

A Comparative Study on the Opportunities and Challenges of Blockchain Implementation in Logistics and Supply Chain Operations in Sri Lanka

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Abstract - The world is evolving and moving forward with Industrial 4.0 and its implications such as Blockchain Technology. However, its application in Sri Lanka is still in an infant stage. The study aims to compare the Blockchain implementation in logistics and supply chain operations and find out the similarities and contradictions in the opportunities and challenges, most importantly the opinions, suggestions, estimations from the relevant industry professionals. In-depth interviews were conducted with seven industry professionals from logistics and supply chain operations using the simple random sampling method. Discourse Analysis was used to find out the similarities, contradictions and special points which were pinpointed by the industry professionals. The study suggests the opportunities for new business models, creating leading solutions for end customers, generating solutions that are hard to imitate by a third party, decreased cost through the interconnected system, ability to increase quality and traceability and reduction of documentations and administration in an organization. As challenges the study highlights the capital requirement in implementation, negativities of standardization, losing the direct value creation of the end customer and losing the organization's flexibility. In conclusion, the study highlights that there are many challenges in comparison with the opportunities in implementing Blockchain Technology to the logistics and supply chain operations in Sri Lanka.

Keywords: *Blockchain Technology, Logistics, Supply Chain Management*

I. INTRODUCTION

In recent advancements and research, technology update is heavily dependent on automation based on the internet; in Sri Lanka, however, industrial automation in the logistics and supply chain operations lags well behind that of developed Asian nations. Industry revolution 4.0 offers a practical and focused strategy to address these demanding objectives (Arnold et al., 2016; Kiel et al., 2017). Logistics and Supply Chain Management (SCM) are rapidly changing and developing with new technological advancements. In the new business world, the most recent trend is Supply Chain 4.0. Growing attention is being paid to the implications of Blockchain Technology and services of Blockchain Technology into industrial value creation in

the context of logistics and supply chain operations in Sri Lanka.

The phrase "Industry 4.0" is becoming a more essential topic in this new industrial period setting (Barreto et al., 2017). One of the key effects of this new industrial revolution is Blockchain Technology. Blockchain Technology is a network of connected computer systems that contains multiple copies of a digital log of transactions. Blockchain Technology is a uniquely groundbreaking and promising technology because it offers expandable visibility for a range of applications while lowering risk and eradicating fraud (Awwad et al., 2018). Although Blockchain Technology is not well understood, it is a hot topic in the media right now and is growing quickly as a medium. There are very few academic articles on Blockchain Technology, which should undergo recurrent updates. Blockchain Technology has become a potentially revolutionary, all-purpose tool for businesses looking to boost trust in their interactions with one another (Yli-Huumo et al., 2016).

In Sri Lanka, Blockchain Technology is not extensively used, there is a knowledge gap, and only a small number of business professionals are keen to offer their insights on the technology to the general public, according to an analysis of the articles. On one side, it guarantees to offer logistics and supply chain operations successful business models, higher enhanced productivity, quality, and working environment. Similarly, logistics and supply chain operations display reluctance to implement Blockchain Technology due to the lack of clarity on challenges and opportunities.

According to Kiel et al (2017) a differentiated study of the various firm sizes, industrial sectors, or manufacturers' roles as providers or users of Industry 4.0 solutions is particularly lacking in the current conversation. Therefore, this study addresses this contemporary concern and build a platform for professionals in logistics and supply chain operations to connect to a world where they can learn more about or enhance their understanding of Blockchain Technology, its opportunities and challenges. Accordingly, the main objective of the study was to identify the similarities and contradictions on opportunities and challenges in implementing Blockchain Technology to logistics and supply chain operations in Sri Lanka.

II. METHODOLOGY

This research was focused on interpretivism philosophy, and a qualitative study is conducted by the researchers. As for the research approach, the study has used an inductive approach whereas the research strategy is the interview method. The research choice was the mono method, and the time horizon is cross-sectional. Seven industry professionals in top level and middle level management were used in the sample out of which three are female professionals. Data collection was conducted through e-mailed questionnaires and interviews via Zoom which last between 90 and 120 minutes. Data analysis was conducted using Discourse Analysis as expressions, opinions, views and thoughts of speakers and the use of language can be correctly analyzed (Mogashoa, 2014; Hodges et al., 2008). Secondary data was collected from journal articles, magazines, newspapers, and reports.

The seven interviewees were given identification numbers as General Manager - IT Department (ID 01), Supply Chain Director (ID 03), Head of Logistics and Customer Service (ID 03), Head of Planning (ID 04), Head of Procurement (ID 05), Head of Department – Academic (ID 06) and Manager - Project Management Office (ID 07).

The overall idea of each interview was summarized into statements to compare and identify the similarities and contradictions of opinions among the interviewees. The comparison was conducted separately for opportunities; strategy and operations and challenges; competitiveness and future feasibility and organizational and production fit. The findings were illustrated through a tabular analysis for convenience in interpretation.

III. RESULTS AND DISCUSSION

According to the literature, industry 4.0 provides significant strategic advantages for business structures. These involve the creation of new business models as well as modifications to established corporate structures. Businesses can leverage these services to offer highly personalized solutions (Müller et al., 2018). These new business models that are driven by data, technology, and digital logic will accelerate the removal of the boundary between the production of goods and the supplies of services following responses will give evidences.

“Yes, with Blockchain Technology being implemented to our organization, the company was able to create a new business model and adopt to a product which will help our company to provide the required information to our customer’s customer fingertips. In your words, which will also lead the company to solve whatever the problem the customer may have. As we are the first to implement this product to our company, our competitors will have a hard time adjusting to it” (ID 01).

“Blockchain may enable new business models to ease up the process. However, gathering this data and market insight is easy, absorbing the analyzed information into the system is challenging. Difficult to make quick shifts Blockchain ledgers create an end-to-end transparent picture” (ID 04).

“Another fact is that all the data and information has been end-to-end encrypted. Which will ensure that information will not be accessed by outside people” (ID 01).

Industry 4.0 has a significant impact on business models since this new manufacturing paradigm necessitates new supply chain communication channels (Pereira & Romero, 2017). According to ID 01 and ID 04, the companies have been able to create new business models and to solve end customer problems just by implementing Blockchain Technology. However, Sri Lankan companies have had issues while trying to integrate individual data into the Blockchain system. The deployment of new manufacturing technologies and production processes associated with Industry 4.0 is influenced favorably by their operational potential (Müller et al., 2018).

“Yes, for a fact, somewhat documentation has been reduced after adopting or as for your study implementation of Blockchain . And, I must add we are still in the implementation process with that we cannot identify any cost reduction” (ID 07).

“By adopting to any technological advancements will provide any organization with cost reduction, however, with adopting or implementing Blockchain Technology to any organization long term cost reductions can be seen, it will be hard to trace any short-term cost reductions” (ID 06).

The cost-benefit analysis of implementing Blockchain and understanding the short-term and long-term benefit is somewhat questionable as per the interviewees.

For instance, new competitors offering connected and smart product solutions or even whole new business models, such platforms, could quickly emerge and impact the current market position of established enterprises. Similarly, increasing competitive dynamics and facilitated market entry of new competitors rank among the most important issues in the industry 4.0 era (Müller et al., 2018).

“Customers expect trustworthy companies, through client interaction, businesses may build greater customer trust and raise the value of their products. However, with Blockchain Technology been implemented the value creation for the end customer may have decrease from a certain amount, from the customer perspective. Because a resource person won’t be able to meet with the end customer as every transaction has been digitalized with the help of Blockchain Technology. With that the connection between the vendor and the end customer may lose its connectivity at some point” (ID 05).

“It is not always about creating value with your customers the companies should be able to give more to their customers and environment within this globalized world. That is what a growing company should focus on” (ID 04).

“End-to-end Blockchain integration for Sri Lanka is a farfetched reality given the costs of implementation. However, developments may come forth in the upcoming years maybe in 2030 due to the technological skewness with Sri Lanka government. Interest of authorities support companies to bring in tech to the market. With the lack of interest and low standards of the government sometimes, the companies feel like not implementing Blockchain Technology” (ID 07).

It is revealed that some of these technological developments may occur in 2030, and with the support of the government, businesses would use Blockchain Technology. However, businesses show little interest in applying these technical breakthroughs if the government is not supporting them.

“Blockchain may enable new business models to ease up the process. However, gathering this data and market insight is easy, absorbing the analyzed information into the system is challenging. Difficult to make quick shifts Blockchain ledgers create an end-to-end transparent picture” (ID 04).

“Recently, our organization adopted Blockchain Technology, and the problem was supplying the system with raw data. Since each demand is recorded separately, it has been difficult to compute the market demand from the data and feed it into the system; nevertheless, the Research and Development Department is now working to develop a solution” (ID 02).

Accordingly, feeding raw data to the system of Blockchain is a challenging task as the individual demand should be converted into market demand in order to feed the system. Table 1 analyzes the similarities and contradictions on opportunities in Blockchain Technology.

1: Similarities and Contradictions on Opportunities in Blockchain Technology

Interviewees' Opinions	Similarities	Contradictions
Blockchain Technology creates new business models	Blockchain technology helps firms to develop new business models, according to IDs 01 and 4.	According to ID 01, giving information at their end users' fingers was simple. ID 04, however, said that their company was experiencing trouble getting individual data into the system.
Blockchain Technology creates leading solutions for customers	ID 01 and ID 04 agreed with Blockchain Technology creating solutions for customer problems.	ID 03 somewhat agrees with the opinions gave by ID 01 and ID 04; however, it was ID 04 opinion that Blockchain Technology's main purpose is to ease up the business activities.
Blockchain Technology generate solutions that are hard to imitate	Blockchain technology, according to ID 01, an IT sector professional, is difficult to replicate. ID 02 shared this opinion.	None
Blockchain Technology allows organizations to decreased costs through interconnection	When it comes to reducing costs, IDs 02 and 06 concurred long-term cost reductions, as opposed to short-term ones, can be seen, according to ID-06, nevertheless.	Since ID 07 is currently being implemented, no cost savings have yet been noticed. Additionally, ID-06 said that while it may be difficult to track short-term cost reductions, long-term cost reductions will undoubtedly occur.
Blockchain Technology allows organization to increased quality and traceability	End-to-end encryption, according to IDs 01, 02, and 03, has been used in the shipping and terminal industries as well as the fast-moving consumer goods (FMCG) sector to secure and track customer data.	None
Blockchain Technology decreased documentation and administration in an organization	According to ID 07, there has been a slight reduction in documentation.	According to ID 05, the amount of reduction of documents required varies depending on the industry. As for ID 05 's company reduction of documents is a hard process.
Blockchain Technology allows increased speed and reactive capabilities	IDs 02 and 03 claimed that the company was able to accelerate the manufacturing and distribution process thanks to the implementation of Blockchain Technology in IDs 02 and 03, respectively.	None

Source: Survey Data (2022)

Table 2 Table 1 analyzes the similarities and contradictions on challenges in Blockchain Technology.

Table 2: Similarities and Contradictions on Challenges in Blockchain Technology

Interviewees' Opinions	Similarities	Contradictions
Blockchain Technology makes organizations replaceable due to standardization	ID 01 and ID 06 claims that Blockchain Technology have replaced the traditional processes due to standardization.	None
Blockchain Technology makes organizations lose value creation of direct customer contact	ID 05 and ID 03 have stated that by implementing Blockchain Technology organizations have lose value creation of direct customers.	ID 04 claims that companies should focus on competing with the global market and giving more to the society, rather than focusing on creating values and emotions.
Blockchain Technology makes organizations lose organization's flexibility, requiring costly solutions	ID 02 and ID 07 have shared the same opinion about losing the organization's flexibility and requiring costly solutions for customers who are not familiar with the concept of Blockchain Technology.	ID 06 have stated that with implementing new solutions the company will have to take different paths.
Blockchain Technology lacks investments	ID 01 and ID 04 have shared the same opinion when it comes to investment to implement Blockchain Technology.	None
For the organization implementing Blockchain Technology is not reasonable	ID 07 and ID 06 both estimates that with government interest it would be easy for companies to trust the process of implementing Blockchain technology or any other technology advancements.	None
Customer demands are too individualized to implement Blockchain Technology	ID 04 and ID 02 both agreed with the opinion on individualized data, as both the companies having a hard time computing the individual demand into market demand.	None
Organizations have too little standardization to implement Blockchain Technology	Both ID 07 and ID 06 asserted that because there is not enough standards for the implementation of Blockchain, businesses will be hesitant to do so.	None
For the organizations the costs exceed the benefits of Blockchain Technology	ID 01 claims that the cost may vary from industry to industry and for ID 01 it is all about their customers' customers satisfaction.	None

Source: Survey Data (2022)

V. CONCLUSION

According to the comparison of the results in Table 1 and Table 2, it is shown that there are less contradictions to the opinions discussed on challenges than the contradictions on opportunities. Through Blockchain based innovations that cut out the middleman, transactions will go more quickly and securely prior to the invention of cryptography. Since Blockchain Technology is still in its infant stage in Sri Lanka, the researchers determine that after seven interviews, what potential role of Blockchain Technology innovation and development the output might have on logistics and supply chain operations. As per the overall idea, it interprets that Blockchain Technology implementation in logistics and supply chain operations has its fair share of both opportunities and challenges. However, as per the present situation in Sri Lanka, the study highlights that implementation will face many challenges opposed to the opinion on its opportunities. Researchers assume this research offers helpful insights for policymakers and decision makers when obtaining initial data on a developing topic like Blockchain Technology.

Overall, researchers think this research might cater as a helpful tool for many practitioners who work in innovations and for stakeholders in different companies to examine potential future circumstances in a more rigorous and rational manner. On the one hand, business management may utilize these predictions as a springboard for implementing Blockchain Technology into its operations

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