Assessing the implications of Blockchain in the wine supply chain: evidence from three Italian companies

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Abstract: In wine supply chains some pilot Blockchain-based projects have been developed. They promise to enable better traceability, thus fronting counterfeiting and allowing consumers to verify the origin and the authenticity of every bottle. Despite expectations are high, the implications of Blockchain (BC) implementation are still underinvestigated. This study aims to provide a state-of-the-art discussion on the actual use of BC technology to face the counterfeiting problem in the wine supply chain. By comparing the BC solutions implemented by three Italian winemakers the paper demonstrates that actually wine companies are far from exploiting this technology to the maximum potential, because it is mainly used as a communication instrument. A further preliminary finding concerns the relationship between the wine price-quality positioning and the configuration of BC solutions, both at the technological and organizational level, to properly front counterfeiting.

Keywords: Blockchain, supply chain management, traceability, transparency, wine

1. INTRODUCTION AND PURPOSE

Wine is one of the most counterfeited food products. In recent years, several pilot projects have been launched to protect wine authenticity and quality through the use of Blockchain (BC). This technology builds transparency and trust between the producer and the final consumer, providing the latter with very detailed information about the whole life cycle of each bottle of wine. In addition, it promises to transform supply chain activities, allowing each actor to track goods and verify the performance of different supply chain processes in real-time (Kshetri, 2018). Despite these characteristics make BC particularly appropriate for facing counterfeiting in wine supply chains, literature about this subject is at an early stage. Decision makers have no reference to understand how the BC could be properly used to address counterfeiting in their specific companies, nor guidelines to decide how to configure BC solutions, both at the technological and organizational level. Using empirical insights from BC adoption in three Italian wine companies this study aims to address the following research question:

R.Q. - How can the BC technology be configured and used to face the counterfeiting problem in wine supply chains?

2. THEORETICAL BACKGROUND

With the advent of globalization, supply chains have become complex and vast ecosystem. This causes problems with information sharing and trust, due to limited visibility beyond company boundaries (Brody, 2017). Nowadays, BC is at the center of a mediatic hype because of its potential that can go beyond the purely financial and monetary application of its origins. In particular, among the different processes that are likely to be transformed by BC, the supply chain ones deserve special attention (Kshetri, 2018). The bunch of pilot projects launched by important enterprises, like IBM or Maersk, suggest big benefits (Hackius and Petersen, 2017). The technology promises to revolutionize the way in which supply chains are managed and so to rethink inter-organizational business processes. In fact, it seems that it will transform supply chain activities allowing trust among suppliers, better security and efficiency, improved transparency, cost and fraud reduction (Kshetri, 2018). BC makes it possible to execute transactions between actors in a trustworthy manner also in a network where there is no mutual trust. Today, in order to maintain trust, supply chain members resort to intermediaries (e.g., certification or inspection bodies) that allow agreeing upon a shared, truthful set of data, despite the related costs and inefficiencies. From the arguments above, it seems that BC could effectively be adopted to support traceability within wine supply chains and tackle the counterfeiting problem. Till today, most of winemakers leveraged on barcode, RFID and web-based solutions to guarantee authenticity, but all these technologies suffer from the possibility of counterfeiting stored information (Biswas, Muthukkumarasamy and Tan, 2017). BC could store information of the overall process in an immutable and visible way. It has the potential to be an effective solution to overcome counterfeiting problem and to

ensure transparency and authenticity in the wine supply chain.

3. METHOD

The lack of research on the use of BC to face the counterfeiting problem in the wine supply chain led to the selection of an exploratory approach. This study uses a multiple case study method aimed at theory building. Data were collected using face-to-face interviews with three Italian winemakers. These companies have been selected because they were pioneers in the adoption of BC technology in their industry. Furthermore, we chose companies that differ in terms of implemented BC solution.

4. BRIEF DESCRIPTION OF THE CASES

The three companies, to which we will refer with the names "Company A", "Company B" and "Company C", all adopted a public BC in order to make the information accessible to everyone inside and outside the organisation. Company A sells products of low-to-medium quality. BC is used to store data collected during each stage of the wine making process, mainly manually entering data gathered also with the support of automated tools, like drones and Internet of Things (IoT). In order to accurately describe the processes, a large amount of information is transferred to the BC by all the different supply chain actors involved. Company B and C, instead, sell wine for of medium-high quality (and price) level. Both companies they adopted BC solutions that record pre-existing certified information that has been provided by supply chain actors or derived from on-site inspections made by independent certification bodies. Information is firstly stored in the central control authority databases to guarantee compliance to Italian national wine norms (e.g., DOC, DOCG, etc) and then synchronized with public BC, in order to guarantee visibility to final consumers. To allow customers to access to such data and verify the wine origin and authenticity, company A and C apply a QR code to each bottle, while company B uses a near field communications (NFC) chip. Simply scanning the tags with their smartphone, customers have access to the historical background of the wine, including details on processes and grapes/wine ownership transfer throughout the supply chain (at the level of the lot related to each bottle), as well as additional information about the company, etc. Finally, according to the respondents, BC implementation didn't require significant changes to organizational processes within their supply chains.

5. DISCUSSION AND PRELIMINARY FINDINGS

From the preliminary data analysis, it emerges that none of the implemented solutions fully exploits the potential of BC. On the one hand, in company A the manual entry of some data into the BC raises problems associated with veracity, because BC could be updated with fraudulent data. On the other hand, company B and C do not suffer from data veracity issues since third-party certification bodies are responsible for data entry. But this aspect seems incoherent with one of the main advantages of BC which is the elimination of third parties. An effective use of BC requires each supply chain member to represent a node of the system and to be linked directly to the BC to update data. Moreover, due to the relatively low frequency of physical inspections, it is not possible to continuously monitor processes and feed the BC with real-time updates. Since all these BC solutions provide only general descriptions of the main events occurring along the supply chain, they don't significantly improve process visibility to the different supply chain actors. Supply chain transparency is only partially achieved. In general, for the three companies, the BC role appears to be limited to that of a communication tool directed to final customers. Differences in company business strategies and in wine strategic positioning seem to imply different levels of importance of the counterfeiting problem and, hence, different ways of implementing BC. In case of products of low-quality level and low price, the BC provides a lot of information to the consumer without any significant effort to ensure their authenticity. Instead, companies that sell higher quality products at premium prices use BC to provide customers with carefully selected information and ensure their veracity by means of certification bodies. Another point emerging from case comparison refers to the use of the QR code as smart label. Unlike NFC sensor, the content of which can be protected using encryption, QR code is easily replicable just scanning and then printing it. So, cheaper wines could be sold as expensive products simply applying a new label with the QR code of another more expensive bottle. The small price difference between the two solutions should justify the adoption of NFC for the companies concerned with the counterfeit problem. A strong integration with IoT devices could help in facing information veracity problem through an objective and more detailed data collection. In fact, gathered data would be directly linked with BC avoiding any human action that could opportunistically alter them. Furthermore, allowing a real-time data capture, IoT would improve SC transparency and hence the visibility that each actor has over supply chain processes. The combination of BC and IoT could also eliminate the need for middleman auditors, increasing efficiency and lowering costs.

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