

# In vino veritas? Wine industry and Blockchain

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**Abstract.** Transparency and traceability in food industry have become two central themes for both consumers and companies. On one side, consumer awareness rises and a more in depth information. On the other side, food manufacturers want to mitigate food safety risks, reduce coordination costs and frauds improving their presence on the market. In this scenario, innovative technologies and blockchain may have a major impact. Authors investigate the adoption of blockchain in the Italian wine industry and, in particular, the effects of blockchain on complex inter-organizational supply chain systems in which SMEs are engaged. A qualitative approach has been chosen in order to preliminary analyse both motivations that drives small Italian wineries to adopt blockchain technologies and advantages or drawbacks managers have identified during these pilot experiments.

**Keywords:** *blockchain; supply chain; traceability; transparency; certification; wine industry.*

## 1 Introduction

In the last years, big organizations such as technology companies and financial giants have heavily invested into blockchain based technologies to radically transform business applications. Blockchain would contribute to securely execute business processes, to automate transactions between companies and considerable benefits are foreseen.

Blockchain technology can also be considered a huge opportunity for small and medium organizations, which do not have enough resources to invest in new technologies and often are left behind when a new technological leap forward is made.

According to some experts<sup>1</sup>, SME can innovate and build an edge with blockchain transformation by using blockchain-based services as well as creating their own apps on top of blockchain – decentralized apps, or DApps. SME can already use different blockchain solutions. For instance, there are marketplaces for renting or selling properties on blockchain-based P2P marketplaces (real estate industry); managing claims

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<sup>1</sup> Blockchain Technology Applications for SME [Expert Roundup] - Written by Mindaugas on September 17, 2018 and retrieved from <https://blog.invoiceberry.com/2018/09/blockchain-technology-applications-sme/>

(insurance field); dealing with security (IoT), monitoring and tracking freight movement (in logistics), and ensuring food safety via IBM's Food Trust network (for food industry companies, such as distributors, retailers, producers, and regulators).

In this paper, authors focus on the field of SMEs in the Italian wine industry. These companies represent the 75-80% of the Italian production, which has a total turnover of 13 Billion euros, with 310 thousand wine companies and 46 thousand wine-making companies<sup>2</sup>. In this scenario, innovative technologies and blockchain may have a major impact that cannot be ignored. The impacts are more evident on the complex inter-organizational supply chain that SMEs manage and deal with.

A qualitative approach has been chosen in order to preliminary analyse the motivations that drives small Italian wineries to improve their supply chain management with the use of blockchain. Authors also will underline advantages and drawbacks that managers have identified during their pilot experiments.

## 2 Literature review

The blockchain is a Distributed Ledger Technology (DLT), an unalterable database of information related to each transaction carried out and shared between a network of participants [15]. This technology is based on the Disintermediation and Decentralization principles, which means that data can be recorded, stored and updated in a distributed manner by all network members [16]. This kind of architecture allows actors to maintain and share records in a synchronized manner, ensuring their integrity via validation protocols based on consensus and cryptographic signatures [5]. The governance is based on a widespread and distributed system of mutual trust, in which no actor can prevail and decision process is built on consensus [4].

### 2.1 Blockchain based Supply Chain Principles

Blockchain is an integrative technology conceived with the aim of defragmenting the supply chain through the synchronization of data recorded along the same. It can be considered as an integration of existing information and legacy systems [20].

More specifically, each product is characterized by a processing cycle that involves several actors. Each actor have a unique digital identity (provided by an accreditation service) and has the role to record (track) all the key information about the development processes of the product (or service) and its status within the network. At the same time, each product is assigned to a digital identity using a specific tag (as a barcode, RFID or QR Code). This tag is a unique digital cryptographic identifier that connects the physical good to its virtual identity on the network, enabling any actor to retrieve all the associated information. In order to protect the process from theft and counterfeiting, blockchain involves the creation of a digital token associated with the digital identity

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<sup>2</sup> Federvini – retrieved the 10/8/2019 from <https://www.federvini.it/studi-e-ricerche-cat/1273-ismea,-fotografa-l-italia-del-vino-aumentano-produzione,-valore-ed-export-stabile-la-struttura>

when the product/service is made or exchange between the actors of the supply chain [1]. The final product's addressee can, therefore, authenticate the token and follow the history of the article from the beginning [13]. When the product is transferred (or sold) to another actor, both partners must sign a digital contract to authenticate the exchange. Once all actors have signed the contract, the details of the transaction will be stored. Actors' privacy can be modified according to the preferences of the subject involved. Actors can choose to remain anonymous, but their identity must be authenticated by the certifiers who guarantee trustiness in the system [1].

According to what it is been described, the founding principles of the blockchain technology are:

- *Transparency*: each participant can view all recorded content at any time. This is why blockchain is considered a reliable tool [21].
- *Open source*: the system is open to all participants, each registration can be controlled publicly and everyone can freely use the technology to implement any application [14].
- *Autonomy*: blockchain is a consensus-based system, open to all participating players; it can be modified only once all members have given their approval. With blockchain devices are able to interact with others without the involvement of any server [17].
- *Immutability*: blockchain ensures absolute inalterability and incorruptibility of all information. The only exception is represented by the possession of 51% of the control of a node [18].
- *Anonymity*: both the transfer of data and the individual transaction can be anonymous, provided that the blockchain address of the person is known [14].

## 2.2 Governance and blockchain types

From a governance point of view, a blockchain can be *permissioned or unpermissioned*. The permissioned one, or authorized, is the alternative evolution to the unauthorized chain (the one in which anyone can participate); examples are Bitcoin and Ethereum [18]. In this case, transparency is only towards authorized participants, which makes it difficult to process data that require some privacy [3]. Two types of subjects can be distinguished:

- *Participants* who can only use the system and
- *Validators* who can use the system, hold a copy of the updated ledger and being responsible for the process of distributed consensus [12].

The unpermissioned blockchain does not require owners and allows all participants to own a copy of the updated ledger. In this case, participants may also be validators and are responsible for both the distributed consensus process and the system integrity [2].

Three types of blockchain are classified as *Public*, *Consortium* and *Private* and affect some the following key elements [20]:

- *Consensus*: the consensus determination is gradual, passing from the public, then to the consortium and finally to the private one. Everyone, in fact, could take part

in the public blockchain; in the consortium only a small group of nodes is responsible for the validation of the block; in the private, the chain is entirely controlled by a single organization that could define the final consensus. Moreover, a public blockchain is an example of an unauthorized chain; the other two cases, however, are models of permissioned blockchain [20].

- *Transparency*: blockchain transaction are entirely visible in the public, but this visibility tends to fade away passing to the consortium and then to the private.
- *Immutability*: from the point of view of immutability, in the public blockchain one, transactions are much more complex to manipulate, since the number of participants who store the records is greater. Otherwise, the same information in a private or in a consortium system might be easily tampered.

The main difference between the three blockchain types is that the public is totally decentralized, the consortium is partially decentralized and the private is completely centralized and controlled by a single node.

### **3 The Italian wine supply chain with the use of blockchain**

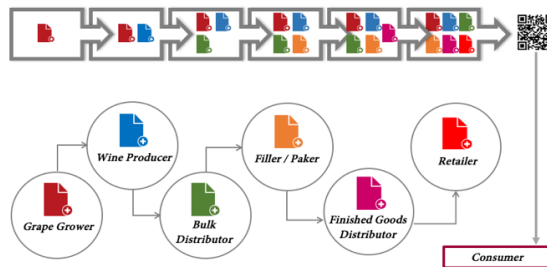
Various experiments has been conducted in Italy to introduce blockchain technologies in the agri-food industry and tin the winery sector. Among others, the main goals of these experiments are to tackle problems of wine counterfeiting, guarantee the wine origins, certify the product providing a unique identity the bottles of wine, track and trace the wine production along the entire supply chain, and to exploit technology innovation as marketing campaigns.

#### **3.1 Italian wine industry and innovation**

In a fast changing market, expectations and consumption dynamics change, even when the reference industry is typically traditional, such as the wine segment. Several technologies have been introduced in various phases of the production from the cultivation of grapes (harvesting and destemming) to the vinification process (crushing, primary fermentation, cold stabilization, laboratory tests, blending and fining), bottling, marketing, and finally distributing the resulting products. These technologies are implemented with the aim of creating added value, trying not to lose the quality that distinguishes Italian wine in the world. A Cisco and Digital Transformation Institute research, in 2017, showed that the main Italian wine industry investments on innovation took place downstream of the supply chain. Actually, the 77.3% of Italian wineries have not invested in ICT technologies nor have spent up to 5,000 euros in the last five years. Of the remaining 22.7% that invested more than 5,000 euros, about half (49%) is represented by the largest companies. The technologies that are most affecting the wine sector are mainly related to management and business management (74%), traceability (57%), and transmission of information in electronic form (53%) [10].

### 3.2 Blockchain in the Wine Supply Chain: how does it work?

Ideally, as the wine supply chain begins between the vineyards, the winegrowers should generate the first block in the chain (Figure 1). This block is checked by the majority number of miners in the system, before the next block is created. All participants in the chain receive an identification code and a batch number indicating the production quantity supplied by the wine producer. In the same way, the producer puts all his information that is recorded in a further block and shares it with all the other participants. Afterwards, the block is checked again and added to the chain. The procedure is repeated until the last person involved. In some cases information shared could be critical and kept private, taking advantage of the cryptography keys that the technology provides [6].



**Figure 1.** Blockchain in the Wine Supply Chain (personal elaboration)

One of the main features of the proposed traceability system is the possibility of tracing the origin of each individual bottle of wine. The consumer can trace the complete flow of data and related information by scanning a tag, like a QR code, placed on the label of the bottle.

## 4 Hypothesis, research method and sample of analysis

The purpose of this study is to investigate the impact of blockchain technology in the Italian wine sector. Through ethnographic interviews conducted on a sample of companies, authors explore both the benefits and the limits perceived by developers and managers in pilot experiments that have adopted blockchain technology to certify, track and trace the agri-food supply chain.

Two hypothesis are analysed:

- H1: blockchain technology allows an effective and efficient control of inter-organizational business processes and supply chain flow.
- H2: blockchain technology it is a transparency vehicle, both inside the company, and in the relationship between the firm and the final consumer.

An exploratory and comparative survey was carried out by means of semi-structured qualitative interviews with eight managers who were involved in the pilot projects. In order to have a complete scenario, authors also interviewed two representatives of companies that develop and resell blockchain technology in the agri-food sector.

Authors adopted the inductive “emergent” method. The results derive from the observation, analysis and comparison of empirical evidences, particular manifestations of the companies’ experiences, facts and circumstances in the considered context. It was decided to adopt, as the main reference in the analysis of the text (coding), a research model inspired by the Grounded Theory. Through interviews focused coding, authors defined categories and subcategories, compared them during the analysis of all interviews, and grouped into sets of themes. The authors developed the latter through a thorough and interested reading of the interviews, examining broad periods of the texts reported. The categories considered most important were taken into consideration to explain the macro-themes and the sub-themes identified. Using NVivo software the categories are represented by the nodes and the subcategories by the child nodes.

The sample is constituted by SMEs operating in the Italian wine industry. Authors contacted all the companies that are investing in technology and are adopting supply chain system based on blockchain, but only seven answered and were available for further investigations and interviews. In order to have the most complete explorative information, various individuals dealing with different organizational roles have been interviewed (Table 1). The companies have joined, as “pilot”, three different projects aimed at experimenting with blockchain technology, with the aim of tracking, tracing and certifying their supply chain. Three companies out of seven have been involved by DNV GL, one of the most important certification authorities in Europe in the agri-food. One company out of seven has joined the Ernst & Young project, in collaboration with the start-up technology developer, EZ lab. Three companies out of seven have been involved in the testing program strongly supported by the Italian Ministry of Agriculture and Forestry (MIPAAFT), in collaboration with the developer Almaviva, SIAN (National Agricultural Information System) and AGEA (Agricultural Supplies Agency).

**Table 1.** “Sample respondents” features (personal elaboration)

<b>Respondent</b>	<b>Position</b>	<b>Project</b>	<b>Project Owner</b>
Respondent 1	Co-owner	<i>MyStory</i>	DNV GL
Respondent 2	Biologist	<i>Wine Blockchain EY</i>	EY
Respondent 3	Export Manager	<i>Wine Blockchain EY</i>	EY
Respondent 4	Owner	<i>eNology</i>	MIPAAFT
Respondent 5	Quality Manager	<i>MyStory</i>	DNV GL
Respondent 6	Quality Manager	<i>MyStory</i>	DNV GL
Respondent 7	Owner	<i>eNology</i>	MIPAAFT
Respondent 8	Owner	<i>eNology</i>	MIPAAFT

## 5 Result of Analysis

From a more in-depth reading of the interviews, the authors identified 11 categories and 15 sub-categories. The coded nodes emerged from the most recurrent, sometimes implicit, issues discussed during the interviews. Although the detail-oriented analysis, the degree of abstraction of the conceptualization is quite high. Through the coding with NVivo, macro-themes have been distinguished from sub-themes as in Table 2. The

purpose of the aforementioned subdivision between nodes and sub-nodes is to clarify the multiple facets of each of the 12 themes that emerged. In the following sub-paragraphs, the authors proceeded to comment on each of them, once grouped by identifying the boundary objects between each of them.

**Table 2.** Groups of macro-themes and sub-themes (personal elaboration)

<b>Groups</b>	<b>Macro-themes</b>	<b>Sub-themes</b>
<u>Group 1</u>	1. Certification	<i>Quality and Sustainability; Role of the certification body; Role of the Blockchain</i>
	2. Transparency	<i>Company - consumer relationship</i>
	3. Traceability	<i>Tracing</i>
<u>Group 2</u>	4. Communication	<i>Reputation and Image</i>
	5. Strategy	
	6. Processes	<i>Supply chain management</i>
<u>Group 3</u>	7. Collaboration	<i>Complexity</i>
	8. Safety	<i>Trust; Inalterability of the data; Privacy; Regulation</i>
	9. Territorial Identity	
<u>Group 4</u>	10. Training	<i>Skills; Required roles</i>
	11. Dissemination	

### **5.1 Group 1: Certification, Transparency and Traceability**

All respondents consider essential the registration in the blockchain of only the information validated a priori by a certification body. According to their opinion, being *certified* by a third body protects the company from its own responsibility and protect the consumers. “[...] *there is a super partes entity that testify, guaranteeing that this data is true. I pay the certification body to attest that my work meets the requirements of the standard for which I do certify my work. [...] The certification body acts as my guarantor by promoting its brand.*” [Respondent 5].

This consideration call into question the usefulness of blockchain technology as a mean of autonomous and independent certification system of agri-food supply chain. It is not clear to the interviewees what differences occur between the operation needed for a traditional certification and the ones for the blockchain. In other words, the procedure for blockchain seems almost repetitive. “*All this, however, is already done by certification bodies that control me step by step in this process [...] So it makes no sense do it twice also because [...] with the blockchain no one is verifying the your data; you are the one who in good faith decides to load it into blockchain and then make it unchangeable.*” [Respondent 1].

With regard to the issue of *transparency*, two very interesting aspects emerge from the analysis: on one hand, the desire to be completely naked in front of the consumer and win him over; on the other hand, allow the consumer to understand easily the product he/she is buying. In the first case, the blockchain is seen as a tool that can be used to enhance the clean and honest image of the company. In the second case, the reflection shifts to the opportunity to offer consumers more information and a more interactive,

engaging and aware approach in evaluating the products he/she is purchasing. One of the respondents defined this as “consumer empowerment”. *“The topic is, as always, consumer empowerment. Does consumers freely choose the product? Are their choices dominated by brands, distribution channels or industries? The blockchain gives power to the consumer and we like it because consumers are able to acquire more information than other certification mechanisms. These latter are usually based on abbreviations, logos, but it is not clear what value bring to the consumers.”* [Respondent 3].

As regard *tracing*, certifying the supply chain also means offer the consumer the instruments to go back over the supply chain, up to the raw material. Equal importance is given to both the traceability and the product certification profiles. This because if there were a problem with the healthiness of the product, it would be crucial to trace it back to its origin. For example, with blockchain, it would be easier to identify the damaged batch number, avoiding a great waste of resources on the part of the company. *“[...] one knows where that bottle comes from, otherwise he would only know that it has been certified, namely that it satisfies the minimum requirements of the disciplinary.”* [Respondent 7].

## 5.2 Group 2: Communication, Strategy, and Processes

The inner motivations that drive managers to join the pilot experiments has been codified with the following categories: *“Communication”, “Strategy”, and “Processes”*.

As for the first node, the authors return to discuss the relationship between company and consumer, recalling the previous *“Transparency”* category again. The transparency principle represents the first boundary object between the first two groups of nodes. Due to the short period of involvement in the pilot project, companies do not really know the effects of the blockchain on consumer engagements. In fact, while the information about values, history and certifications transmitted is considered as a consumer guarantee, not all have a real usefulness. In any case, interviewees declare that they would like to use blockchain to improve their company’s reputation or visibility in the market, or to access in new markets. The visibility in the panorama of wine companies is guaranteed by a good reputation in the market, but also by knowing how to be at the forefront of competitors. In particular, a higher visibility is required in new and foreign markets, where consumers, unlike the Italian, conceive wine as luxury products and pay more. In this more demanding market, a more attentive approach to innovative technology might provide some advantages. *“[...]in my opinion it is first of all something that guarantees the consumer more than a normal condition and it can also be used from the marketing point of view ... so the origin of the vineyard, the production and all these things are data that for the consumer become a sort of warranty”* [Respondent 7]. From the point of view of supply chain management, it has been stressed by respondents that the control procedures have remained unchanged, without any need for reorganization. *“We already have the issue of supply chain control with or without blockchain. The agriculture sector is one of the most advanced and experimental one. We control all our batches of grapes, wine, and what ends up in every single bottle. These data are on paper. [...] 30 years ago we already mentioned this information.”*[Respondent 4].



### 5.3 Group 3: Collaboration, Safety, and Territorial identity

One of the results that pilot companies verified is to make people understand the importance of the documentation provided. Authors did not unveil internal resistance or hostility because what reported was a great team spirit and enthusiasm to the experimentation. The link between the second and third group of nodes is therefore the “*collaboration*” between the players operating in the supply chain. In fact, a better supply chain management depends on the maximum cooperation between the parties involved along the production chain. However, the extra-work required to retrieve precise information of a very long term process was unveiled as a factor of greatest hostility. “[...] *Perhaps it becomes more complicated for those who have more actors in the supply chain and therefore when farmers, producers, transformer, bottlers and the distribution have to coordinate [...]*” [Respondent 8].

As regard safety, especially on the non-modifiability of the data, the debate opens about the truthfulness of the recorded data and returns to discuss, once again, on the central role played by the certification body. When there is not certification body mediation (the self-certification case) the problem exists. “*The blockchain guarantees the immutability of information, but not its truthfulness. Truthfulness lies in the common sense of the people who upload and provide real data, because in this way they expose themselves.*” [Respondent 1].

Furthermore, the trust question remains not only in the good faith of those who are uploading data to blockchain, but also in the guarantee of reliability of a system that, according to the most experts, should protect against fakes and prevent the market for counterfeits. Not all respondents saw the absence of regulation and laws as a limit, probably because they believe that the aspects of traceability and everything that the consumer can actually read from the QR Code scan have a greater weight. “[...] *This thing goes beyond any type of regulatory system. [...] with the blockchain the end user is able to realize things that fails with any other certification.*” [Respondent 3].

A last significant child node concerns the disclosure of some more confidential data, hence the management of privacy. In this case, attention has no longer been paid to information that intrigues the consumer, but rather to what data the company can load avoiding plagiarism from other competitors.

As regard the territorial identity, this issue is the subject of strong debate between those who support the enhancement of Made in Italy and those who do not entirely agree. In favour of the territoriality exaltation, there is the product geolocation that is made visible through the inclusion of maps, satellite photographs and films showing the origin of the bottle of wine, that are visible through the code in the label. “[...] *Certainly it is a very direct system that shows the consumer the connected cultivation and this is a very important thing because from there we can even get the satellite photo. [...]. Comparing with what exists about the territorial identity and the Made in Italy, blockchain solution provide great results.*” [Respondent 8].

#### 5.4 Group 4: Training and Dissemination

The collaboration discussed in the previous sub-paragraph is also influenced by the “*Training*” of whom contribute to the development of the supply chain activities. In this case the boundary objects between the third and the fourth group are precisely the two micro-themes “*Skills*” and “*Required Figures*”. For this reason, the discussion shifts to the need for trained and experienced figures in the use of advanced technologies. Since both the organization and the supply chain managerial mechanism have not changed, the skills required by the pilot companies was the ability to find accurate and precise information. No technician has hired, mainly because external consultants have conducted the implementation of the solution. Although, many of the respondents felt the need for a better understanding of the technology functions, a greater ability to disseminate the benefits of the blockchain applications to consumers, and the desire to create awareness among other companies in the wine and agri-food industry.

*“It is one of those innovative and pioneering technologies. Let me explain: it is a technology that is completely known and used, but in the application of supply chain it is certainly pioneering. [...] So maybe in 10 years all the products of the world will come out in blockchain because it will be what the market will require.”* [Respondent 3].

Large-scale retailers or governmental institutions (as the Agriculture Ministry) will promote this new scenario.

#### 5.5 Comparison of wineries vs. developers

The same issues discussed with the pilot companies were addressed to the two developer companies (Table 3).

**Table 3.** “*Out-of-the sample respondents*” features (personal elaboration)

<b>Respondent</b>	<b>Position</b>	<b>Project Owner</b>
Respondent A	Business Developer	Ambrosus
Respondent B	Business Analyst	Food Chain

This in-depth analysis aims to allow technology experts to clarify some aspects neglected by the interviews of pilot companies. It was decided to compare the two perspectives only on the issues that have been defined as *boundary objects*, namely the link between the four groups of categories identified: “*Transparency*”, “*Management of the supply chain*”, “*Training*”. This because they represent the contact point between all the topics discussed and recalled during the course of the analysis. On one hand, companies see the main utility of blockchain in *transparency*, perceived like a guarantee for the consumer, for the company itself and for the territory. On the other hand, developers attribute to it a secondary utility compared with the management benefits. Companies, instead, attribute a secondary utility to the blockchain in the wine *supply chain management*. In fact, no changes in business processes have been unveiled and

no information on smart contract has been perceived. The same issue is hot for developers, who seen blockchain as a constant traceability guarantee, thanks to the use of a management platform with a friendly user interface.

*"[...] There is a conflict of interest between what the blockchain entails and what their activity is, because the blockchain [...] provides more visibility than those that are daily activities. For example, information about the logistics process or company can be provided, even if not everyone is obviously willing to give this kind of data to their customers. So if any operator (such as the one in logistic) tends to have a 1-2% errors not respecting the declared SLAs, cannot deal with the blockchain, because with the blockchain it becomes very difficult to manipulate this information."* [Respondent A].

Training is the only contact point between the two perspectives. In fact, both wineries and developers do not consider it necessary to enter any new IT-oriented figure because the technology is developed by third parties. Instead, more information on data security and privacy issues should be disclosed.

## 6 Discussion

Authors identify which positive factors and limits experts perceive during the experimentation of blockchain in the wine industry. The analysis results have given a negative answer to the research question and the two hypotheses formulated have been denied. It was found that there is a gap between what was presented in the scientific literature and the actual state of the art in the context examined. This has been further supported by the discordant points of view that emerged during the comparison between companies and developers. The company pilots, in fact, seem to have taken into account only the communication aspects, linked to marketing and transparency. Empowering the final consumer or providing more in depth information to enter in a new market is the main goal of the pilot companies.

Developers, while confirming the importance of the previous point of view, are more conscious that the real change is in the simplification and efficiency of business processes, that are the basis of the correct development of the supply chain and the actors that are part of it awareness.

The only contact point seems to be training, seen as the need for greater dissemination and consciousness of what the blockchain is and how it should be implemented. However, some considerations need to be spent in favour of pilot companies. The experimentation, in fact, lasted too long for such high expectations of implementation and development on the front of the supply chain management. Since the projects were started on a single type of wine, it was understood that today it is too early to observe concrete changes in all business processes and, consequently, also a tangible evolution in the supply chain functioning. Unfortunately, also from the consumer's point of view no result has found. Again, it cannot be excluded that it is a matter of time, which is necessary to launch blockchain certified products on the market and understand which is the real impact on consumers. As matter of fact, the pilot's answers to the questions on the topic were based on expectations, hopes and forecasts, to be verified once again

only in the long term. The most evident benefit was the commitment at the organisational and supply chain level, aimed at a careful search for the information to be recorded in blockchain. The possibility of tracing the supply chain in detail has also given space to those players such as winemakers, whose work seems to stop once the harvest is over.

The perception of greater transparency for consumer protection has also grown. The recording of information validated by a certification body in the first place, in addition, has infused more protection to companies, encouraged by the fact that they do not input data directly into the blockchain. A third body does it and usually is accredited and recognized at national and international level (DNV GL in the case of MyStory and Ernst & Young for Wine Blockchain EY). This is a brake on the functioning of the technology: since it is a private blockchain, the companies have not a full control of the published data, resulting in the disappearance of two of the main features of the technology, namely decentralization and disintermediation.

The exploratory analysis carried out has some research limits. Despite a group of sixteen companies participating in the three projects, only seven of them made themselves available for interviews. The small sample on which the qualitative analysis was carried out precludes the possibility of extending the results of the research beyond the boundaries of the sample itself. Finally, the main limitation was the lack of opportunity to listen also to the point of view of the companies that provided the technology in the wine sector, of the consulting firm EY and of the certification body DNV GL. Knowing the perspectives of the three organizations, for example, would allow to understand the reasons behind the implementation of a private blockchain solution and to better analyse the issue of data recording through appropriate platforms created ad hoc. Listening and including the point of view of all the actors involved, would have given the opportunity to take new research paths and to deepen further aspects of the subject matter. In fact, it should be remembered that the blockchain consists of an unlimited and potentially boundless aggregation of data, whose central node is what to do with it and whose greatest limits remain human imagination and genius.

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