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IMPLEMENTATION OF BLOCKCHAIN FOR INCREASING TRACEABILITY AT VEHGRO SUPPLY CHAIN

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ABSTRACT

Blockchain is a new technology where the presence is emerging around many business sectors. Although the origin of blockchain was to facilitate business in financial sectors, the technology has developed to suit other sectors besides financial so that it can help the organization to be more effective and efficient. The technology which acts as a distributed ledger enables transparency in the usage. In the middle of current situation where consumer is deman ding more and more from an organization to provide information, even worst by some cases of food contamination, this new technology that originally creates for financial sectors has evolved to help business in the food sector and others. If implemented properly to the supply chain management of a business, it can be beneficial in many ways. This thesis aims to see the effectiveness and efficiency of the implementation of blockchain in VehGro company. The author used literature review as a research method which analysed scientific journals, reports, and research.

Keywords: Blockchain, Supply Chain, Supply Chain Management, Traceability

BACKGROUND

In order to minimize food safety threats, it is important to monitor the movement of food products and to control the cause of hazards which can be achieved by providing a good traceability system within the supply chain. Traceability is critical in guaranteeing the safety of food products and reducing the concern among consumer since it enables the parties involved to know the information streams about the food products and make it possible to trace the root of issues quickly if there is a problem, such as hazardous substance. Hence, traceability is becoming an increasingly urgent requirement and a fundamental as a competitive point in many supply chain industries including the agri-food sector (Costa et al., 2013)

VehGro is located in Hengelo, Netherlands. The company was established in 2012 named after the combination of the beginning of its two founders' surnames André Vehof and Michel Groothuis. VehGro business covers import, export and distribution of high-quality natural food supplements, food and care products; this company seems to have problems in the traceability of its product and information flow within the supply chain. The company has been stuck in an era where technology is exposing things, and customer are demanding more and more information related to the product they consume. The consumer is demanding most information to achieve possible safety threats which might occur.

In order to comply with demands regarding food safety issues, companies are driven to implement sophisticated information systems and technologies that focus on improving tracking and tracing capability within the supply chain such as RFID and wireless sensor network-based architectures (Tian, 2017). However, Current supply chains rely heavily on centralized, sometimes disparate and stand-alone information management systems that has its own pitfall within organizations (Abeyratne &

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Monfared, 2016). Along by that there is a very important issue that has not been discovered which is whether the information shared in a food supply chain by the members in the traceability systems can be fully trusted and further complicate managing this traceability in the supply chain. Strategic and reputational competitive issues arise from these risks and lack of transparency leads to the need for a new solution (Saberi, Kouhizadeh, Sarkis, & Shen, 2019). Blockchains is a technology that provides transactional, distributed ledger functionality that operates by decentralize peer, without any third parties in a direct relationship, and an immutable record. (Galvez, Mejuto, & Simal-Gandara, 2018).

Blockchain provides transactions within a supply chain that establish trust, accountability, and transparency. These applications are managed by a so-called smart contract. A smart contract is a software programme that contains rules and policies for negotiating terms and actions between parties. It automatically verifies that contractual terms have been met and executes transactions (Delmolino, Arnett, Kosba, Miller, & Shi, 2016).

Overall, this thesis will investigate how blockchain and smart contract can bring added value for VehGro supply chain especially between the importer and VehGro regarding the coffee beans traceability due to the product safety to make sure the authenticity and no asymmetric information. Therefore, we will analyze the implementation of blockchain specifically to the relation of importer and VehGro.

THEORITICAL FRAMEWORK AND HYPOTHESIS DEVELOPMENT

Demand for information related to the product along the supply chain is predicted to increase more significantly than present time and going to have a higher requirement for well traceability system while the supply chain of a business involves many stakeholders and complicated processes within the activities (Aung & Chang, 2014).

Blockchain is a system that supports business operation, which is having an ideal decentralized composition for distributing digital content within parties in a certain network. Information flow of each digital content is added to the blockchain by the mining technology, the system works on itself in creating blocks with the information provided and because of the highly encrypted technology making it impossible to infiltrated and immutable (Kishigami, Fujimura, Watanabe, Nakadaira, & Akutsu, 2015).

Traceability is defined as the capacity to delineate and follow the life of a prerequisite, in both a forward and reverse way; i.e., from its beginnings, through its advancement and detail, to its consequent organization and use, and through times of continuous refinement and emphasis in any of these stages (Aizenbud-Reshef, Nolan, Rubin, & Shaham-Gafni, 2006).

Having an effective traceability system enables corrective actions to be implemented quickly and effectively when things are not going as it is supposed to. When a potential food safety issue is identified by any organization, an effective traceability system ensure corrective action by isolating and preventing contaminated products from reaching consumers (Tanner, 2016).

Companies that operate in a supply chain generate process which integrates data from previous stakeholders and to the next stakeholders concerning all information of the product. There is a lot of stakeholders involved in a certain supply chain network. Therefore integration between these stakeholders come up to a supply chain management, which the process of managing things such as information, paperwork, and payment related in order to get the product or service from its original state until delivered to the customer. (Korpela, Hallikas, & Dahlberg, 2017).

A well-structured supply chain is one of the value-added use by an organization to have a competitive advantage among competitors in the business. A strategic supply chain

is a supply chain where all stakeholders within the network fully integrated at all aspect such as strategy, operation and technology. (Fawcett, Magnan, & McCarter, 2008).

Relationship between Blockchain and Traceability

Traceability has evolved into an important aspect that an organization should have to feed consumer demands and survive against other competitors. The concept of blockchain technology as a decentralized public ledger provides business to fulfil all stakeholders and the consumer demand of traceable product (Biswas, Muthukkumarasamy, & Tan, 2017).

In an example where consumer continuously demands to know the information of the product that they consume, blockchain overcomes this problem by the technology that enables records to be seen for the consumer by scanning barcode in the product then the information related such as the details of product, materials, production and essentials of it are available to the consumer (Aung & Chang, 2014).

In another project done by Walmart incorporation with IBM to monitor production, blockchain is able to identify then trace the sources of a defective product to its root and do a strategic removal of a certain product instead of doing a mass recall to the entire product line which affects to a cost-saving. (De Jesus, 2016).

Relationship Blockchain, Traceability and Supply Chain Management

The supply chain management process of managing activities happening in a supply chain that involves many stakeholders is a process that companies wanted to be excellent at. But under the current situation where traditional supply chain involves centralized organization to keep all the information, thus giving the chance of a great possession of power resulting to the misconduct of practice or other bad behaviour that lead to a traceability system within the supply chain. With many stakeholders involved in the supply chain and a great number of activities happening, traceability then becomes an essential part of how an organization deal with its governance especially in the supply chain management of production process. Consumer or even stakeholders that involve directly in the supply chain when having a doubt of the authenticity or originality of the product or anything related to information of the product are able to trace back all relevant information to be sure of from the current supply chain (Tian, 2017).

Increasing Traceability Through the Implementation of Blockchain

The implementation of blockchain in a supply chain network has come up to a positive impact in terms of dealing with effective and efficient supply chain management and also traceability (Casado-Vara, Prieto, De la Prieta, & Corchado, 2018). As the idea of traceability is an ability to trace back information to the beginning, customers are seeking for real time information about the products and making it as a consideration of buying the product (Aung & Chang, 2014). Refer to that, a company that would like to remain in the competitive market and makes profit from the business needs to pay attention to this thing and to make it happen the company must provide better traceability system.

RESEARCH METHODOLOGY

The methodology to answer the research questions is by generating an expert meeting with VehGro and do a substantial literature review on how Blockchain technology can bring added value for the traceability of organic coffee beans in a specific relation between Importer and VehGro. Furthermore, due to the fact that the research will analyses how blockchain will bring added value to VehGro in solving traceability problem, an expert meeting with the company or representative of VehGro and the importer to analyses current system used to operate specifically between this two stakeholders and asking about their opinion for the implementation of blockchain in the supply chain.

In order to ensure that the studies stay on the right path, the search terms focus on "blockchain in the supply chain", "blockchain for traceability" and "blockchain in the food sector", anywhere in the title or abstract. The restrictions for the language were set to English. Studies were acceptable for concern to this review if: (a) the focus of the study was blockchain implementation in a food supply chain; and (b) blockchain implementation for traceability system.

The source of materials that are used in this study obtains mostly from articles from journals published online, from sciencedirect.com and researchgate.net.

In order to retrieve the relevant articles, the following keywords and abbreviation have been used in various combinations:

- Blockchain
- Supply chain
- Traceability
- Agri-food
- IoT
- RFID
- Sensor network
- Smart contract

RESULTS AND DISCUSSION

Policy

This research is conducted based on VehGro that had issues in adapting to the current competitive situation and a very demanding request from customer. This section will contain the suggestions of the author, which could solve the issues that VehGro may face in accordance with the preferences of VehGro. These suggestions could also be used for other organizations in the same or different sector that would like to implement blockchain in the supply chain management but is considering few things. Suggestions that are provided are based on the current development in technology and the current situation in implementing blockchain for VehGro while the author writes this research.

The implementation of *The Proposed Blockchain-based Supply Chain Model* discussed earlier is believed to be suitable for VehGro supply chain especially between importer and VehGro but might have several important aspects that should be considered and addressed properly to achieve successful implementation. The advantages that may benefit VehGro when implementing blockchain to the supply chain especially the importer to VehGro are transparency, traceability and trust. By implementing *The Proposed Blockchain-based Supply Chain Model*, VehGro supply chain will be highly visible to everyone involved which enables all stakeholders the ability to gather information and trace it all back to the root to ensure authenticity and even answering some issues that regarding food safety. This later could build trust between stakeholders where VehGro could see all the product that the importer has and the authenticity and vice versa. Disadvantages of the implementation are high cost, integration and adaptation.

The author believes that *The Proposed Blockchain-based Supply Chain Model* is applicable to VehGro supply chain due to the outstanding number of benefits that could be of added value for the traceability of organic coffee beans between the importer and VehGro since the technology act as a distributed public ledger where information is available for all stakeholders and traceable to the root. The smart contract in the blockchain technology also enables a safer transaction or agreement between the stakeholders especially from the importer to VehGro. While still need to consider that this will be a long-complicated process and making this happened will cause a lot of work and lot of time as of course, it will be more effective and efficient if all stakeholders implement the

technology. The author also believes that if all are integrated properly and committed, it will address VehGro issues and able to bring benefit to be superior among the competitors.

Limitation

The author would also like to mention some limitation regarding this research. The original idea of blockchain was to facilitate a finance organization making it complex for company in the non-financial industry in implementing it to the supply chain management since it also may vary according to the industry necessity. It is important for VehGro to have a good measurement and idea regarding the market and demands of customer to address problems in the best way.

CONCLUSION

The current development in technology has resulted on increasing demand of traceability to business actors such as raw material suppliers, manufacturers and wholesalers regarding the product. Some components which previously were insignificant becomes something that is urged to be present in order to ensure the company staying competitive in the current situation so that it can earn more customer and profit from the business.

Traceability in the company perspective plays an important role in providing traceback of product that benefits company to a lower cost distribution system and might reduce recall expanses. Supply chain is a complex network where company interact to each other to produce and distribute product to end customer. There are a lot of possibilities where problems might occur in the supply chain, especially when dealing with a huge number of activities and companies involved.

It is clear to see that blockchain beneficially affect the operation of company in terms of traceability and having a good supply chain management that could save cost and expenses while also increasing company confidence to stay competitive in current development. Although blockchain is categorized as fancy technology which means it tends to be costly, still it is a technology that needs to be a considered to implement in the company since the benefits exceed the high price especially if a company decide to stay competitive with other competitors.

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