

Role of Smart Contracts in Halal Supply Chain Management

14

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INTRODUCTION

The technologies and its advancement have brought many solutions to various complex aspects of our life. Blockchain technology is a new revolution in the era of technology that called the Fourth Industrial Revolution (Tieman and Darun 2017). The basic idea behind this technology is that, its “an open, distributed ledger that stores transactions between two parties on distributed servers located in different places around the world and this make it more secure and trustable (Iansiti and Lakhani 2017, Tapscott and Tapscott 2017). The blockchain system has the ability to improve traceability and the transparency of the supply chain operations (Tieman et al., 2019). Hence, Blockchain technology had provided solutions and had enormous values in streamlining agreements, transactions and industry workflows inside and among the organizations. For instance, varied number of industries such as energy sector, robotics systems industries, finance, medical, insurance and supply chain can potentially apply this technology and provide solutions to overcome challenges and being greater benefits to all these sectors (Burger, Kuhlmann et al. 2016, Engerati 2017) (Gatteschi, Lamberti et al. 2018).

In the energy sector, Blockchain technologies has confirmed its great potentials to enhance the existing processes and practices in this field. Blockchain technologies can offer a great benefits to this industry in various ways such as: reduce costs, enhance energy security and foster sustainability (Andoni, Robu et al. 2019). Similarly, Blockchain technologies shows its potentials and promises in the robotic systems industries. (Ferrer 2018, Lopes and Alexandre 2018, Afanasyev, Kolotov et al. 2019, Lopes, Alexandre et al. 2019) emphasized the benefits and outcomes of the integration of Blockchain and robotic systems

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whereby it will offer an essential capabilities to enable the operation of robotic swam systems, rise the efficiency between agents.

Other field and sectors such as business sector, Blockchain technologies has offered numerous types of applications to facilitate the operations and business processes. (Andoni, Robu et al. 2019) summarized those applications as a use cases by Blockchain technologies in the business field. Billing, Sales and marketing, Trading and market, Automations, Smart grid applications, and Grid Management are among the potential applications in the field of business offered by Blockchain technologies (Grewal-Carr V 2016, Arsenjev, Baskakov et al. 2019)

On the other hand, with the invention of smart contracts within the Blockchain technology, the overall Supply Chain Management (SCM) will become more efficient as well as the transaction and traceability will be better in the supply chain process (Catallini 2017, Law 2017). To elaborate this, Blockchain offers capabilities such as tamper data saved in Blockchain, providing a single source of the truth, and smart contracts that automatically execute agreement terms. In combination, these capabilities promote the supply chain traceability, trust and veracity that are vital to the industry's future competitiveness (Casey and Vigna 2018) .

Likewise, Tieman and Darun (2017) argued that Halal Supply Chains Management (HSCM) are susceptible and due that becomes more difficult to design, manage and optimize. As a result, a combination of Blockchain technology and smart contracts that help in transparency is needed to ensure trust, reputation and originality of Halal supply chains products. Thus, this study aims to provide a comprehensive review on the role, benefits, and promises of utilizing the smart contracts in the domains of SCM, and HSCM.

Moreover, to the best of our awareness, till date, there has been no review study specifically focused on the implementation impact of the smart contract on the SCM and HSCM. Hence, this chapter will add new value to the intended researchers and practitioners by providing a clear view and critical discussion on smart contracts in term of its roles and benefits to the HSCM.

This paper is organized into the two main sections: Section 2 (Background) elaborates the smart contracts with SCM along with providing a detailed discussion on the roles, benefits, and promises of utilizing the smart contracts in SCM domain. Section 3 discusses further the application of smart contracts in HSCM with presenting its roles, benefits, and promises. Section 4 concludes this study.

BACKGROUND

Benefits and Promises of Smart Contracts with Supply Chains Management

Smart contracts are not a word to do with artificial intelligence but it's a term used to define an automated computer program that is capable of facilitating, executing and enforcing an agreement without interference of third party. The idea back to the mid-90s when scholar Nik Szabo has introduced this term explaining its uses and potentials (Botsman 2017). Hence, since the required technological infrastructure was not existed, Nik Szabo innovation was not recognized. But and due to the advent of Blockchain and crypto protocols, many things are changing and smart contracts starts its revolution.

In our global society, traditional contracts require a middle man for enforcement such as bank, lawyer, ebay and etc. On the other hand, smart contracts are segments of code that build upon Blockchain technology to verify or enforce the performance of contracts. Moreover, smart contracts have many advantages over traditional contracts. Simple computer programs to replace enforcers, easy to understand, immutable, transparent, accurate, verification, visibility, lower costs, self-execution, clarity of

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