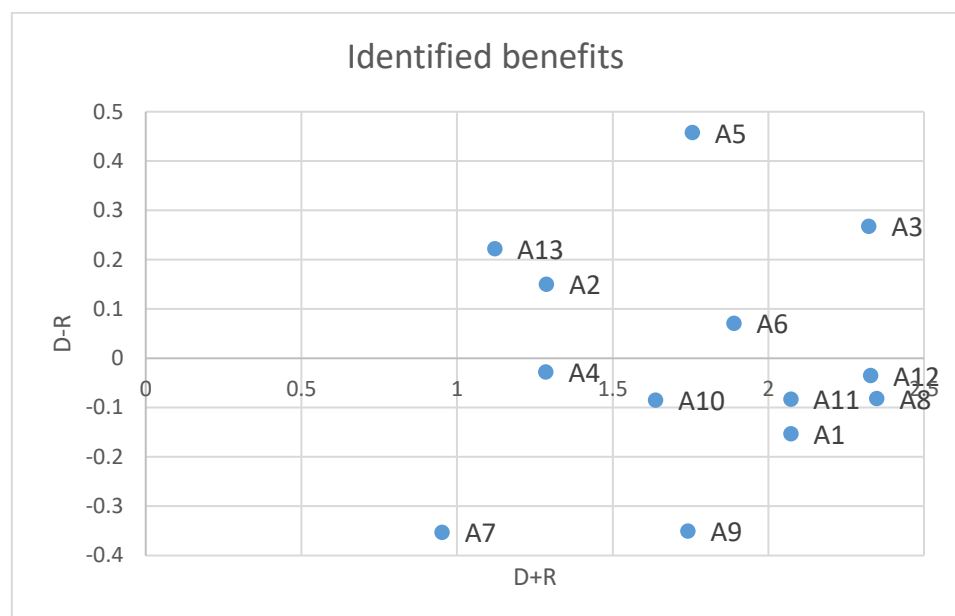


Figure 2. Impact diagram of the benefits of implementing blockchain in private public companies

Based on the influence and impact diagram presented, the analysis reveals the following key insights: five of the subfactors (A5, A13, A2, A6, and A3) are identified as influential, while eight of the subfactors (A7, A4, A10, A9, A11, A12, A8, and A1) are considered influenced. Furthermore, the calculated values provide additional insights.

- Subfactor A8 had the highest level of interaction with other factors, as indicated by its significantly higher (D+R) value. This suggests that A8 is of greater importance than the other subfactors.
- In contrast, subfactor A7 has the lowest level of interaction and importance among the subfactors, as evidenced by its considerably lower (D+R) value.

Building on these findings, the next step was to perform the DANP method to prioritize the identified benefits of implementing blockchain technology in private state-owned companies. The output of this step is the effective DANP weights for the subfactors. To obtain the weight of the factors, the weights of the subfactors related to each factor are added together. The final weighted prioritization of the subfactors is presented in the following section.

Table 4. Weight and rank of factors and sub-factors

	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13
Weight	0.04	0.02	0.03	0.02	0.02	0.03	0.02	0.04	0.03	0.03	0.03	0.04	0.01
Rank	1	12	5	10	11	7	9	2	6	8	4	3	13

5. Conclusion

This study aimed to identify and prioritize the benefits of implementing blockchain technology in private state-owned companies. These benefits were validated by reviewing the relevant literature and consulting with subject matter experts. The DANP method was employed to prioritize these benefits. The research findings are summarized as follows:

- Regarding the importance of the identified benefits, the experts ranked "Improving the Quantity and Quality of Services" as the most important and highest-priority benefit of implementing blockchain technology.
- The benefits related to "Increasing Credibility" and "Reducing Corruption" were ranked next in terms of importance and priority.

Overall, this study provides valuable insights into the key benefits and priorities of implementing blockchain technology in private state-owned companies. These findings can inform strategic decision-making and guide the effective adoption of this transformative technology.

Improved Supply Chain Communication and Transparency with Blockchain: Blockchain technology, with its shared network infrastructure and distributed ledger, enhances communication and collaboration among all parties in the supply chain. Greater traceability and transparency eliminate issues such as duplicate orders, invoice fraud, and overage. Compliance with contractual obligations on a blockchain network encourages all parties to fulfill their agreed-upon responsibilities in a timely, complete, and accurate manner. Full visibility of financial and performance information also improves financing opportunities for small businesses. Additionally, blockchain helps streamline and enhance supply chain performance by reducing paperwork at lower levels of the supply chain.

Blockchain as a Tool for Innovative Problem-Solving: Blockchain technology introduces new systems of trust and exchange, allowing users to share information, experiences, and knowledge directly between parties without the need for intermediaries. This direct knowledge and experience sharing, along with its utilization by all members of the organization, can lead to more innovative approaches to addressing the problems and issues at hand.

Increasing Customer Loyalty through Blockchain: Trust is crucial for building brand loyalty. Blockchain's ability to create transparency makes it an attractive option for organizations seeking to gain and maintain customer trust and loyalty. By empowering customers to control and create a permanent record, blockchain technology can enable the development of reward-based and loyalty programs that reduce errors, lower costs, and increase customer trust and loyalty.

Efficient Decision-Making and Lawmaking with Blockchain: Blockchain is a platform that can record and store desired information. The access and transparency of this information vary depending on whether the blockchain is private or public. Depending on the nature, volume, and transparency of the recorded information, blockchain can facilitate better decision-making and more efficient lawmaking, benefiting both legislative institutions and active businesses.

Effective Monitoring through Blockchain: The presence of accurate and transparent information with easy access makes it easier to monitor activities and increases the security of stakeholders in various sectors, such as investment and privacy.

Improved Communication and Interactions with Blockchain: By enhancing process and information transparency, increasing service delivery speed, and improving performance through blockchain technology, customer satisfaction increases, leading to stronger solidarity and communication.

Increased Consumer Trust in Private Businesses through Blockchain: By making processes and information more transparent, increasing the speed of service delivery, eliminating intermediaries in the market, and creating reliable user interfaces, blockchain technology can increase consumer trust in private businesses, contributing to their development and growth.

Proposed Solutions:

Leveraging Blockchain for Globalization and Facilitation of International Communication

- Blockchain technology can enable cross-border transactions and asset transfers without being constrained by borders or legal frameworks.
- Blockchain-based digital currencies can help overcome the challenges of using foreign currencies that are dependent on third-party countries.
- Blockchain technology can empower small businesses to engage in international commerce, erasing the boundaries between large and small enterprises.

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