engineering proceedings

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Proceeding Paper

Analysis of Data Sharing Systems in the Context of Industry 4.0 via Blockchain in 5G Mobile Networks †

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† Presented at the International Conference on Electronics, Engineering Physics and Earth Science (EEPES'24), Kavala, Greece, 19–21 June 2024.

Abstract: The article discusses the advantages and disadvantages of Blockchain technologies. The types of distributed networks are defined and established as open, closed, consortium, and hybrid. Due to the variety of platforms in the Industry 4.0 society, which cannot be distinguished exactly as one type among those listed, the advantages and disadvantages of public and private networks are analyzed. Creating a real project requires compliance with various criteria. The synergism of standard and specialized environmental factors suggests difficulty in developing a techno-economic analysis for a specific task. Therefore, a SWOT analysis is proposed through which strengths and weaknesses, threats, and challenges are determined. To reduce the impact of threats and weaknesses when implementing technology in the industry, a combination of an Enterprise Resource Planning (shortly ERP) software platform and a fast data-transfer environment (such as 5G) is proposed. For this purpose, the features of the latter, which overcome threats and weaknesses, are established. It is established that the collaborative integration of technologies fosters business growth enhances economic impact, and serves as a strong foundation for long-term development across various fronts, positioning ahead of competitors.

Keywords: Blockchain; public; private; consortium; hybrid; SWOT; ERP; 5G

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Citation: Hristova, T.; Mihaylov, G.; Hristov, P.; Taneva, A. Analysis of Data Sharing Systems in the Context of Industry 4.0 via Blockchain in 5G Mobile Networks. *Eng. Proc.* **2024**, *70*, 2. https://doi.org10.3390/engproc2024070002

Academic Editor: Jacob Fantidis

Published: 23 July 2024

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1. Introduction

The management of production processes and the digitization of industry is not only related to investing funds for the implementation of new technologies but also to meeting the criteria for sustainable development [1,2]. According to the paradigm of sustainable development, it is necessary to increase the parameters in one area, not to worsen those in another [3,4], and these parameters are defined as economic, social, and ecological [3,5]. Examples of applying sustainable practices in the context of Industry 4.0 are big data analysis, Blockchain, artificial intelligence, lean manufacturing, Six Sigma and reverse logistics, and others [1]. The implementation of new technologies is supported by governments. The U.S. Department of Commerce promotes "the creation of manufactured products that use processes that minimize negative environmental impacts, conserve energy and natural resources, are safe for employees, communities, and consumers and are economically sound" [1]. The differentiation of the three spheres is related to increasing reliability, flexibility, quality, and responsibility and reducing the use of raw materials and production costs to achieve an improved economic result. From an ecological point of view, it is recommended to increase the traceability of raw materials, recycling, and waste

reduction. Social activities are public engagement, improved working conditions, human rights, increasing worker satisfaction, and business models to achieve them. The benefits in the economic sphere can be summarized as profit acquisition, the added value of a product, the acquisition of shares, the growth of sales, increases in competitiveness, and others [1].

Classification by the areas of application of Blockchain for development in different fields is not completely correct. In fact, the self-serving development of one sphere is impossible because they have mutual influence. For example, the digitization of industrial flows is related to the investment of finance for the purchase and introduction of technical and informational means. This improves the working conditions of the workers, which is considered a social factor. In addition, staff training is required, which positively affects the staff's qualifications. The financial resources invested are returned through the production of products with a higher added value. These products are sold at a higher price and the enterprise that invested earns more. An economic effect is also considered because the manufacturer is one step ahead of its competitors, possessing new technologies. At the same time, digitization leads to the improvement of environmental conditions, respecting energy efficiency criteria. SCADA-type automatic control systems, smart sensors, IoT, cloud technologies, Blockchain, and others are used to digitize production [6–8]. This example demonstrates the mutual influence of the three areas. In Figure 1, the three areas with some of the main advantages for the analyzed case are visualized.



Figure 1. Mutual influence of the three areas of sustainable development during digitization in the industry with Blockchain—ecological, social, and economic.

The question of the full return on invested financial resources remains pending, which is related to a serious technical and economic analysis. This is most often performed in a business plan, which requires paying consulting firms. It is good for managers to initially define the goal and the tasks to achieve it. Then, a SWOT analysis can be performed to screen out the unpromising investments and retain those for obtaining a product with high added value [9].

Given the growing popularity of Blockchain technologies in the article, they are considered from the point of view of increasing the efficiency of work and achieving the criteria of sustainable development. The reason is that they achieve the security, transparency, and immutability of data when shared without the need for a third party [8,10]. This clearly ensures a positive economic and social effect. Based on cryptographic algorithms and a pair of keys, network subscribers authenticate their rights. These can be read-only or offer, validate, and

record transactions. Blockchains are part of DLT (Distributed Ledger Technology) in which all ledgers have the same records.

That is why the team, after conducting an overview and analysis of Blockchain platforms, has a task: to ensure an industrial process under the synergistic influence of requirements for high data transmission speed, energy efficiency, high scalability, and security.

For this purpose, the types of platforms were first examined and then a SWOT analysis was conducted for the permitted and non-permitted applications. The identification of flaws and threats when using Blockchain technologies leads to the need to find means to neutralize them. Nowadays, choosing the right digital technologies is a time-consuming task due to the wide variety. When defining criteria and specifics regarding the application, the circle of those satisfying the specified conditions is narrowed. Therefore, it can be said that the implementation/introduction of an automated production process management system and data sharing through a fast and secure environment like 5G is achieving the goal.

Choosing a single software platform is an approach and methodology for tracking and managing a company's resources. The production and management systems are focused on the working flows over the years. Hence, they have created and developed the so-called and nowadays widely used Enterprise Resource Planning (shortly ERP) [11]. This has been created to help companies manage and use data concerning their daily and normal processes. ERP keeps and shares the data and information track on variables including the payroll, raw materials, process engages, sale orders, and production capacity.

The storage and analysis of acquired data are not always possible in the cloud. The reason is that with the growing number of mobile devices and increased data traffic, both mobile and other networks must not compromise energy efficiency and spectral density. 5G provides significantly increased operational performance and spectral efficiency, higher data rates, and low latency. Also, this generation of mobile communications takes care of the mass harmonization of various technologies such as Wi-Fi, Lora, IoT, and Blockchain [12]. It is necessary to reach acceptable levels of energy consumption, equipment and network deployment costs, and operating costs [13].

Therefore, the article examines the advantages and disadvantages of Blockchain, ERP, and 5G in one system for ensuring the collection, management, storage, and analysis of data from production processes in an industrial enterprise.

2. Methods

In the analyzed literature, our approach is to consider the shortcomings of ERP and Blockchain separately and overcome them when connecting in one system [8,14–16]. In this development, the operation of the Blockchain is initially described. Then, the types of DLT are classified. Given the options to focus on financial and industrial applications, only Blockchain technologies (also distributed ledger and ledger) are considered and Direct Acyclic Graphs (DAG) and Tempo are not. The thematic areas of application of decentralized data sharing are defined. Those with high and low maturity for industrial tasks are evaluated. Since it is impossible to compare the different types of networks, a SWOT analysis is proposed. It then describes how ERP and 5G work, highlighting their features for improving the Blockchain environment. Based on it, to achieve the set task, articles from the last 10 years, in the field of peer-reviewed and indexed journals, are analyzed. A weakness of the paper is the lack of numerous bibliographic data on the benefits of Blockchain and ERP integration [12].

3. Blockchain

One solution to this problem is Blockchain technology. It is a way of storing and distributing data. These chains are decentralized, i.e. they do not depend on a single central authority or actor but are supported by multiple nodes that interact through consensus algorithms. Blockchain technologies have the potential to improve the security,

transparency, trust, and efficiency of various applications and processes in areas such as finance, healthcare, logistics, energy, etc.

The enthusiastic adoption of this technology without a real assessment of the opportunities and threats for all sectors is not a good strategy for companies. Therefore, it is necessary to make a detailed assessment of opportunities, threats, strengths, and weaknesses [17]. From here, the widely known term 'SWOT analysis' is formed, coming from the English definitions: strengths, weaknesses, opportunities, and threats. It is part of strategic analysis and is often used in organizations [6,18–20] to establish the strengths and weaknesses for or arising from the implementation of a management decision. It is appropriate to use this analysis when distinguishing the types of Blockchain networks.

3.1. Blockchain—Functionality and Types

The main networks currently known are centralized, decentralized, and distributed [17]. DLT is a distributed database providing the immutable, asynchronous, and traceable recording and sharing of data through multiple repositories (ledgers). The books acquire exactly the same records maintained and controlled by a distributed network of nodes (nodes). This way of communication allows a faster execution of complex tasks compared to centralized and decentralized systems [18]. When evaluated in the order of centralized, decentralized, and distributed networks, complexity in scalability and difficulty in management and maintenance, but also an increase in attack surface, are found.

Cryptographic and algorithmic methods are used in the process of verifying and recording transactions in DLT (Distributed Ledger Technology) [19]. This achieves the immutability and security of the shared data, which are encrypted by public–private key pairs. Smart contracts are used to define the rules for offering, validating, and approving a transaction [20]. They constitute a code that provides and follows the business logic in the data entry process. Through them, intermediaries are eliminated, transaction costs are reduced, and information security is increased [1].

The propagation of records proceeds according to a predefined algorithmic method called "Consensus Mechanism" [21]. Any data change in the block is saved in the DLT nodes only after validation. Thus, every node of the network has an identical copy of the transactions. Transaction integrity checks ensure integrity and recorded transactions are difficult to tamper with. The technology is applied to various assets that operate with data in digital form. It achieves unambiguous, secure, and traceable storage; sharing among interested actors (counterparts, participants, customers, etc.); and retrieval on demand [22,23]. Inconsistency among recorded data in different nodes cannot exist.

3.2. Types of Networks

According to the access rights of the participants, Blockchain networks are open (public, permissionless), permissioned (private, permissioned), hybrid, and consortium [24]:

- Public ones have low transaction speed and high power consumption because participants plug in without permission and see and validate everything. They are popular for mining cryptocurrency and validating public documents. Their advantages are independence, transparency, and trust, but their disadvantages include a lack of performance, scalability, and security.
- Private ones have high transaction speed and low power consumption because participants join after permission and are fewer in number. They see everything, but certain among them have validation rights. They are characterized by increased resistance to tampering and scalability and are throughput. They are used when tracking confidential material and financial flows in which the participants are secure and do not want the data to be seen by the general public, such as in banking, patient health data or drug research results, supplies, industrial process results, and more. Their advantages are high access control and performance for the lack of trust and auditability according to the public.

- Hybrid—These networks scale better than public networks because they have a public and a private part. Their application is in the delivery of parts and medical products and real estate trading. Their advantages are high access control, performance, and scalability, but their disadvantages include a lower transparency and possibility for upgrading.
- Consortium—These networks are closer to private networks with limited access to a specific group protecting them from malicious attacks. They are suitable for separating data flows in a private network as a consortium because validator nodes are responsible for accessing and modifying data in the decentralized private network. A consortium network is actually a private Blockchain with a customer-facing part. It finds fairly wide application even in the banking business for announcing the exchange rate and fees for banking operations, where high confidentiality is expected. Other applications are in research, supply chains, and other areas. Its advantages are high access control, scalability, and security but disadvantages include lower transparency.

It can be summarized that there are four main types of networks, but the main characteristics are clearly visible in public and private networks, as shown in Figure 2. In private and closed networks, participants are explicitly identified and authorized by an administrative unit. The others are open, wherein anyone can freely join, send transactions, and validate. The other two types are intermediate between the main ones listed. Determining applicability, advantages, disadvantages, and threats is difficult for a layperson. The reason is that the two types have different characteristics in data transmission, access rights, privacy protection, scalability, latency, and other parameters. Sometimes they are opposite. That is why the article proposes to conduct a SWOT analysis for both types of networks.

Briefly, a specific SWOT analysis according to the characteristics of open and closed networks will be presented.



Figure 2. Private or public Blockchain in the industry.

3.3. SWOT Analysis for Open Networks

The strengths and capabilities include visibility, redundancy, integrity, improved threat protection, full compliance between Blockchain and physical-world elements, no collusion among parties, and automated auditing.

The strengths and threats include irreversibility, the development of auditing, no central authority to deny transactions, and no central authority (CA) to verify the existence, ownership, and measurement of elements.

The weaknesses and strengths include a lack of complete trust, lack of non-repudiation, and lack of confidentiality.

The weaknesses and threats include privacy, no CA to report cyber attacks, data theft when a key is lost, and consensus difficulty.

3.4. SWOT Analysis for Closed Networks

The strengths and capabilities include traceability, redundancy, integrity, confidentiality, a consensus among parties, no denial of validated transactions, the ability to apply a market search to find the right platform, the presence of an admin, clear rules, and automated auditing.

The strengths and threats include the existence of a central denial authority; presence of a CA to report cyber attacks; verification of the existence, ownership, and measurement of items by the CA; difficulty of data theft, and additional knowledge of the application industry required.

The weaknesses and opportunities include non-repudiation, the existence of an audit transaction among the parties, the need for independent Blockchain evaluation services, and the arbitration of disputes among participants.

The weaknesses and threats include confidentiality, the possibility of deniability, no need for a new audit, the difficulty in changing the consensus protocol, and the difficulty in changing a smart contract.

With this analysis, it can be seen that to increase the effectiveness of Blockchain in the industry, it is necessary to overcome some threats and weaknesses. For open ones, there is a lack of security and privacy and the possibility of data theft. For private ones, the weakness is confidentiality again, due to the need for arbitration, audit engagement requirements, and more. A solution to this problem is to build a system where enterprise data are managed through ERP and the transmission medium is 5G. The synergistic influence of the technologies in the system presented in this way will lead to the improvement of the characteristics in the technical–economic analysis.

4. ERP

From a general point of view, this is specialized software. Individual modules use a single relational database, which allows modules to share data in a centralized environment. The whole software is configured and commissioned regarding to each company's needs. Typically, the core modules are production, accounting and finance, human resource management (HRM), sales, marketing, supply chain management (SCM), and customer relationship management (CRM) [11]. The full configuration will have all modules and can be enlarged with more. We have presented its scheme in Figure 3.

This is strongly related to a certain process and reflects the final-price ERP software version. A feature is that the commissioning has many steps. It takes a different amount of time for each user. One of the first companies to develop and offer such a powerful tool was SAP [25].



Figure 3. Compact representation of the ERP element modules.

4.1. RP—Functionality and Operation

A program (ERP) for a given production is a set of tables, e.g. over 32,000 pcs. tables making up the individual modules. This program, actually combining multiple tables, makes links among them for exchange, similar to Excel. In this sense, the program becomes difficult, or, in other words, becomes very "heavy". This is a disadvantage due to the need for more modules containing necessary tables according to the specifics of a given production.

According to a specific task, a module is created, and tables are connected and filled. This program in the course of its normal operation is served by the various departments and, therefore, by people. This is related to the so-called action PLANNING, in which the program rearranges and summarizes the data in all tables. This takes technological time and must be performed, at an appropriate time, regularly. It is usually initiated at night, when it is expected that there is no production process and work in the program modules. This is a major step in explaining what ERP is and how it works. When such PLANNING is not executed successfully, it leads to a situation where the modules are not loaded with up-to-date information (data), which is undesirable and a weakness.

ERP systems are supported by various companies. Two of them will be presented here, but even on this alone, their advantages and disadvantages stand out clearly.

The company SAP presented its strategy and served the Internet and the economy by establishing mysap.com in 1999. Later, then, it branched out into three future and fruitful directions: mobile technology, database technology, and cloud.

SAP offers the possibility supported by the largest cloud vendors. The company's integrated functionalities connect all parts of activities into an intelligent platform and also with digitalization. The technology platform combines application development, data and analytics, integration, and Artificial Intelligence (AI) into one software.

The use of cloud technology, on one side, is easier without maintenance by the user. Hence, it seems this is an advantage. It is a paradox that using cloud technology is both an advantage and a disadvantage. On the other side, uploading the data to the not-own server and cloud storage has risks because the outside of the company network communication is used. Having Internet access hides the threat of unwanted activities, malware, etc. Furthermore, the process and other data can be affected.

The evolution of workflows combines separate levels, for instance from the economic-base-management point of view, through the organizational management to the technological process base control. This removes one of the weaknesses of open decentralized networks, which is the transmission of data in different channels. Also, data recorded in other databases and the cloud can be used if necessary to prove the presence and actions of participants in a Blockchain.

Today, many companies like Microsoft [26] have their own platform products, naturally with their own cloud technology.

An example is Dynamics. This is their platform and is widely used in Bulgarian manufacturing [27].

Dynamics 365 is a portfolio of intelligent business applications that delivers superior operational efficiency and breakthrough customer experiences enabling businesses to become more agile and reduce complexity without increasing costs.

The disadvantage is that Microsoft owns customer data and the price is high because there is a subcontracting company that conducts and supports the commissioning process of the ERP software. The human resource department is very important. There is no certainty that the employees who carry out the commissioning of the program will remain employed in it until the full implementation. On the other side, they have to be regularly trained to operate correctly with the program's modules.

In short, an ERP system increases the control and efficiency of operational management. The disadvantages of the centralized accumulation of data in one server are increased risks of losing data and vulnerability to error, hacking, corruption, or attack and the reduced reliability and transparency of the processes, products, and activities of the supply

chain [1,8]. All this leads to the need to increase security, trust, traceability, and transparency, which are characteristics of Blockchain technologies.

That is why we offer the next level of efficiency improvement in the context of Industry 4.0, the establishment of communication between the automated factory resource management system and its environment [16].

4.2. ERP—Benefits

A trend in recent years has been the development of Blockchain technology so that it enters all spheres of life and society for potentially disruptive identification systems, government services, education, manufacturing, and others [8,16,28]. Integration between ERP and Blockchain extends the scope of automated management systems beyond an enterprise and connects them into a common ecosystem [29]. Co-constructing Blockchain with ERP systems requires real data interoperability in areas such as banking, finance, agriculture, mining, trade, engineering, transport, and others. Using Blockchain in ERP leads to improved productivity, speed, flexibility, quality of the production process, immutability, efficiency, real-time transfer, transparency, scalability, and reliability [8,28,29]. In such a system, ERP serves as an internal center for the data and activities of production [11]. Studies recommend that considering the benefits of combining Blockchain and ERP is based on four components: identity, assets, logistics, and transactions [11]. Digital identities are a major factor and Blockchain adoption is possible with a consortium structure to achieve trust, familiarity among trusted actors, and the standardization of services at an established momentary low maturity [11]. Asset tracking avoids double entry in the books, but there are still no prerequisites for tokenizing these flows. The tracking of customer behavior and the possibility of analysis are highlighted as two of the main advantages of Blockchain in logistics. In addition, they emphasize the reduction in losses from undelivered goods, the absence of fraud, counterfeiting, and others.

In summary, it can be written that the advantages of ERP are increased security, the decentralization of data sharing, the strengthening of corporate systems, the irreversibility of records, and the possibility of managing the various flows through the smart contracts of Blockchain. Blockchain, with its distributed structure, keeps the centralized repository for all ERP partners, but their data can be channeled to it (Figure 4). Therefore, transactions become transparent, with trust, increased cyber security and transmission speed, and reduced production costs.



Figure 4. Blockchain technology and ERP system.

4.3. ERP and Blockchain

Opportunities to complement ERP functions are in building intelligent I-ERP or Blockchain-as-a-service (BaaS) with ERP systems. In the first case, communication is carried out with many Blockchain systems or the so-called B2B [29]. This serves to manage and store various data while separating them for real-time reading or storing for analysis. According to this analysis, having a record in the system reduces threats to the anonymity of participants in open systems because they are known in advance. The system not only accepts data from sensors in production but can also connect to IoT, AI for analysis, and more. Therefore, authorized users can log in via Ethernet or via wireless access in a cloud network. The error of incorrect or wrongly sent data goes away. The probability of validating nodes denying the validation of a transaction in this case is negligible. All data sent by ERP are checked and will be validated as such.

The second possibility is Blockchain Platforms as a Service (BaaS). Previously, the service was called Platforms as a Service (PaaS) and anyone could develop an application through the Google, Microsoft, or Amazon platforms, but through Blockchain, it became BaaS [28]. In BaaS, ERP cloud-based hosting services are pre-developed or allowed by the company. There is an option to add new ones when expanding the activity. Examples include building components to Blockchain platforms (e.g., Hyperledger or MultiChain) from a cloud computing platform such as Microsoft's Azure with management applications, or Microsoft Dynamics 365, or third-party applications using the Ethereum Blockchain [29–31].

Proof of the joint work of ERP with Blockchain Technology lies in the existing projects in the fields of automobiles, architecture, the sale of metals and medical products, the maintenance of drones, and others [32,33].

With the opportunities provided to integrate Blockchain and ERP, it is clear that these two can overcome the threats of the lack of anonymity in open chains, improve optimization, and increase security and transparency while creating trust in a trustless environment. For closed loops, this eliminates the possibility of the need for arbitration.

At the same time, the data flow must be defined in the ERP system, which reduces the probability of changing the smart contract, defined as a threat in private chains. Sending data from the automation system is an open-network loss prevention guarantee. Having a system that verifies and delegates rights to send a certain type of data increases trust.

From the research conducted, it is noticed that depending on the company, the creator of ERP has the possibility to build different functions and levels of security and the possibility to change and develop the management system.

On the other hand, the benefits of Blockchain come from the secure storage of data in relational databases. This unequivocally confirms that for open and closed Blockchains, systems can be constructed to enhance their strengths and capabilities and avoid weaknesses and threats according to the SWOT analysis.

5. 5G—Functionality and Benefits

There remains the need for secure data transmission with high scalability without interruption or the loss of signal. Such an environment is provided by the proposed 5G network. With it, the security of data storage in the cloud and the term and the quality of support are achieved as shown in Figure 5.

Like their predecessors, fifth-generation mobile networks are cellular networks in which the service area is divided into small geographic areas called cells. All 5G wireless devices in a cell are connected to the Internet and telephone network via radio waves through a local antenna in the cell. An important advantage of the new networks is that they have a larger bandwidth, giving higher data transfer rates—up to 10 Gbs [34,35]. The main idea is that due to the increased bandwidth, these networks can not only serve mobile phones but also be used as general Internet service providers for laptops and desktop computers, competing with existing Internet service providers such as cable Internet. This enables new applications in the Internet of Things and communication among machines (Machine to Machine, M2M) [36].

One of the possible applications is a transport medium for the data from ERP to servers and cloud structures in order to analyze data and create optimized management solutions.



Figure 5. Blockchain integrated with 5G networks.

The need to keep the parameters of industrial flows secret has already been pointed out. The transmission and recording of data on unknown media, often owned by other companies, is not convenient and is completely unacceptable if you want to preserve confidentiality. This is, again, evidence of the need to harmonize systems to prevent data loss due to key loss or trace arbitrage occurring.

5G and Blockchain can work together to improve interoperability among IoT devices, as well as to increase trust and data transparency. For example, 5G can provide fast and reliable communication among devices while Blockchain can ensure that data are correct and cannot be tampered with or deleted. Thus, 5G and Blockchain can support applications such as Smart Cities, Smart Agriculture, Smart Healthcare, industrial processes, and more. Blockchain is adopted as a back-end for distribution and broadcasting through IoT devices and sensor communications with the aims of increased service availability and reductions in malicious attacks and operational failure [37]. With the latter, there is a CA to report on cyber attacks, which constitute an identified threat in open circuits. At the same time, it is an external evaluation of the performance of closed Blockchains and an opportunity for arbitrage, thereby removing the weaknesses of closed chains (Figure 6).

Blockchain technologies and 5G networks can be used together to achieve a higher degree of trust, scalability, and optimization in various scenarios. For example, Blockchain technologies can both provide the identification and authentication of devices and users in 5G networks as well as manage access to resources and services. Blockchains effectively facilitate the exchange of data and value among devices and users in 5G networks, thereby ensuring the traceability and integrity of information. They support the coordination and optimization of resources in 5G networks, such as via frequency band sharing, dynamic spectrum allocation, or energy efficiency management [38].

5G and Blockchain are two of the most promising and innovative technologies in the modern world that have the potential to change the way we communicate, store, and exchange data. They can work together to both improve interoperability among IoT devices as well as increase trust and data transparency. However, 5G and Blockchain also present a number of challenges that need to be overcome, requiring a large amount of infrastructure, computing power, and energy [39].



Figure 6. Mutual influence of Blockchain, ERP, and 5G.

6. Conclusions

Blockchain has been proposed to track data from industrial projects. An analysis was conducted of its capabilities based on authorized and unauthorized networks. It was found that the multifactorial nature of the task made a technical–economic analysis difficult, and therefore, a SWOT analysis was proposed. Based on it, the strengths and weaknesses of the technology, as well as the development opportunities and threats for data tracking in industrial tasks, were identified.

Nowadays, it is impossible to manage objects with only one technology. An analysis was conducted of suitable industrial sites for management. They are characterized by a diverse flow of data, but with the entry of various digital technologies into the market, it is necessary to choose the appropriate set of parameters to optimize and achieve the energy efficiency of the processes. The synergistic action of different means helps improve efficiency and reliability and obtain products with higher added value. For this reason, it was chosen to make a system out of the synergistic action of ERP, Blockchain, and a fast data-transfer environment like 5G.

Such are the ERP systems for industrial automation and the 5G environment for data transmission. Using them together has been found to increase development opportunities and reduce threat levels. This achieves efficiency not only in the production process but also in data transfer, obtaining products with higher added value, and increasing the competitiveness of a company.

There are several challenges faced while implementing these systems. First and foremost is the immaturity regarding identified weaknesses in Blockchain technology in implementing interoperability from centralized systems and inheriting structures. The enrichment and completion of the regulatory framework follows. There are also disadvantages such as energy consumption and the investment of financial means to inherit data and transform structures. However, it was found in our research that there are suitable Blockchain platforms (Hyperledger or MultiChain) to manage data from the existing Microsoft Azure ERP and Dynamics 365.

Thanks to 5G connectivity, problems such as memory, scalability, latency, transaction processing power, cyber security, and stability in the digital environment are solved.

The team remains challenged to fully analyze the applicability of consortium chains in industrial data transmission. They must be compatible with an operational ERP system.

Author Contributions: Conceptualization, T.H., P.H. and G.M.; methodology, T.H., P.H. and G.M.; resources, T.H., P.H., G.M. and A.T.; writing—T.H., P.H., G.M. and A.T.; editing—T.H., P.H., G.M. and A.T.; visualization—T.H. and G.M. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflicts of interest.

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