

The Good, the Bad, and the Ugly: Analyzing the Impact of Blockchain Technology on Traceability for SMEs

Leonardo Maria De Rossi
SDA Bocconi School of Management
leonardo.derossi@sdabocconi.it

Nico Abbatemarco
SDA Bocconi School of Management
nico.abbatemarco@sdabocconi.it

Abstract

This paper examines the effects that adopting a blockchain-based traceability solution can have on micro and SME organizations. Specifically, in our study we investigate the case of TrackIT, a project launched by the Italian Trade Agency to support the fight against the market of counterfeited and “Italian sounding” products, valued at approximately €8.7 billion in 2019. Through a series of 18 interviews with participants in the TrackIT ecosystem, we delineate the positive (good), negative (bad), and ambiguous (ugly) impacts of the solution on the involved companies. Building on this, we provide a set of guidelines for organizations involved in similar projects, detailing potential ways to exploit the good, minimize the bad, and manage the ugly. Among these, we highlight five major recommendations: capitalize on blockchain’s hype to digitalize processes, leverage its innovative image for marketing, consider traditional alternatives, act as a consortium, and adjust economic expectations before adoption.

Keywords: Blockchain; Traceability; Counterfeiting; Italian-sounding; Supply chain tracking.

1. Introduction

Counterfeiting represents a significant global issue. Although estimates vary, the annual value of counterfeit goods sold ranges between €1.55 trillion and €4.1 trillion (Corsearch, 2019; Forbes, 2022). Despite the relevance of the issue, existing traceability systems often proved inadequate in effectively identifying counterfeit products. Recent years have seen numerous instances where supply chains failed to promptly detect and address problematic products. For example, the 2008 Chinese milk scandal, in which melamine-contaminated milk powder caused serious health issues and fatalities, highlighted critical issues in product traceability and quality control (Pei et al., 2011; Sharma & Paradakar, 2010). Likewise, the 2013 horse meat scandal in Europe, where horse meat was fraudulently labeled and sold as beef, exposed severe deficiencies in

supply chain transparency (Agnoli et al., 2016; Premanandh, 2013). Similar challenges have been observed in other sectors such as the luxury goods one, where, for example, Burberry in 2018 had to destroy €33 million worth of unsold clothes, accessories and perfume to protect against counterfeits (BBC, 2018).

In Italy, counterfeiting poses a considerable threat to the local business environment, affecting various sectors and causing substantial economic and social costs (Beqiraj et al., 2020; OECD, 2021). According to the OECD, counterfeit goods constitute a notable portion of Italy’s trade, with counterfeit goods’ imports valued at approximately €8.7 billion in 2019. On the other side, global trade in counterfeit products infringing Italian trademarks amounted to €24.3 billion. Beyond counterfeiting, the “Italian sounding” phenomenon – referring to products being marketed with Italian-sounding names and packaging to mislead consumers into believing they are purchasing authentic Italian goods – further undermines Italian trade (Bonaiuto et al., 2021; Carreño & Vergano, 2016). These two challenges particularly impact micro and small-to-medium enterprises (SMEs).

According to Eurostat standards, the Italian National Institute of Statistics classifies small and medium enterprises as firms with fewer than 250 employees. Specifically, micro-enterprises have fewer than 10 employees, small firms have 10-49 employees, and medium-sized enterprises have 50-249 employees. Due to their limited size, micro and SMEs often lack the resources to afford advanced traceability systems both for their supply chains and for their own products (Francioni & Albanesi, 2017). To mitigate this issue, in 2022 the Italian Trade Agency (ITA) – a governmental body supporting the international business development of Italian companies and promoting foreign investment in Italy – launched the “TrackIT Blockchain” project, a blockchain-based initiative aimed at Italian companies to improve their traceability capabilities and support the fight against the counterfeiting and Italian sounding phenomena. As of June 2024, TrackIT encompasses a

total of 1,531 products registered across various blockchain protocols, with 276 participating companies.

Based on 18 interviews conducted over the past 12 months with participants in the TrackIT ecosystem, this study delineates the primary impacts that the adoption of the solution had on the involved companies. We categorize these impacts into three clusters: the “Good” (positive impacts), the “Bad” (negative impacts), and the “Ugly” (ambiguous impacts, potentially but not necessarily negative). Building on this analysis of the status quo, we provide a series of guidelines that companies can apply to exploit the “Good”, minimize the “Bad”, and manage the “Ugly”. We suggest that our results and recommendations can be generalized beyond the TrackIT context and applied more broadly to all traceability applications where blockchain is used as the core digital technology. Accordingly, we believe they may be useful for practitioners in two key areas. First, for managers whose companies are uncertain about joining a blockchain-based traceability ecosystem, these insights can help clarify the associated benefits and challenges. Second, for practitioners working within entities like ITA, these recommendations may provide valuable lessons learned on important factors to consider before launching a similar project.

The structure of this paper is as follows. The next section provides a comprehensive analysis of the context of counterfeiting globally, the specific situation in Italy, and the phenomenon of Italian sounding. It also provides more details on the TrackIT project and the rationale behind its launch. Section 3 discusses the primary impacts that the adoption of the solution has had on ecosystem participants thus far. In Section 4, we present our recommendations for managing the identified impacts, which we then summarize in the Concluding Comments section. The methodology, including information about the interview data used to build the case, is presented in the Appendix.

2. Context

2.1 Current challenges with counterfeiting and traceability systems

As reported in the introduction, counterfeiting is a serious problem, with the total amount of counterfeit goods sold each year ranging from €1.55 trillion to €4.1 trillion (Corsearch, 2019; Forbes, 2022). However, the repercussions of counterfeiting extend beyond economic losses to wider consequences. For example, the importation of counterfeit products (especially potentially dangerous ones) from China, along with other factors such as intellectual property theft, contributed to the U.S. decision to impose tariffs against the country a few years ago (Bikoff et al., 2015; Lan,

2020). From a private firm perspective, counterfeiting represents a significant source of competition on a global scale. In fact, brands must contend not only with legitimate competitors vying for market share but also with counterfeiters who erode consumer trust (Nguyen & Gunasti, 2018). Counterfeiting not only siphons revenue from businesses but also undermines consumers' confidence in their ability to purchase genuine goods in an open marketplace. Without proper security and tracking measures, consumers quickly lose faith in brands' ability to protect them from fraud. According to intellectual property and brand protection company IncoPro, 52% of consumers reported losing trust in a brand after purchasing a fake good online, while 64% lost trust in online marketplaces (Forbes, 2022). For instance, this erosion of trust was a contributing factor in Nike's decision to stop selling its products on Amazon (Forbes, 2020).

Despite the importance of the issue, current traceability systems do not effectively protect against counterfeiting due to several challenges, ranging from logistics to quality management issues (Ringsberg, 2014). Among these, information management challenges are particularly critical, as these systems often lack interoperability between different stakeholders and platforms, creating gaps in data and reducing overall transparency (Ringsberg, 2014). Addressing these challenges requires innovative solutions that enhance transparency, security, and scalability in supply chain management (Kshetri, 2018). In recent years, the use of blockchain and distributed ledger technologies (DLTs) has been proposed to solve this issue and has been associated with multiple traceability business cases, ranging from the food and beverage industry (e.g., Kshetri, 2023) to the pharmaceutical sector (e.g., Matke et al., 2019). However, the impacts of this type of solution on companies are currently mixed, with cases of failure seemingly outnumbering those of success. For example, TradeLens, the blockchain-enabled platform launched by Danish company Maersk and once presented as one of the first success stories in this field (Jensen et al., 2019) definitively closed in 2022 due to lack of commercial viability (Maersk, 2022). The impacts of the adoption of similar technological solutions are even less clear for micro and small-to-medium enterprises (SME), which have so far been less involved in initiatives of this type.

2.2 The impact of counterfeiting in the Italian economic environment

Out of a total of €8.7 billion of counterfeit goods' imported in Italy in 2019, the estimated volume of forgone sales for Italian wholesalers and retailers was

€4.2 billion (OECD, 2021). This figure represented 3.2% of total sales wholesale and retail sectors in the country for that year. The highest sales losses were in the clothing, footwear, leather, and related products sectors (€1.48 billion in forgone sales), followed by electronic, electrical, and optical products (€1.25 billion in forgone sales). On the global trade side, the value of counterfeit products infringing Italian trademarks amounted to €24.3 billion in 2018, representing 3.6% of total abroad sales for the affected Italian manufacturing sectors. Counterfeiters have increasingly targeted core Italian manufacturing sectors, particularly clothing, footwear, leather goods, and optical products. The value of counterfeit “Made in Italy” goods in these sectors has continued to grow.

The reduction in sales due to counterfeit also results in lower tax revenues for the Italian government. The total value of forgone tax revenues amounted to nearly €1.7 billion in 2018, equivalent to 0.55% of total taxes collected from these sectors. Reduced sales also diminished labor demand, resulting in significant job losses. In 2018, it was estimated that nearly 20,000 jobs were lost in Italy’s retail and wholesale sectors due to counterfeit imports, accounting for more than 2.1% of all employment in these sectors. Again, the most affected sectors were clothing, footwear, accessories, and related products, which saw over 8,000 job losses, or 2.7% of all employees in these areas.

In addition to counterfeiting, the “Italian sounding” phenomenon further undermines the Italian economy (Bonaiuto et al., 2021; Carreño & Vergano, 2016). This refers to products marketed with Italian-sounding names and packaging to deceive consumers into thinking they are purchasing authentic Italian goods. This practice is especially prevalent in the food and beverage industry, with imitations of products like Parmesan cheese and San Marzano tomatoes. According to Assocamerestero, the association of Italian Chambers of Commerce abroad, the turnover of Italian-sounding products is estimated at €90 billion globally, significantly higher than the value of authentic Italian food exports (Assocamerestero, 2017). This results in substantial economic losses for genuine Italian producers and dilutes the global reputation of “Made in Italy” products. Addressing counterfeiting, trademark infringements, and the Italian-sounding phenomenon requires, among others, enhanced traceability systems. However, implementing these systems is particularly challenging within the Italian economic framework, which is characterized by a significantly higher percentage of exports from micro and SME companies compared to other countries (53% in Italy versus an average of 40% in the EU and 25% in France and Germany) (European Investment Bank, 2021). The primary issue is that Italian SMEs lag significantly in terms of digitalization.

This is due to a lack of awareness about the importance of investing in digital technologies, a fragmented offering of digital solutions from major technology providers, and limited availability of bank credit for digitalization purposes, all of which hinder SMEs willing to digitalize (European Investment Bank, 2021).

2.3 Introducing TrackIT Blockchain: a traceability project for Italian companies

To address the counterfeiting and Italian sounding issues, in 2022 the ITA launched “TrackIT Blockchain,” a blockchain-based project for Italian companies. According to the ITA website, *“the use of blockchain technology enables Italian exporting SMEs to create a new Direct to Consumer communication channel with potential buyers, through which they can transparently and reliably convey the value of their products. All events across the various stages of a given supply chain can be securely and immutably tracked. For Made in Italy products, the advantage of blockchain tracking helps to enhance the uniqueness and history of the products and to protect the brand from counterfeiting and Italian-sounding phenomena”* (ITA, 2022).

More specifically, the service provided by ITA aims to connect Italian companies, particularly micro and SMEs, with selected technology providers. For the first 18 months, these SMEs receive – free of charge – consulting from a technological partner on supply chain mapping, implementation and management of a blockchain traceability system (e.g., notarization services), design and development of programming interfaces (APIs), assistance, and creation of a user interface (landing page) for consumers to view and verify all data related to the tracked product(s).

Ultimately, the blockchain platform serves as a tracking system for both the SMEs' products and the related supply chains. The data is accessible to the end customer simply by scanning a smart tag (e.g., QR-code) placed on the final product, allowing all associated information to be verified at any time on a dedicated webpage. The service also includes the creation of product sheets in both English and Italian. Companies are responsible for drafting/translating these webpages and for any customizations or service extensions. After the first 18 months, companies can either terminate the service, continue it at their own expense, or transfer it to another provider (ITA, 2022).

Eligible companies must realize products associated with Italian identity (according to the Non-Preferential Rules of Origin of the European Union – see European Commission (2021)), be registered within the Italian Chamber of Commerce system for at least 3 years, operate in the agri-food and textile/clothing sectors, and have recorded at least 20% of their total

revenues from international markets over the past 3 years (ITA, 2022). Overall, the initiative not only aims to enhance supply chain transparency but also to strengthen the reputation and competitiveness of Italian SMEs in the global market.

The blockchain protocols used in the TrackIT Blockchain project are diverse; there is no single protocol adopted uniformly by all providers. Some providers use Quadrans, others Hyperledger Fabric, while others use Eterna, Ethereum, and its layer 2 solution Polygon. However, all these protocols utilize smart contracts to maintain a consistent thread of the various recordings and localizations on the blockchain, thus enabling the entire supply chain to be retraced. The participating companies can freely choose what processes they want to notarize and make visible to the customer. As of June 2024, TrackIT counts a total of 1,531 products registered in the different blockchain protocols and a total of 276 companies that have adhered to the project (ITA, 2022).

3. Assessing the impacts of TrackIT on Italian SMEs

From an adoption perspective, the numbers presented in the last paragraph indicate that the initiative itself was successful. However, they provide little insight into the actual impacts it had on the participating companies. Therefore, in this section, we analyze the impact of the solution from the perspective of the Italian SMEs that participated in the initiative. To this end, we conducted 18 semi-structured with companies that participated in the TrackIT Blockchain project. Key data about the interviews are presented in Table 1 below; The details of the methodology are presented in the Appendix. Based on the interviews, we categorize the observed impacts into three clusters: the “Good” (positive impacts), the “Bad” (negative impacts), and the “Ugly” (ambiguous impacts, potentially but not necessarily negative).

Ref	Size	Sector	Role
R1	Small	Food & Beverage	Sales Director
R2	Small	Fashion	CEO
R3	Micro	Food & Beverage	Owner
R4	Micro	Food & Beverage	Owner
R5	Micro	Agriculture	Owner
R6	Micro	Fashion	Owner
R7	Medium	Textile	CEO
R8	Small	Food & Beverage	Owner
R9	Medium	Fashion	CIO
R10	Micro	Agriculture	Owner
R11	Micro	Food & Beverage	Owner
R12	Micro	Agriculture	Owner

R13	Micro	Food & Beverage	Owner
R14	Small	Food & Beverage	CMO
R15	Small	Food & Beverage	Sales Director
R16	Micro	Fashion	Owner
R17	Micro	Textile	Owner
R18	Small	Fashion	CEO

Table 1. Interviews – Overview.

3.1. The Good: Blockchain improves traceability and fosters enterprise branding

Firstly, the solution was valued for effectively addressing the original challenges it was intended to solve and for enhancing existing traceability systems. From the interviews it emerged that acting as consortium (and having ITA's name associated with the solution) increased its credibility among final customers. This was particularly relevant in the agri-food sector, where in recent years media have published several alarmist reports about the unreliability of quality assurance claims made by companies. Examples include products branded as 100% Made in Italy but undergoing intermediate processing abroad or containing raw materials from countries accepting far higher pesticide levels than those allowed by Italian regulations.

“...the consumer no longer trusts the single company because many claim their product is 100% Italian, and then it turns out that it isn't quite so – take for example the issue of pasta reprocessing. The pasta is sold as Italian, but the wheat often comes from Canada, Turkey, or Ukraine.”

Owner – Company R4

The perceived improvements varied significantly based on the company's pre-existing situation. Most companies already had traceability systems in place, but the quality of the traced data varied widely. The tracking systems used ranged from semi-automated, dedicated software solutions to sporadic use of general-purpose software (e.g., Microsoft Excel) and manual data collection. For these companies, the biggest advantage was that they were helped in systematizing these processes, modernizing their systems, and making them more responsive.

“Our customers frequently ask us the production batch number of our [PRODUCT NAME], especially when problems arise, which unfortunately happens quite frequently. We rely on TrackIT to respond as quickly as possible to these requests, or at least to demonstrate that we are able to act swiftly.”

CIO – Company R9

“The difficulty we had consisted in having paper-based catalogs that were almost never updated. We can now replace them with something that is online 24/7.”

Owner – Company R6

“Data tracking is valuable for us. It is something that we managed sporadically and in a completely manual way. Now we can do it digitally instead.”

Owner – Company R11

Companies that already had advanced tracking systems received much more limited benefits in this regard, although they still appreciated the ability to communicate the tracking data externally rather than using it solely for internal purposes. This feature was enabled by the adoption of additional technological tools, such as QR codes, to which the tracked data had been associated, making it relatively accessible for end users. The improvement was particularly evident in sales made in foreign markets.

“Instead of continuing to work on Excel with this documentation, which was fundamentally only for us or for our auditors, we took advantage of this project to say: OK, let's start creating a digital label where we can put all the information that represents our product.”

CMO – Company R14

“...the average consumer doesn't understand it [the solution, Authors' note] and it doesn't make a difference to them. However, the first importer who bought one of our certified [PRODUCT NAME] said: Wow! That's a great way of showing how transparent you are.”

CEO – Company R2

This quotation allows us to transition to one of the key points of our analysis. Although many interviewees mentioned the improvement of their traceability systems, this benefit was often secondary to another aspect: the contribution of blockchain to the company's branding strategy. Establishing a reputation as innovators was the most frequently cited benefits of adopting TrackIT. Even SMEs still in the prototype and testing phases received positive feedback during product presentations at public events, such as industry fairs, particularly from younger and international customers.

“...at the latest [FOOD INDUSTRY FAIR], our Canadian distributors told us: ‘congratulations, well done!’. They greatly appreciated the innovativeness of this initiative.”

Sales Director – Company R1

The benefits in this regard extended beyond the appreciation of the solution's innovativeness to include also other branding factors.

“For now, we have primarily used it in that sense [for branding purposes, Authors' note], as we will, for example, in a few weeks when we will showcase it at an important event on sustainability.”

CEO – Company R7

3.2. The Bad: Blockchain is a costly and complex solution

The most critical point regarding the solution that emerged from the interviews was its long-term financial sustainability. In this context, company size was a significant factor. The micro enterprises interviewed unanimously claimed, albeit to varying degrees, that they would not be able to sustain the costs of the solution in the future.

“The costs are unsustainable for us. [...] We stopped the project when we realized the actual cost for the long-term maintenance of this solution.”

Owner – Company R11

From the interviews, it also emerged that the long-term maintenance costs of TrackIT would be higher than those of alternative traceability solutions. However, this largely depends on the complexity of the already adopted solution. For companies that primarily relied on free or low-cost tools, such as Microsoft Excel, for their traceability operations, transitioning to TrackIT resulted in significantly higher costs.

“This is a complex initiative [...] if we had to pay for it, it would be absolutely uneconomical. As a micro company, we simply can't afford it.”

Owner – Company R5

For these companies, TrackIT proved challenging to adopt not only economically, but also organizationally. For instance, they often had to create a new database of technical data from scratch.

“We already had the required data, but it was not in the format required by the provider. Thus, we had to manually redo the technical sheets ourselves, and this meant we had to fully dedicate a resource to this task.”

Owner – Company R10

Conversely, all companies that already had a dedicated traceability solution in place considered the costs of TrackIT aligned with the status quo and therefore sustainable in the long term. Similar

considerations apply to the organizational efforts required by the solution. Indeed, for companies with an advanced traceability system, only a limited additional effort was required to manage the solution.

“There were some changes that we had to make on how to add data to the system, but these were managed in half a day. Once we knew what we needed to do, we created a process and automated everything.”

CIO – Company R9

3.3. The Ugly: Blockchain does not provide immediate benefits, and is not a panacea

None of the companies interviewed reported that the implementation of TrackIT led to positive impacts. While this might sound discouraging, it must be interpreted in the context provided by the interviews. Most SMEs had implemented the solution too recently to see any financial return. Most interviewed companies adopted TrackIT in the second half of 2023, with initial sales results expected no earlier than 2024. Thus, most of the interviewees did not express concern about the lack of immediate financial returns, postponing their evaluation to the following year.

The only exception was a company operating in the agri-food sector, and specifically in the field of organic farming. Despite no data indicating a negative trend in revenues linked to the implementation, the company claimed that the adoption of blockchain was opposed by both its customers and its whole supply chain.

“We opted for this solution to show to our customers all the steps of our production process. Our aim was to highlight how genuine are our organic practices, contrasting with those companies who just engage in storytelling and misunderstand what organic farming means. Yet, we encountered criticism. Most of it came from the organic farming community, that claimed that the using blockchain was against our values.”

Owner – Company R3

A second issue is that some companies became skeptical of the technical capabilities offered by blockchain in the course of the project.

“The problem we see is that blockchain does not solve the last mile issue, which is due to the interaction between the QR code and the physical product [...]. We talk about transparency, but there are many issues that need to be solved to prove that a product is what it claims to be or comes from a certain place.”

Owner – Company R13

“Writing certain data about the product with mathematical certainty is impossible, given its organic nature [...] the risk that we see is that if the solution offers immutability, this data could become incriminating for us. If the Antifraud authority challenges us by saying we provided false data, does the solution enable them to fine us? Because that would further complicate our lives.”

Owner – Company R12

4. Recommendations to exploit the “Good”, mitigate the “Bad”, and manage “The Ugly”

The application of blockchain for traceability is a highly discussed topic in both the fields of Information Systems and Supply Chain Management. Many researchers have identified potential benefits for companies interested in implementing this technology in these domains. In the previous section, we identified and analyzed the positive (the “Good”), negative (the “Bad”), and ambiguous (the “Ugly”) impacts that TrackIT, a blockchain-based traceability solution, had on a group of 18 companies participating in the project.

We argue that the impacts observed in the TrackIT case are not unique but rather generalizable to similar initiatives involving SMEs as the primary target.

	Impact	Recommendations	
		For Participating Companies	For Ecosystem Orchestrators
The Good	Better Traceability Performances	Capitalize on the Hype around Blockchain to Improve Existing Tracking Systems	Provide Highly Automated and Integrated Solutions
	Higher Brand Awareness	Leverage Blockchain as a Marketing Tool	Provide Marketing Opportunities within the Solution
The Bad	Lower Financial and Organizational Sustainability (vs. Traditional Solutions)	Consider Alternative Solutions	Provide a Free Trial Period
		Act as a Consortium	Provide a Homogeneous Service Offering
The Ugly	Lack of Immediate Positive Benefits	Adjust Economic Expectations Before Adopting Blockchain	Provide a Free Trial Period or Opportunities Targeted on the Specific Participant
	Unclear Additional Benefits (vs. Traditional Solutions)		

Table 2. The Good, the Bad, and the Ugly: impacts and recommendations for blockchain-based traceability projects

Therefore, in this section we aim to provide a set of guidelines to assist both companies uncertain about joining a similar project and ecosystem orchestrators intending to launch one. Our goal is to help the former understand how they can benefit from such initiatives and navigate their main challenges, and to aid the latter by offering valuable lessons learned from ITA's experience. Table 2 above summarizes the impacts and the recommendations provided for each.

4.1 Exploiting the Good: Capitalize on the Blockchain Hype to Improve Existing Processes

Many companies still rely heavily on poorly digitalized and automated tracking solutions. This can lead to inefficiencies, increased error rates, and higher operational costs (Choi et al., 2018). By digitizing manual processes, companies can enhance operational efficiency, reduce errors, and improve data accuracy. For instance, blockchain for supply chain management allows for real-time tracking and verification of products, which can replace cumbersome and error-prone paper-based documentation (Saber et al., 2019). However, allocating budget for digitalization without clear economic returns is often challenging, especially for micro and SMEs (Bouwman et al., 2019). Blockchain has been at the forefront of technological discussions for years and continues to draw attention for its potential benefits, particularly in traceability processes. The hype around it can serve as a lever to improve existing systems, especially in those cases where tracking processes are still conducted manually. Blockchain is not the only tracking solution available to these companies; other software solutions have been effectively used for years to manage and track information. However, blockchain, coupled with the belief that it can offer direct financial benefits, can make it a more attractive option compared to more traditional alternatives. Moreover, leveraging blockchain as a tool for digitalization could also facilitate compliance with regulatory requirements by providing a clear and tamper-proof record of all transactions and processes.

For ecosystem orchestrators, our recommendation is twofold. First, participants in TrackIT experienced difficulties in automating certain steps of the traceability process. It was frequently noted that the current solution involved a cumbersome process for data entry and transfer to the service provider.

"The platform is not very user-friendly as it stands; some processes overlap. I think a much easier-to-use tool could have been developed."

Owner – Company R17

Even partial automation of this processes could allow companies to utilize the solution more easily. The second suggestion is to design the solution to integrate with other digital systems.

"...if blockchain becomes a way to help us with certifications and avoid dedicating personnel to these tasks, and if we no longer need to spend an entire day with auditors, then it would make sense for us to adopt it for certification purposes."

Sales Director – Company R15

4.2 Exploiting the Good: Leverage Blockchain as a Marketing Tool (until it lasts)

In line with the previous recommendation, companies should leverage the fact that blockchain is still perceived as an emerging technology, commonly associated with cryptocurrencies or finance, making its application in supply chain tracking a highly innovative concept. This perceived innovativeness can represent a powerful tool for companies aiming to be seen as forward-thinking by their customers. As long as blockchain is perceived as cutting-edge and beneficial, companies can leverage it to enhance their brand image. This is especially relevant in sectors where transparency and authenticity are highly valued. For instance, by implementing blockchain for product traceability, companies can provide consumers with verifiable information about product origins, thereby building trust and differentiating themselves from competitors. Coupling blockchain with the potential of other digital platforms, and thus the inclusion of various types of content (e.g., videos), can lead to additional marketing opportunities. Some companies mentioned how they are using blockchain as a tool to offer more than tracking:

"TrackIT allows us to bring customers into our company. Through the multimedia content we upload, they can somehow share our production experience."

Owner – Company R8

Moreover, the novelty of blockchain can attract media attention and generate positive publicity, further enhancing the company's reputation as an innovator. This marketing advantage can translate into increased customer loyalty and higher sales, as consumers are increasingly drawn to brands that prioritize transparency and innovation (Lacity, 2018).

"We will include videos of the production process to add value to this notarization. It's not just about certifying dates; it's about showing the end customer everything behind the product."

CEO – Company R18

However, it is important to note that blockchain may already be entering a phase of “disillusionment” in some applications. As mentioned earlier, TradeLens, a prominent blockchain-based tracking solution developed by Maersk and IBM, recently ceased operations due to industry-wide challenges and lack of sufficient network effect (Jensen et al., 2019). This example underscores the need for companies to consider the long-term viability of blockchain solutions. Despite these challenges, we believe that the current time horizon still presents a window of opportunity for companies to leverage blockchain's perceived innovativeness. For companies interested in leveraging the marketing potential of blockchain, it is crucial to act now while the technology still carries a significant market interest. If the enthusiasm around blockchain wanes, this opportunity may no longer be viable.

From this marketing-oriented perspective, our recommendation for ecosystem orchestrators is to consider developing a platform that can address these needs from day one. In the TrackIT case, some companies – especially those in the fashion and luxury sectors – complained that the UX of the solution was too basic and did not reflect the image they wanted to convey to their customers.

“We would have liked the ability to use TrackIT to personalize the customer experience. The app could theoretically include fields to make each product unique, for example by associating it with specific music themes or particular events.”

Owner – Company R16

4.3 Minimizing the Bad: Consider Alternative Solutions

One inherent feature of blockchain is its immutability, which ensures that once data is added, it cannot be altered or deleted. This characteristic results in a continuously growing database that requires ongoing management and storage, leading to escalating costs over time (Zheng et al., 2017). Indeed, blockchain maintenance involves additional tasks compared to a more traditional solution, such as the need to ensure compliance with evolving standards and regulations. These tasks can be resource-intensive and may require specialized skills. Therefore, it is essential for companies to consider these long-term costs when planning to implement a blockchain solution. For some companies, the best solution might simply be to turn to other traceability options. If one only wants traceability, it is important to understand that blockchain is just one of many technologies available for traceability and does not resolve some key issues like last mile tracking.

Companies that desire more advanced options could opt for other traditional options such as conventional Enterprise Resource Planning or Supply Chain Management systems, that can still provide effective traceability without the extensive maintenance demands of blockchain technology. While these tools may not offer the same level of security and transparency as blockchain, they are often sufficient for most business needs (Choi et al., 2018). Businesses should conduct a thorough cost-benefit analysis before adopting blockchain solutions. This includes estimating long-term maintenance costs and evaluating whether the operational benefits justify these expenses.

To support the adoption of the solution, ecosystem orchestrators should consider offering a free trial period. In the case of TrackIT, this was a key factor that otherwise would have excluded many companies from participating in the initiative. Additionally, the ecosystem orchestrator should aim to ensure that technology providers target their offerings as precisely as possible according to the company's needs. In the case of TrackIT, sometimes the offers were too low for medium-sized enterprises and at the same time unsustainable for micro and small enterprises. This was due to the fact that the renewal price of the solution did not vary significantly with the number of products registered on the blockchain. Additionally, in the TrackIT case the renewal price varied significantly from provider to provider, with a range of almost three times between the lowest and highest offers. Except for rare cases, those who found the solution sustainable in the long term received renewal offers priced near the lower end of this range. Therefore, an ecosystem orchestrator should ensure that the service offering is consistent and aligned among all technology providers.

4.4 Minimizing the Bad: Act as a Consortium

In addition to considering other technologies, companies could explore forming consortia to pool their economic resources and collectively sustain the overall costs of blockchain implementation. By establishing a consortium, multiple companies can share the financial burden of maintaining a blockchain infrastructure, making it more feasible for each member. Consortia can leverage economies of scale, reducing the per-company expense for blockchain maintenance and development. Furthermore, by working together, companies can share expertise and best practices, accelerating the learning curve and enhancing the effectiveness of the blockchain solution. This collective effort can also improve the bargaining power of the consortium when negotiating with blockchain service providers, potentially leading to more favorable terms and reduced costs. In the case of TrackIT, the consortium nature of the initiative was

guaranteed by ITA's orchestration, but private companies could find a similar equilibrium, as shown by the Corda consortium in the financial sector (Corda, 2024). In the TrackIT case, the consortial nature was key to convey to overcome some customers' skepticism regarding the reliability of individual companies.

"[Customers, Authors' note] don't connect to [COMPANY]'s website, where I can write whatever I want, but to ITA's website, which is impartial."

Sales Director – R1

4.5. Managing the Ugly: Adjust Your Economic Expectations Before Adopting Blockchain

Blockchain is a digital infrastructure that companies might consider for traceability because it enables high levels of transparency, auditability, and immutability. However, they should adjust their expectations regarding direct economic benefits from using this technology. Even though blockchain's advantages in providing a secure and transparent ledger are well-documented (Zheng et al., 2017), the financial return on investment may not be immediate. Companies should recognize that the primary benefits of blockchain in traceability are operational rather than economic. These include enhanced data integrity, improved compliance, and greater supply chain visibility (Saberli et al., 2019). For example, promoting sustainability could be one of these:

"We have been focusing on sustainability for three years, and among all our priorities, consumer health and safety are fundamental. This technology is a way to showcase our commitment to consumers."

CMO – Company R14

From this perspective, ecosystem orchestrators might consider offering a free trial period customized to the need of the specific participant, to allow to better evaluate the benefits of the solution. In the TrackIT case, micro enterprises complained that 18 months were too short to evaluate the potential benefits of the solution.

5. Concluding Comments

We began this paper by underscoring the significance of the counterfeiting problem and the limitations of current traceability systems in effectively addressing it. The Italian economy is particularly affected by counterfeiting and the "Italian sounding" phenomenon, which creates significant challenges for companies, the labor market, and Italian society as a whole. Blockchain technology is often heralded as an emerging solution to these issues.

Consequently, we investigated a currently available blockchain-based project, TrackIT, designed to tackle this problem. Through interviews with 18 SMEs, we explored the impact of blockchain in this context. Our findings indicate that blockchain technology presents positive (the "Good"), negative (the "Bad"), and ambiguous (the "Ugly") impacts. Among its positive aspects, blockchain implementation improves existing tracking systems. However, this is almost a secondary benefit for companies adopting this solution. The primary perceived benefit is branding improvement, as blockchain enhances brand perception by associating companies with innovation and transparency. The primary negative aspects identified include high long-term costs and additional operational efforts. The continuous growth and maintenance of the blockchain ledger involve significant expenses, which can be a burden. Ambiguous impacts include the lack of immediate positive economic effects and unclear advantages over traditional platforms.

Based on these findings, we formalize five major recommendations for companies considering blockchain implementation. First, capitalize on the blockchain hype to digitalize existing processes, thereby improving efficiency and data accuracy and contributing to the fight against counterfeiting. Second, leverage blockchain's perceived innovativeness as a marketing tool while the technology is still perceived as emerging. This can enhance brand image and attract tech-savvy customers. Third, consider alternative solutions if your sole objective is to implement traceability. Fourth, operate within an ecosystem logic, when possible. Fifth, adjust economic expectations before adopting blockchain, understanding that the primary benefits are operational rather than financial.

6. Appendix: Research methods

Given the exploratory nature of the research field, we determined that an exploratory, qualitative research approach would be suitable for this study. To examine the impact of blockchain on companies participating in the TrackIT project, we conducted 18 semi-structured interviews with companies participating in the initiative. To avoid response biases, we ensured participants that their answers would be anonymized. Each interview was transcribed and analyzed individually by each author. The collected data was then synthesized into a cohesive analytical framework to illustrate the current state of blockchain solutions under review. A detailed summary of the conducted interviews is presented in Table 1. This table organizes the interviewed companies in chronological order based on the interview dates. It also details the company size, the sector to which each company belongs, and the interviewee's role within the

organization. The data gathered through the interviews was analyzed using inductive coding to help explain and interpret the findings. The research activity for this paper started in September 2023 and ended in March 2024.

7. References

- Agnoli, L., Capitello, R., De Salvo, M., Longo, A., & Boeri, M. (2016). Food fraud and consumers' choices in the wake of the horsemeat scandal. *British Food Journal*, 118(8), 1898–1913.
- Assocamerestero. (2017). Indagine sui prodotti alimentari «Italian Sounding» | Assocamerestero. <https://www.assocamerestero.it/studi-e-indagini/indagine-sui-prodotti-alimentari-italian-sounding>
- BBC. (2018, luglio 19). Burberry burns bags, clothes and perfume worth millions. <https://www.bbc.com/news/business-44885983>
- Beqiraj, E., Fedeli, S., & Giuriato, L. (2020). Policy tolerance of economic crime? An empirical analysis of the effect of counterfeiting on Italian trade. *European Journal of Political Economy*, 65, 101933.
- Bikoff, J. L., Heasley, D. K., Sherman, V., & Stipelman, J. (2015). Fake it'til we make it: Regulating dangerous counterfeit goods. *Journal of Intellectual Property Law & Practice*, 10(4), 246–254.
- Bonaiuto, F., De Dominicis, S., Ganucci Cancellieri, U., Crano, W. D., Ma, J., & Bonaiuto, M. (2021). Italian food? Sounds good! Made in Italy and Italian sounding effects on food products' assessment by consumers. *Frontiers in psychology*, 12, 581492.
- Bouwman, H., Nikou, S., & de Reuver, M. (2019). Digitalization, business models, and SMEs: How do business model innovation practices improve performance of digitalizing SMEs? *Telecommunications Policy*, 43(9), 101828.
- Carreño, I., & Vergano, P. R. (2016). Geographical indications, “Food Fraud” and the fight against “Italian sounding” products. *European Journal of Risk Regulation*, 7(2), 416–420.
- Choi, T., Wallace, S. W., & Wang, Y. (2018). Big Data Analytics in Operations Management. *Production and Operations Management*, 27(10), 1868–1883.
- Corda. (2024). Home Page. <https://corda.net/>
- Corsearch. (2019). The true cost of counterfeit goods. <https://corsearch.com/content-library/blog/the-true-cost-of-counterfeit-goods/>
- European Commission. (2021). Non-Preferential Origin—European Commission. https://taxation-customs.ec.europa.eu/customs-4/international-affairs/origin-goods/non-preferential-origin_en
- European Investment Bank. (2021). La digitalizzazione delle piccole e medie imprese in Italia. https://www.eib.org/attachments/thematic/digitalisation_of_smes_in_italy_summary_it.pdf
- Forbes. (2020). Council Post: Why Nike Cut Ties With Amazon And What It Means For Other Retailers. Forbes. <https://www.forbes.com/sites/forbesbusinesscouncil/2020/01/22/why-nike-cut-ties-with-amazon-and-what-it-means-for-other-retailers/>
- Forbes. (2022). Council Post: The Global Impact Of Counterfeiting And Solutions To Stop It. Forbes. <https://www.forbes.com/sites/forbesbusinesscouncil/2022/08/02/the-global-impact-of-counterfeiting-and-solutions-to-stop-it/>
- Francioni, B., & Albanesi, G. (2017). The Italian Sounding Phenomenon: The Case Of Germany. *International Journal of Economic Behavior (IJEB)*, 7(1), 39–50.
- ITA. (2022). Home Page. <https://www.ice.it/>
- Jensen, T., Hedman, J., & Henningsson, S. (2019). How TradeLens Delivers Business Value With Blockchain Technology. *MIS Quarterly Executive*, 18(4), 5.
- Kshetri, N. (2018). 1 Blockchain's roles in meeting key supply chain management objectives. *International Journal of Information Management*, 39, 80–89.
- Kshetri, N. (2023). Blockchain's Role in Enhancing Quality and Safety and Promoting Sustainability in the Food and Beverage Industry. *Sustainability*, 15(23), 23.
- Lacity, M. C. (2018). Addressing key challenges to making enterprise blockchain applications a reality. *MIS Quarterly Executive*, 17(3), 201–222.
- Lan, N. (2020). Why Tariffs against China Are Ineffective for Intellectual Property Protection. *Am. U. Intell. Prop. Brief*, 11, 17.
- Maersk. (2022). A.P. Moller—Maersk and IBM to discontinue TradeLens, a blockchain-enabled global trade platform. <https://www.maersk.com/news/articles/2022/11/29/maersk-and-ibm-to-discontinue-tradelens>
- Mattke, J., Hund, A., Maier, C., & Weitzel, T. (2019). How an Enterprise Blockchain Application in the U.S. Pharmaceuticals Supply Chain is Saving Lives. *MIS Quarterly Executive*, 18(4), 246–261.
- Nguyen, H., & Gunasti, K. (2018). Original brands in competition against high quality copycats. *European Journal of Marketing*, 52(7/8), 1574–1597.
- OECD. (2021). Trade in Counterfeit Goods and the Italian economy. <https://www.oecd.org/gov/illegal-trade/Summary-Brochure-Italy-EN.pdf>
- Pei, X., Tandon, A., Alldrick, A., Giorgi, L., Huang, W., & Yang, R. (2011). The China melamine milk scandal and its implications for food safety regulation. *Food policy*, 36(3), 412–420.
- Premanandh, J. (2013). Horse meat scandal—A wake-up call for regulatory authorities. *Food control*, 34(2), 568–569.
- Ringsberg, H. (2014). Perspectives on food traceability: A systematic literature review. *Supply Chain Management: An International Journal*, 19(5/6), 558–576.
- Saberi, S., Kouhizadeh, M., Sarkis, J., & Shen, L. (2019). Blockchain technology and its relationships to sustainable supply chain management. *International Journal of Production Research*, 57(7), 2117–2135.
- Sharma, K., & Paradakar, M. (2010). The melamine adulteration scandal. *Food Security*, 2(1), 97–107.
- Zheng, Z., Xie, S., Dai, H.-N., Chen, X., & Wang, H. (2017). Blockchain challenges and opportunities: A survey. *International Journal of Web and Grid Services*, 14(4).