

BLOCKCHAIN TECHNOLOGY FOR PRODUCT AUTHENTICATION AND SUSTAINABILITY

Extended Abstract

Abstract

Due to several issues the process of identifying counterfeit products is complex. The counterfeit and pirated items now constitutes to significant amount of global trade volume. In this article, we have advocated a novel and a smarter way to detect the counterfeit products using the IoT and blockchain technologies for product authentication and documenting sustainable products.

Keywords: authentication, product, internet-of-things (IoT), security, blockchain

1 Introduction

Due to factors such as lack of transparency, dearth of resources and of enforcement capabilities, the process of identifying counterfeit product items is complex. Thus the counterfeit and pirated items are now constitutes up to 3.3% of total global trade volume (Organisation for Economic Co-operation and Development, 2019). The range of product categories varies a lot and all most all the expensive product categories are susceptible of counterfeiting. Due to the affordable cost of international shipping, companies are increasingly selling their products at the global level, and at the same time, more and more consumers are willing to buy the products online and internationally due to competitive prices. However, the market for counterfeits products is also increasing, therefore there is an imminent need for the development of the product authentication methods, using which the product manufactures can protect their intellectual property rights (IPR) by fighting against the counterfeits copies of their products.

In recent years, there has been a growing interest in exploring Distributed Ledger Technologies (e.g. Blockchain) for decentralised applications in several industries. With the immutability and transparency properties (Faber et al., 2019) blockchain offers several interesting opportunities for the product traceability in supply chains and logistics domain. Inspired by the United Nations Sustainable Development Goals (United Nations, n.d.) many companies/consumers aspire to produce/consume the products that are sustainable and environmental friendly. In competition to others, it has become a challenge for the producers to document their products about their origin, identity and originality, that they are produced in accordance with certain standards e.g. ecological and fair trade practices, and that they can document the carbon foot print, etc. Again, new digital technologies such as blockchain support their efforts and create value for both their own business and as well as their consumers. In this paper, we investigate the use of blockchain technology for product authentication and also for documenting sustainable products. This leads to our research question: *how blockchain technology can create business value by supporting product manufactures to prove the authenticity and sustainable nature of their products?*

2 Research Approach

The research method that will be adopted for this project is Action Design Research (ADR) (Sein et al., 2011). We plan to build and develop prototypes to demonstrate the use of technology in the iterations of build, measure and learn by incorporating the feedback from different stakeholders such as manufactures and consumers. Initially, we target 12 of more than 100 companies that produce or resell Danish design products for testing these prototypes. Several workshops have been conducted with the candidate 12 companies, where each company will define and present one or more use cases for their produce either in terms of product authentication or documenting sustainable nature of their products. Subsequently, we select suitable use case for prototyping based on blockchain technology and to evaluate the expected value from using the blockchain technology.

Related Research: We conducted a literature review regarding blockchain technology within the senior basket of eight for IS research, within IS associated outlets including conference proceedings, a majority is regarding crypto currencies eg. BitCoin (Nakamoto, 2019) and a few other cases eg. within logistic (Jensen, Hedman, and

Henningsson, 2019) and health care (Zheng et al., 2019), however we could not find any research work related to product authentication to the best of our knowledge. As part of our research project (Industriens Fond, 2019), we want to explore the suitability of an IoT based blockchain platform mainly for: 1) product traceability 2) product authentication 3) documenting sustainable products and their carbon footprint and 4) recycling of products.

3 Proposed Solution and Expected Results

Blockchain is the decentralized distributed datastore that is combined with guarantees against tamper-resistance of transactions/records using cryptographic methods. By using time-stamping of its transactions and messages, blockchain provides universally verifiable proofs for existence/absence of a transaction in the distributed database and the underlying cryptographic primitives using hash functions and digital signatures provide guarantee that these proofs are computationally secure and verifiable at any point in time. Blockchain technology combined with embedded IoT device brings three primary advantages compared to the standard legacy systems. They are: *A*) Product Tracking (with embedded GPS); *B*) Immutable product history; *C*) Service History (product maintenance tracking). The distributed ledger capture events on the blockchain from a wide range of stakeholders such as material suppliers, product manufactures, distributors/retailers and consumers etc.

As shown in figure 1. we have modelled use case A which is checking the authenticity of a product. We can see in figure 1 that the user can scan the code of the product (chair in this case) and sends the information to the Blockchain network services. As a response, the user receives the digital certification of the product given the product is authentic, if not then will the get proper message. Blockchain-powered product authentication can be achieved by fitting IoT device (such as the Near-field communication (NFC) tracking technology-based device) inside the furniture. The blockchain-based authentication system can have an undeniable authenticity trail. Blockchain guarantee that it is not fake and also it provides immutable product history.

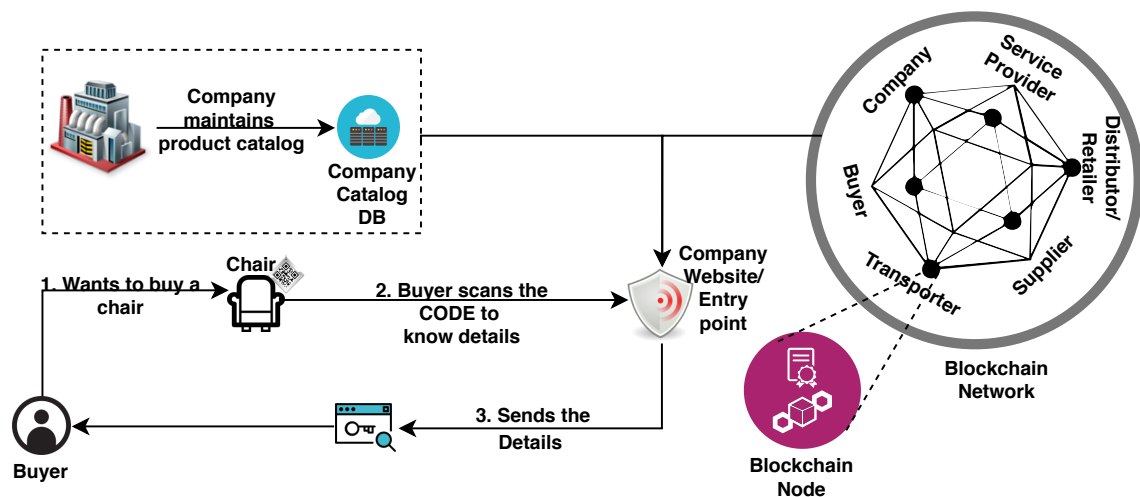


Figure 1. Product authentication workflow using the Blockchain ecosystem

The companies participated in the workshops represent a variety of products from textile to jewellery to furniture and many more. We found that the sustainable product manufactures are competing with less honest competitors eg. that sell counterfeit products or that cheat with fake documentation e.g. without being an ecological produce. The top use cases prioritized by the companies based on expected business value are: *A*) provide customers option to validate the originality and origin of the individual product *B*) provide documentation eg. certificates for material and processes related to the produce *C*) carbon foot print for a product. For testing these use cases, we are developing prototypes with an embedded IoT device in the products and a solution based on blockchain technology. The potential business value will be derived from prototyping the blockchain solution for the above mentioned use cases using ADR methodology.

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