Revista Catarinense da CIÊNCIA CONTÁBIL

ISSN 2237-7662, Florianópolis, SC, v. 24, 1-14, e3520, 2025

https://doi.org/10.16930/2237-7662202535202

Available at http://revista.crcsc.org.br

TRACEABILITY SYSTEM FOR GOODS USING BLOCKCHAIN, SPED FISCAL, AND ELECTRONIC INVOICE

BRUNO ANSELMO GUILHEN[1]
Federal Institute of Santa Catarina,
Department of Computer Science, Ibirama Campus, SC, Brazil
https://orcid.org/0000-0002-4012-0723
bruno.guilhen@ifc.edu.br

VALKYRIE VIEIRA FABRE
State University of Santa Catarina,
Department of Accounting Sciences, Ibirama, SC, Brazil
https://orcid.org/0000-0002-4664-1415
valkyrie.fabre@udesc.br

ABSTRACT

The emergence of Blockchain technology has unlocked potential for innovations in business operations across various sectors. The traceability of goods is a concern for both governments and business owners, as deviations can lead to tax evasion and loss of goods. This research aims to develop a proposal for electronic traceability of goods using Blockchain technology. It is an applied research study with a qualitative approach and exploratory objectives, utilizing existing tools within the Brazilian tax system to propose technological adjustments that enhance and control processes. These improvements can facilitate tax oversight and protect both business owners and citizens from the illegal reception of goods. SPED Fiscal and the Electronic Invoice (NF-e) are the suggested mechanisms for implementing a unique product traceability system, which would be established as an ancillary tax obligation. As a result, the proposal suggests that Blockchain be used to record information in the NF-e from production to the final consumer. If a product is stolen or diverted, this information could be logged, preventing its circulation and labeling it as illegal, thereby making it impossible to re-enter the market. In case of an attempt to reintegrate it into the SPED system, the tax authorities could be automatically notified of the illegal reception of goods. This research contributes not only to academia but also to the practical application of technological solutions that would facilitate government tax oversight while protecting business owners and citizens.

Keywords: Blockchain. Traceability. SPED. Electronic Invoice. Tax Oversight.

Edited in Portuguese and English. Original version in Portuguese.

Version of the article presented at the 14th IEEE International Conference on Industry Applications (INDUSCON), São Paulo, Brazil, 2021.

[1] **Correspondence Address:** R. Santa Cruz, 1-123 | Bela Vista | 89140-000 | Ibirama/SC | Brazil.

Received on 07/16/2024. **Revised on** 12/20/2024. **Accepted on** 02/14/2024 by Prof. Dr. Rogério João Lunkes ((Editor-in-Chief). **Published on** 03/25/2025.

1 INTRODUCTION

Information technology has advanced rapidly in certain areas over the past decades. While business owners are concerned about the diversion of goods, tax evasion is a major issue for the government. Among the possible solutions for enhanced control, Yano et al. (2023) suggest establishing tracking mechanisms for goods from production to resale. However, most current processes are still limited to physically tracking goods using technologies such as RFID and GPS. According to Madeira and Geliski (2019), these techniques do not prevent cases of diversion, loss, theft, or robbery, nor do they address the potential reintegration of stolen products into the market (illegal reception). In this context, Blockchain technology emerges as a viable alternative due to its characteristics of traceability, immutability, security, and transparency (Nascimento, 2023). This research presents an original proposal for goods traceability using Blockchain technology, leveraging existing tools within the Brazilian tax system to propose scientific technological adjustments aimed at improving and controlling processes. The proposal contributes scientifically by addressing the existing research gap and offering a practical solution that assists in goods control for both business owners and tax authorities (Yano et al., 2023; Madeira & Geliski, 2019) through the application of Blockchain technology (Nascimento, 2023).

The Brazilian government has incorporated technology to control and track goods through the Public Digital Bookkeeping System (SPED), established by Decree No. 6,022 of January 22, 2007. This system is a tool used by the Brazilian Federal Revenue Service (RFB) to unify the reception and validation process of all documents related to a company's accounting records, including mechanisms for monitoring the inflow and outflow of goods.

SPED enabled the creation of the Electronic Invoice (NF-e), which includes fields for the proper identification of goods. The NF-e is a digital document, issued and stored electronically, designed to document transactions involving the movement of goods or the provision of services between parties. Its legal validity is ensured by the digital signature of the issuer and authorization from the tax authorities in the taxpayer's jurisdiction (RFB, 2024).

The government has a degree of traceability over goods produced by the industry and sold to retailers (Nascimento, 2023). However, when an unforeseen event diverts goods from their normal course, losses impact multiple stakeholders in the supply chain. The government loses tax revenue, and in many cases, retailers or manufacturers suffer losses due to missing merchandise. An effective way to enhance the traceability of goods would be to implement Blockchain technology.

Nakamoto (2009) defines Blockchain as a distributed and shared data tracking mechanism that enables the secure and immutable recording of transactions, creating a global and secure index for all transactions within a given supply chain. Blockchain is particularly well-suited for data tracking due to its decentralization, transparency, and tamper-proof nature (Wang, Tian & Zhang, 2021).

Therefore, in addition to the scientific gap, there is also a technical gap, which motivates this research to present an alternative to existing market solutions. This study aims to contribute to the technical enhancement of Brazilian tax oversight and the security of goods movement through traceability. The objective of this research is to **develop a proposal for electronic goods traceability using Blockchain technology.**

This research contributes to the advancement of academic discussions, particularly in terms of practical applicability, by proposing a method that will assist tax oversight. It is relevant for combating tax evasion, supporting business control, ensuring the security of goods circulation, and enhancing the traceability of products that reach the final consumer.

In the tax sector, the attributes of Blockchain technology, such as its ability to provide traceability, immutability, security, and transparency to transactions, align with the priorities of a modern tax system (Dourado et al., 2022). Therefore, this research is highly relevant for assisting

public administrators and tax auditors, while also enhancing security for business owners who are vulnerable to the challenges posed by goods diversion.

In business management, one of the key challenges is controlling product losses due to goods diversion, whether caused by theft of the product or the cargo itself. Beyond the direct loss, there is also the issue of stolen products re-entering the market through companies that purchase stolen cargo and sell it directly to consumers.

This study is an applied research with a qualitative approach and exploratory objectives, utilizing product identification codes which are already mandatorily recorded in the fields of the Electronic Invoice (NF-e) to create a tracking and data-sharing chain using Blockchain technology. Specifically, the article demonstrates that the integration of SPED, NF-e, and Blockchain technologies not only enables traceability but also prevents stolen goods from being legally reintegrated into the market. Once a product is diverted, its status is recorded in the distributed database, marking it with an incident code (e.g., "theft"). As a result, the product cannot be reinserted into the system since it carries a unique identification. The proposed implementation is detailed throughout the article.

2 THEORETICAL FRAMEWORK

In an effort to control the flow of goods, from production to final sale to consumers, the government has been implementing a digital transformation process to monitor cargo movement. In 2009, the government introduced the Public Digital Bookkeeping System (SPED), which converted physical accounting processes into digital processes, enabling greater control over tax compliance within companies (RFB, 2024). To provide a better understanding, the following section will present further details on SPED and its role in monitoring the movement of goods.

2.1 Public Digital Bookkeeping System– SPED

The Public Digital Bookkeeping System (SPED) was established by Decree No. 6,022/2007, representing a significant transformation in the digitalization of the relationship between tax authorities and taxpayers. SPED modernizes the submission of so-called ancillary obligations, which are transmitted by taxpayers to regulatory agencies (RFB, 2024). This entire process is validated through the digital signature of electronic documents, with its legal validity ensured by digital certificates, governed by Law No. 14,063 (2020).

According to the Brazilian Federal Revenue Service (RFB, 2024), the main objectives of SPED are:

- Promote integration among tax authorities;
- Streamline and standardize ancillary tax obligations for taxpayers;
- Accelerate the identification of tax violations.

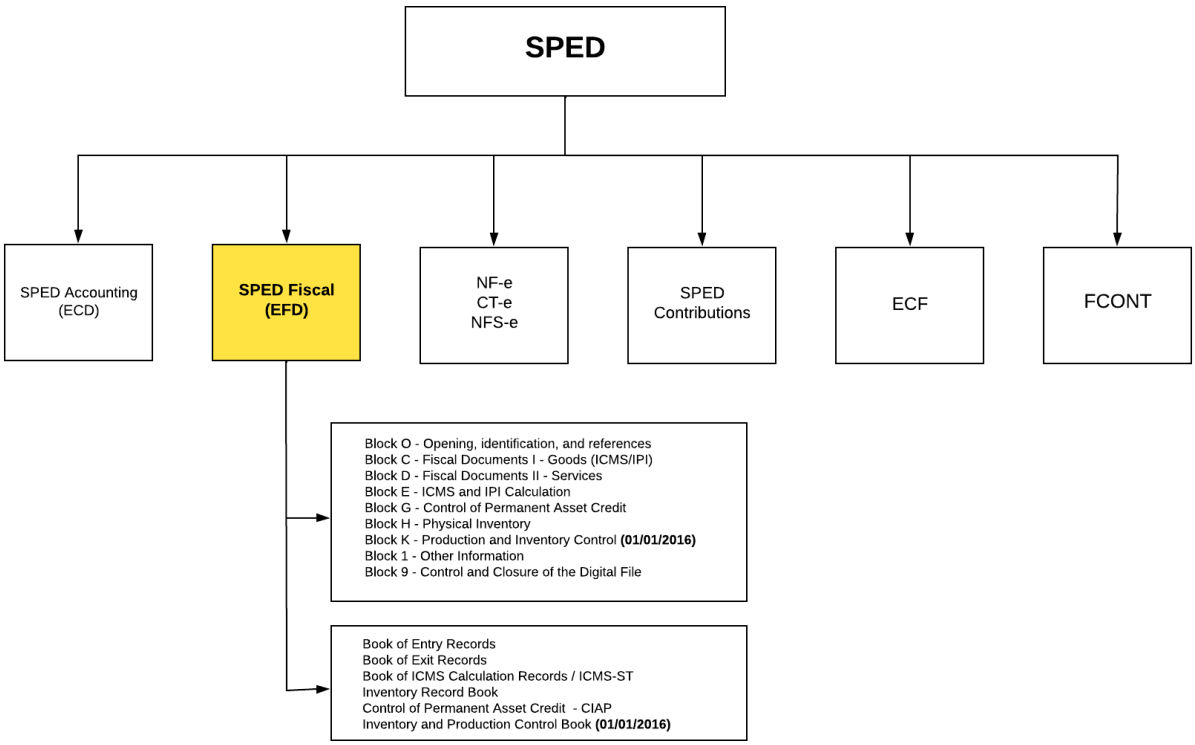
The issuance of electronic documents has simplified the declaration process, but significant efforts are still required for the consolidation and bookkeeping of tax information, especially for medium and small enterprises (Søgaard, 2021).

The current system struggles with tax payment processing, which is conducted through partnered banking networks, creating delays in government revenue flow by introducing a gap between the taxpayer's payment and the actual availability of funds in public accounts (Saripalli, 2021). Additionally, this mechanism is further impacted by losses due to goods diversion during transit and their illicit reintegration into the market.

Thus, the accounting record process for companies has been modernized with a structured control system, applied to the bookkeeping and tax compliance of taxpayers, including business owners and legal entities, even those exempt or immune, all of which is registered through SPED.

The Brazilian Federal Revenue Service (RFB) developed an organizational chart to represent the structure of SPED, which can be seen in Figure 1.

Figure 1
Structure of SPED



Source: RFB (2024).

To support this process, various goods tracking mechanisms have been developed. The two main mechanisms, which can be seen in Figure 1, are Digital Tax Bookkeeping (EFD) and the Electronic Invoice (NF-e).

2.1.1 Digital Tax Bookkeeping – EFD

The EFD is part of the SPED project, and its main function, according to the RFB (2019), is to promote the integration of federal, state, and Federal District tax authorities through the sharing of digital tax information.

Before the implementation of the SPED fiscal project, all accounting records were written in physical books, known as the "Journal" and "Ledger". The Digital Tax Bookkeeping is the evolution of this process, requiring monthly accounting actions by the company to record all incoming and outgoing goods transactions.

This record occurs in fields defined in the EFD project (RFB, 2019), referred to as “blocks” and “records”. Similar to a relational database management system (RDBMS), the blocks can be compared to tables, and the records correspond to the fields containing information for those tables.

Figure 2 shows the nine blocks available in the EFD (RFB, 2019).

Figure 2
EFD blocks

Block	Description
0	Opening, identification, and references
C	Fiscal Documents I - Goods (ICMS/IPI)
D	Fiscal Documents II - Services (ICMS)
E	ICMS and IPI Calculation
G*	Control of Permanent Asset Credit- CIAP
H	Physical Inventory
K**	Production and Inventory Control
1	Other Information
9	Control and Closure of the Digital File

Source: RFB (2019).
Note. * Block G was included to be effective starting from the January 2011 reporting period. ** Block K was included to be effective starting from the January 2017 reporting period, as per Adjustment SINIEF 01/2016.

Each block in the EFD, shown in Figure 2, contains a predetermined number of records (RFB, 2019) that allow the taxpayer to provide all relevant data regarding the movement of goods, which is the focus of the study. These include information such as the issuer and recipient of the product, the quantity of products, among other details.

Block C contains the main records for identifying the goods. Block K includes records that enable tracking the moment when the goods are produced, where they will be stored, and the quantity of goods in stock. All blocks are important in the tax, fiscal, logistical, and goods traceability control process.

The Digital Tax Bookkeeping (EFD) is a monthly process, meaning that all goods sold, transported, or diverted will be reported in a file and sent to the tax authorities monthly. In daily operations, the control over goods is managed by the Electronic Invoice (NF-e), which will be detailed in the next section.

2.1.2 Electronic Invoice – NF-e

According to the Taxpayer Guidance Manual from the Brazilian Federal Revenue Service (RFB, 2020), the Electronic Invoice (NF-e) is a digitally-issued and stored document, designed to document, for tax purposes, a transaction involving goods movement or the provision of services between parties. Its legal validity is ensured by the digital signature of the sender and the authorization granted by the tax authorities prior to the event that triggers the tax obligation.

The NF-e was created with the main goal of being a nationally issued electronic document, with uniform characteristics across all Brazilian states, to replace the traditional paper model that was commonly issued.

The NF-e project aimed to implement a national model of electronic fiscal documents, identified by Model 55, to replace the paper-based fiscal documents, Models 1 and 1A. This model ensures legal validity through the digital signature of the issuer, simplifying ancillary obligations for taxpayers and enabling real-time monitoring of commercial transactions by tax authorities (RFB, 2024).

Thus, any sale or transport of goods, whether from business to business (B2B) or business to consumer (B2C), requires the issuance of an invoice so that tax authorities can register, audit, and validate the procedure.

The NF-e has brought speed and greater ease to the control of goods movement, as it is composed of electronically filled fields, some of which are mandatory, that validate and perform checks during the movement of goods (Nascimento, 2023). While the EFD is a monthly process, the NF-e is issued for each batch or shipment of goods, and then all the information will be included in the EFD.

2.2 Blockchain

According to Gupta (2020), Blockchain can be defined as a shared and immutable ledger for recording transactions and tracking assets in a commercial network. Nakamoto (2009), when defining the structure of Bitcoin, established that virtually anything of value can be tracked and traded on a Blockchain network, reducing risks and cutting costs for all parties involved.

The data is stored in groups of information (blocks), with each subsequent block being dependent on the previous one, meaning it carries a code (hash code) that timestamps and dates each block (Gupta, 2020). The blocks in the Blockchain context are generated automatically at short time intervals. For example, in Bitcoin, a new block is generated every 10 minutes, in Ethereum a new block is generated within 20 seconds, and in TRON, a new block is generated every 3 seconds (Vacca et al., 2021).

Vacca et al. (2021) explain how the hash is inserted to form the chain created in the Blockchain system, where the process is as follows:

Block 1 = content = *hash* 0

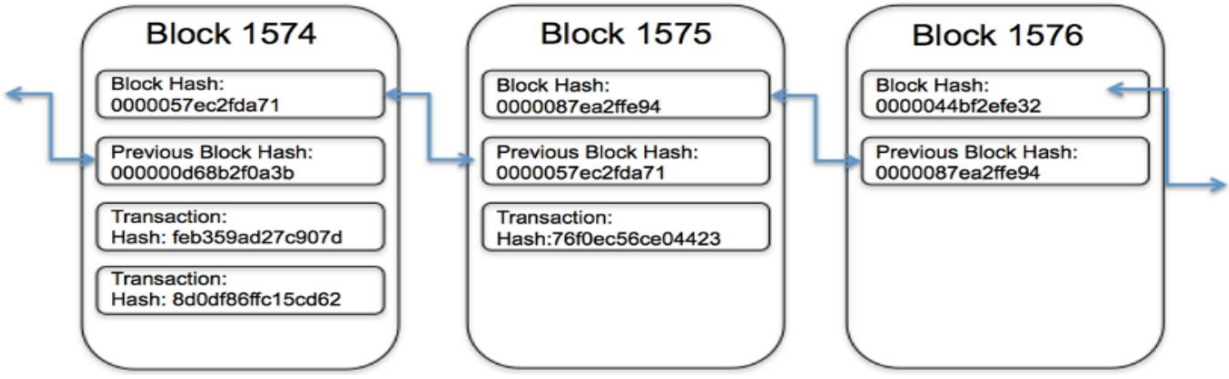
Block 2 = content + *hash* 0 = *hash* 1

Block 3 = content + *hash* 1 = *hash* 2

Figure 3 shows a blockchain chain, with each block containing a unique "fingerprint" for identification, also known as the Hash.

Figure 3

The storage of transaction records in a series of blocks.



Source: Gupta (2020).

Figure 3 exemplifies why Blockchain is so secure in ensuring the integrity of various operations, as the validating network is decentralized, meaning there is no single point of failure, as opposed to when a bank (a centralizing entity) guarantees a given transaction. According to Yano et al. (2023), Blockchain technology is an excellent solution for ensuring data integrity, due to its immutability characteristic. Each block has multiple "validators", and in order for a failure to occur, it would be necessary to corrupt more than 50% of the validators (Wang; Tian & Zhang, 2021).

To validate the entire integrity of this chain, the concept of "Smart Contract" was created. While Blockchain is referred to as the "Public Ledger", the smart contract represents the rules with definitions that allow strangers to engage in transactions and business using the Internet, with a high degree of trust, without the need for a central validator (Vacca et al., 2021).

The first Blockchain standard proposed by Nakamoto (2009) showed that any computer could participate in the validation process of the chain, known as "miners". A challenge is issued, and the first computers to respond to it send the data that becomes part of the block chain and receive a reward for doing so. This type is considered public Blockchain (Vyas & Krishnamachari, 2019).

On the other hand, the private model is controlled by a single organization that determines who can read and send transactions and participate in the consensus process. Because they are 100% centralized, this type of chain works well in restricted areas (sandboxes) but is not suitable for production environments (Vyas & Krishnamachari, 2019).

The Brazilian government is attempting to implement bConnect in ports for data exchange regarding imports and customs, initially within the MERCOSUR region. It is a private Blockchain standard controlled by the Government's Data Processing Service (Serpro) to create efficiency in imports and exports (Serpro, 2020).

After its massive use in the financial sector, through the success of digital currencies (Perboli et al., 2018), further research was conducted utilizing the validation scheme proposed by Nakamoto (2009). Among these, supply chains and logistics have caught the attention of researchers in recent years. The use of Blockchain was adopted due to its high reliability and the ability to create a system for a company to control its inventory, audit its sales, and conduct business with other companies, even from other countries (Yano et al., 2023).

The practical application of the proposal presented here is feasible within the Brazilian tax monitoring system. However, Setyowati et al. (2020) point out that the use of Blockchain technology is influenced by factors such as technical capacity and government policy. Thus, the basic infrastructure required to support the application, such as Internet networks, servers, and digital identity mechanisms, must be either prepared or made available.

3 METHODOLOGICAL PROCEDURES

This is an applied research study with a qualitative approach and exploratory objectives, utilizing goods identification codes to create a tracking and data-sharing chain through the use of technology.

The methodology for developing the proposal was Design Science Research, known in the field of data engineering as "research in design science". This form of research, introduced in 1996, aims to bridge the gap between the technical development needs of scientific technological artifacts and the market requirements, in this case, related to fiscal aspects and goods control.

For the theoretical review, a search was conducted in the Web of Science and Google Scholar databases. The bibliographic research used the search terms Blockchain AND ("supply chain" OR logistics) AND traceability, focusing on publications from 2016 onwards. In the Web of Science, 42 articles were found, 10 of which were selected for abstract review, and a total of 6

articles were relevant to the research. In Google Scholar, a new filter was applied, including articles with more than two citations. 11 articles were selected, and after reviewing the abstracts, 7 were used in the research.

In this research, Blockchain is employed as a mechanism for tracking and controlling goods. Therefore, the focus is on inserting information that uniquely identifies a product, such as its barcode or QR code, within the fields of the NF-e. Subsequently, the fiscal entry is made in the EFD and at the beginning of the product's supply chain, with these data also being written into the Blockchain.

Thus, the entire process of goods movement related to sales, which requires ancillary tax obligations (EFD/NF-e) to be recorded, should also be registered as an additional block in the chain. This way, from production to the final consumer, the tax authorities will be able to monitor the entire flow of the goods. It should be noted that the registration should only concern the product, not its monetary value, as the goal is to track the goods for reasons related to diversion, theft, and not its added value.

Since this involves the development of a proposal for electronic goods traceability using Blockchain, the details of the proposal’s construction are presented directly in the results section, to facilitate the reader’s understanding and practical applicability.

4 RESULT

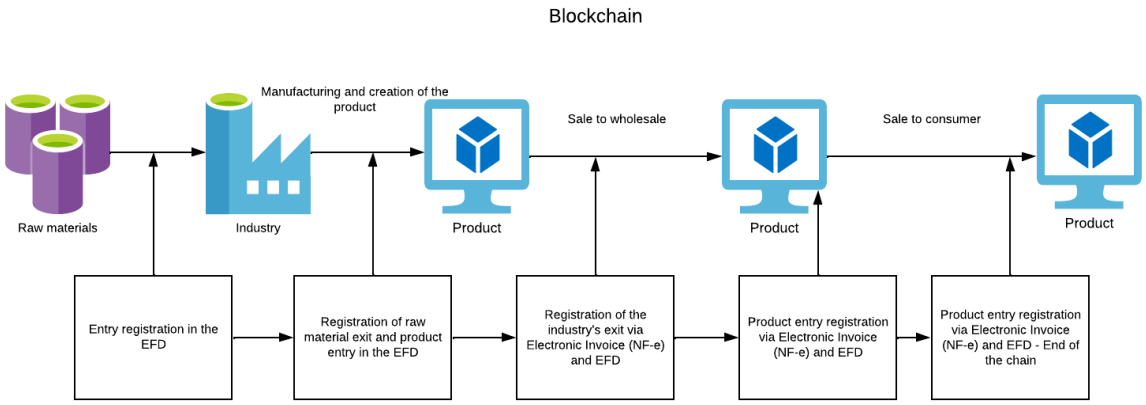
Brazilian tax authorities are able to conduct audits on various products by employing the reading of EFD data related to the NF-e, or the so-called "fiscal cross-checking", for the purpose of auditing tax collection. As this research is limited to the traceability of goods, which EFD and NF-e allow, the steps shown in the research are only part of the audit mechanism, covering only certain types of goods.

For example, when a TV is sold individually, the sales record is always made one by one. In this case, it will be possible to write the data into the NF-e. However, when a factory sells a box of twelve 1-liter milk cartons, only the box of twelve will be recorded, but at the supermarket, the sale could be made per unit, not by batch. In this case, it will not yet be possible to implement the mechanism described in the research (Vyas & Krishnamachari, 2019).

To perform audits and traceability, the regulatory institutions cross-reference the data from the NF-e with the data from the EFD. At the beginning of the production chain, the input of raw materials is registered accounting-wise, and the output is the product registration. All of this is recorded in the EFD, in blocks C and K. When the product is sold from the manufacturer to the retailer, the manufacturer registers the exit, and the buyer registers the entry. This cycle repeats until the final consumer: when the consumer buys the product, the seller registers the sale in the specific NF-e, and at the end of the month, the EFD records the exit of the product, executing the "write-off" (RFB, 2020).

Figure 4 illustrates the current control method used by the tax authorities and other regulatory agencies.

Figure 4
Current process for tracking a product, from its creation to the final sale..

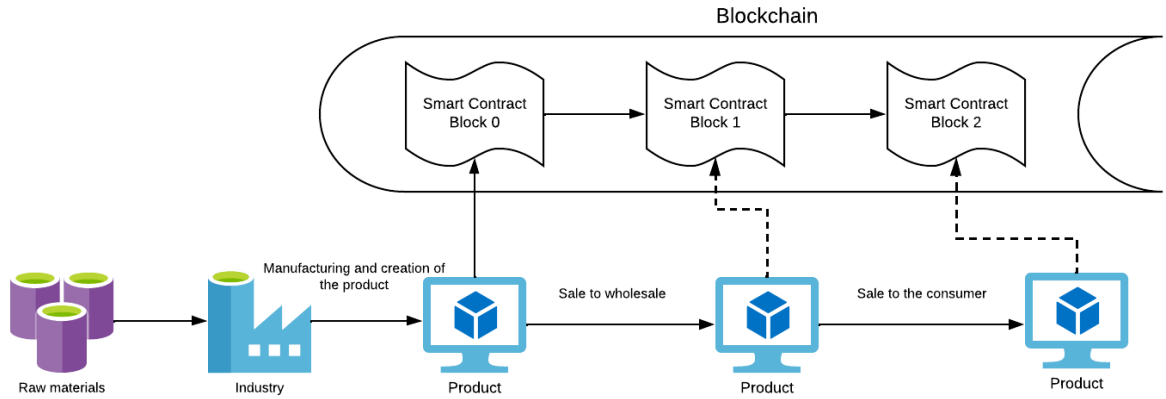


Source: Own authorship (2024).

In the process shown in Figure 4, it is noticeable that in the case of theft, robbery, or diversion, there is only a record of product loss. However, if this product is reintegrated into the market, there is no way to control it, both by police authorities and tax authorities.

The proposed digital transformation for the traceability of the production chain and control would involve recording the product's data using Blockchain. In this way, at each stage, the data entered in the NF-e and EFD to identify the sales process would also be written into Blockchain using a SmartContract (Vacca et al., 2021). Thus, the process repeats at all stages until the final consumer, where the chain would be completed. Figure 5 illustrates how this sequence of actions would occur.

Figure 5
Control of the chain using Blockchain



Source: Own authorship (2024).

Figure 5 does not change the standard adopted in Figure 4, but it creates a control mechanism for the entire chain, from the moment the product is created until it reaches the final consumer. This process is transparent, can be monitored and controlled, and, as the goal is to track the product within the chain, it serves its purpose.

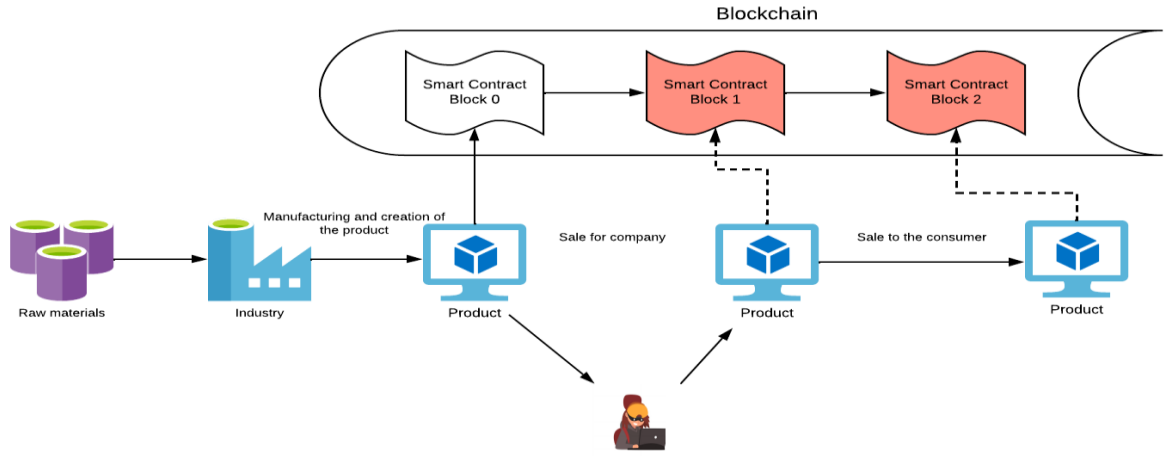
The traceability proposed by the use of Blockchain allows the creation of a mechanism that controls any type of incident with the product. For example, if the product is diverted for some

reason, it is sufficient to record this information in the next block, so that if the product returns to the market, it cannot be "legalized". In other words, the company that decides to resell the product will not be able to issue an invoice, since the block containing the previous information, such as “theft”, “robbery”, “internal use”, or “spoiled product”, cannot be altered.

Several attempts have been made in Brazil to create mechanisms for goods traceability. For example, the Brazilian Mint (CMB), following the Federal Revenue Service (RFB) Normative Instruction, started issuing seals for the traceability of beverages. These seals have unique codes and are used specifically for the purpose of performing audit checks, that is, the fiscal cross-checking of NF-e and EFD data. The Federal Revenue Service discontinued the mandatory use of these seals due to logistical and cost issues (Normative Instruction RFB No. 1432, 2013).

Figure 6 shows the traceability condition: when a product is diverted and attempts to return, if the company that buys it writes in Block 1 the entry of the product, and consequently in Block 2 the exit, the regulatory agencies will easily check and confirm that the origin is illicit. The company itself will be able to verify whether the product has a legal origin or not. Just like in Bitcoin transactions and other digital currencies (Vacca et al., 2021), the same pattern can be followed for goods.

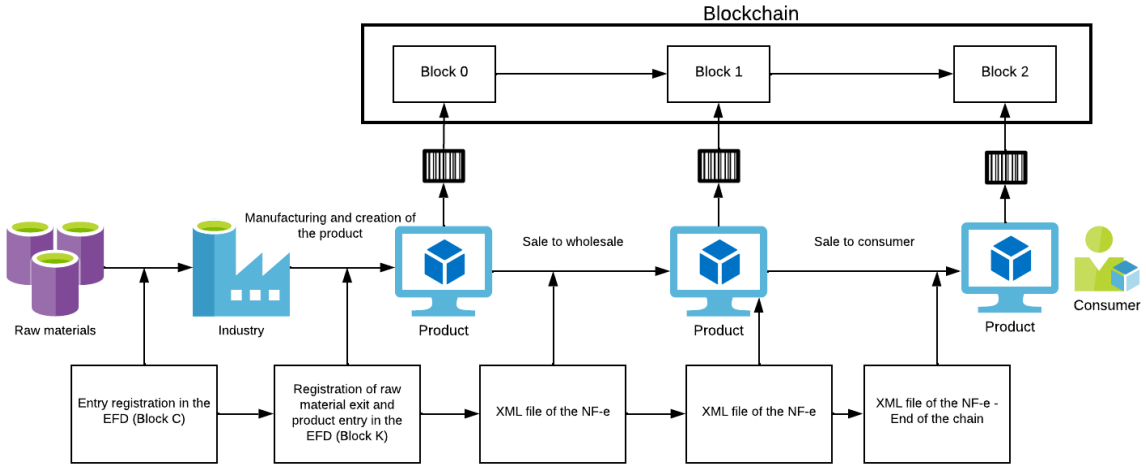
Figure 6
Traceability using Blockchain.



Source: Own authorship (2024).

Since many products already have barcode or QR Code identifiers in their production process, such as televisions, the proposed research aims to insert a unique identifier for each product into these barcodes, serving as a key element for writing into Blockchain. As seen in Figure 7, when the product is created, the manufacturer would register the barcode in Block K of the EFD, and upon sale, the barcode would be recorded in the NF-e (which is an XML file). This process continues until the last NF-e issued to the final consumer, where the final entry would also be recorded in the Blockchain.

Figure 7
Process of writing the barcode into Blockchain for traceability.



Source: Own authorship (2024).

Figure 7 illustrates the process of writing the product's barcode into Blockchain. As previously shown in the previous Figures, the barcode represents the digital identity of the product and will be inserted into the first NF-e when sold, also initiating Block 0 of the Blockchain structure.

The proposed tracking system provides an alternative for control both for regulatory authorities and any member who was part of the process, generating transparency, increasing security, and reducing costs, as proposed by Vyas and Krishnamachari (2019). In addition to preventing losses, the transparency provided by the process also contributes to greater fiscal control and tax collection.

5 CONCLUSIONS

The objective of this research was to develop a proposal for electronic traceability of goods using Blockchain. The detailed results transcribe the proposal and its practical applicability, where it is possible to base the model on existing tools in Brazilian fiscal relations, adapting the control mechanisms and integrating Blockchain into the processes.

The first reflection on the model proposed in this research is that it is already being adopted, in part, for supply chain traceability, as shown by Perboli et al. (2018). A good example is the case of KFC restaurants, as presented by Vyas and Krishnamachari (2019), which manage their supply chain control with Blockchain.

On a governmental level, the technology has been used in various locations, such as voting in the European Union in 2020, the TCU's accountability in 2018, and data sharing in ports (Serpro, 2020). However, this research sought to create a model that uses Brazil's existing digital accounting infrastructure (SPED, EFD, NF-e), which represents the national ledger, combined with the "digital ledger" represented by Blockchain.

Although the fiscal mechanisms already exist, for practical implementation, legislative and regulatory adjustments are required, along with alignment with the technology. It is important to note that the legislative and regulatory process that mandates the barcode registration of products in ancillary obligations (EFD, NF-e) does not yet exist. This is the first critical point of the model proposed by the research, as only companies that truly seek transparency and traceability would incorporate this process into their structure.

An important step observed in bConnect by Serpro (2020) is that the federal government already has the necessary Blockchain infrastructure in operation and under testing for traceability models, which reduces the implementation cost of the proposal. It is worth noting that with the tax reform approved in Brazil in 2024, which will come into effect in 2027, there is time for implementing this proposal, should the government be interested, as it would become part of the tax regulation to be approved.

This research was limited to proposing the technological artifact. It is suggested that future research conduct practical testing of the system proposed here, which may require a partnership with the national tax oversight sectors, thus bringing a significant advancement to the literature on the topic and providing an empirical test to enable the application of the model to the Brazilian reality.

The digital transformation mechanism should be specially treated by the government as a great ally to transparency and bureaucracy reduction. Regarding traceability, the research shows that once implemented, it will improve the audit process, tax collection, and regulatory and security agencies will likely mitigate the problem of illicit products being reintroduced into the market improperly.

REFERENCES

Dourado, L., Silva, P., Peres, C., & Díaz, D. (2022). Challenges and Opportunities for a Fiscal Blockchain. *American Academic Scientific Research Journal for Engineering, Technology, and Sciences*, 87(1), 117–137. https://asrjetsjournal.org/index.php/American_Scientific_Journal/article/view/7520

Gupta, M. (2020). *Blockchain for drummies* (3rd IBM Limited Edition). John Wiley & Sons, Inc. Hoboken, NJ.

Instrução Normativa RFB n.º 1432, de 26 de dezembro de 2013 (2013). https://www.legisweb.com.br/legislacao/?id=263711

Lei n.º 14063, de 23 de setembro de 2020 (2020). https://www.planalto.gov.br/ccivil_03/_Ato2019-2022/2020/Lei/L14063.htm

Madeira, L. M., & Geliski, L. (2019). O combate a crimes de corrupção pela Justiça Federal da Região Sul do Brasil. *Revista de Administração Pública, 53*(6), 987-1010. https://doi.org/10.1590/0034-761220180237

Nascimento, L. D. V. (2023). *Blockchain fiscal: uma proposta para as administrações tributárias.* [Dissertação de mestrado, Universidade Salvador – UNIFACS, Salvador, BA, Brasil].

Nakamoto, S. (2009). *Bitcoin: a peer-to-peer electronic cash system*. https://bitcoin.org/bitcoin.pdf

Perboli, G., Musso, S., & Rosano, M. (2018). Blockchain in Logistics and Supply Chain: A Lean Approach for Designing Real-World Use Cases**.** *In IEEE Access, 6*, 62018–62028. https://doi.org/10.1109/ACCESS.2018.2875782

Receita Federal do Brasil [RFB] (2019). *Guia Prático da Escrituração Fiscal Digital – EFD ICMS/IPI* (2019). Versão 3.0.3. http://sped.rfb.gov.br/pasta/show/964

Receita Federal do Brasil [RFB] (2020). Sistema de Nota Fiscal Eletrônica. *Manual de Orientação do Contribuinte***.** Versão 7.0. https://www.nfe.fazenda.gov.br/portal/listaConteudo.aspx?tipoConteudo=ndIjl+iEFdE=

Receita Federal do Brasil [RFB] (2024). Sistema Público de Escrituração Digital – SPED. *Manual do Programa de Escrituração Contábil Fiscal.* Versão 10.0.9. http://sped.rfb.gov.br/pagina/show/7477

Saripalli, S. H. (2021). Transforming Government banking by leveraging the potential of blockchain technology. *Journal of Banking and Financial Technology*, *5*(2), 135-142. https://doi.org/10.1007/s42786-021-00035-4

Serviço de Processamento de Dados do Governo Federal [SERPRO]. (2020). *bConnect entra em uso no início de 2020.* https://www.serpro.gov.br/menu/noticias/noticias-2019/bconnect-uso-inicio-2020-blockchain-serpro

Setyowati, M. S., Utami, N. S., Saragih, A. H. & Hendrawan, A. (2020). Blockchain technology application for value-added tax systems. *Journal of Open Innovation: Technology, Market, and Complexity*, *6*(4), 1–27, 2020.https://doi.org/10.3390/joitmc6040156

Søgaard, J. S. (2021). The blockchain-enabled platform for VAT settlement. *International Journal of Accounting Information Systems, 40*. https://doi.org/10.1016/j.accinf.2021.100502

Wang, L., Tian, Y., & Zhang, D. (2021). Rumo à autenticação de acumulador dinâmico entre domínios com base em blockchain na Internet das Coisas. *IEEE Transactions on Industrial Informatics*, *18*(4), 2858-2867. https://doi.org/10.1109/TII.2021.3116049

Yano, I. H., Castro, A., Granelli, M. A., & Silva, F. C. (2023). Fortalecimento de marca empresarial por meio de práticas sustentáveis, marketing digital e tecnologia Blockchain. *Revista de Gestão e Secretariado*, *14*(1), 802–819. https://doi.org/10.7769/gesec.v14i1.1550

Vacca, A., Di Sorbo, A., Visaggio, C. A., & Canfora, G. (2021). A systematic literature review of blockchain and smart contract development: Techniques, tools, and open challenges. *Journal of Systems and Software*, *174*, 110891.

Vyas, N., Beije, A., & Krishnamachari, B. (2019). *Blockchain and the supply chain: concepts, strategies and practical applications*. Kogan Page Publishers.

CONFLICT OF INTERESTS

The authors declare no conflict of interest regarding this submitted work.

AUTHOR CONTRIBUTIONS

Roles	1st author	2nd author
Conceptualization	♦	♦
Data curation	♦	
Formal analysis	♦	♦
Funding acquisition		

Investigation	♦	
Methodology	♦	
Project administration	♦	
Resources		
Software	♦	
Supervision		♦
Validation		♦
Visualization	♦	♦
Writing – original draft	♦	
Writing – review & editing		♦