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Research Article

An Analysis of Block Chain Technology Influence on Supply Chain Management: A Review

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Abstract

Manufacturing organizations want to amplify fiscal gains not only by trading goods and services but also by adopting the new tools, techniques and technologies to advance the manner of business models.

There are few distinct focused methods discussed in this proposal. First deals with the enabling factors that are required to implement successful block chain application within conventional supply chain management. But, there is a scarcity of literature on how these enablers were taken to enhance competencies of the Supply Chain (SC) and eventually affect a particular supply chains reliability and performance. The second deal with an extension of literature review to identify potential driving factors and challenges to implement block chain within supply chains. The third deal with responsible to develop and empirically test a conceptual Block Chain Technologies (BCT) adoption model for attaining competencies in supply chain.

The proposed research work will address the gaps including potential driving factors, barriers and conceptual framework in existing research by understanding the BT selection measure in supply chains. A survey on Indian manufacturing firm's practicing supply chain management will be conducted considering different variables further data will be analysed using IBM-AMOS & IBM–SPSS for structural equation modelling and descriptive analysis respectively.

It is expected that the proposed block chain driven supply chain adoption model should improve a supply chain's competence in the new dynamic business environment. The implication of this research may help small and medium scale Indian manufacturing firms for improving their services to the customers with a good business model.

Keywords: *Supply Chain (SC), Block Chain Technology (BT), Supply Chain Competencies, Barriers*

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Introduction

Industries need to enhance economically increases by exchanging products and service as well as by receiving the forward-thinking apparatuses **[Büyüközkan G. et al., 2018]**, procedures and innovations to advance the manner of business prototypes. Presently, the competitions are between the organizations as well as are by all accounts between supply chains to convey right data to enterprises, to convey their arranging exercises **[Goldsby, T. J. et al., 2016]**. Such data dividing between all partners of any inventory network is a lot of wanted to construct certain choices according to advertise variety **[Casey M. J. et al., 2017]**. Data is dubious from client to other upstream individuals from the supply chain because of expansion at each stage **[Li, Z. et al., 2017]**. Sharing the incomplete information may bring about the issue of misrepresentation between real interest created by client and inventory carrying by manufacturer to avoid lost sales, i.e. bullwhip effect **[Nakasumi M. 2017]**. This overstated data about the interest of merchandise as well as administrations required by client from different partners of inventory network goes to unsettling influence of the setting up the asset use and outcomes in reducing productivity and viability of the entire supply chain **[Kshetri N. (2018), Tsanos C. S. et al., 2016]**. Recent data driven technologies related to manufacturing planning and execution such as big data driven supply chain management (SCM) **[Xu, L. et al., 2017]**, industrial internet of things **[Banerjee M. et al., 2018]**, additive manufacturing, and Block Chain Technologies (BT) have changed the way of business **[Biswas K. et al., 2017]**. These issues identified with data transparencies might be settled by embracing block chain technology **[Casino F. et al., 2019].**

Block Chain can be reported as a Constant and unchanging (Immutable) ledger that records all information as information entrances in a dispersed fashion **[Collomb A. et al., 2016, Angelis J et al.,2019]**. It facilitates all articles with others exclusive of the existence of a centralized committed third party **[Aste T et al., 2017]**. The block chain (BC) holds an endlessly increasing bunch of information admissions, compacted collectively into data blocks which on approval to the BC connected to the prior and upcoming blocks with cryptographic protocols **[Bocek T. et al., 2017].**

Literature Review

During the most recent few decades, the exponential rise of data and communication advances has created various upheavals in each and every commercial design, principally in the supply chain management (SCM) discipline. By virtue of these unsettling influences, Logistics and Supply Chain Management (LSCM) have been evaluating various sets up while introducing extensive endeavors with overhaul their plans of action. Along these lines, the multifaceted nature of relationship among partners of supply chain generously influence by such novel factor. This associates for illustration to faith between the individuals of supply chain, straight forwardness, and responsibility throughout the system, coordinated effort, information sharing, and demand and supply chain incorporation amid supply chain partners. Nevertheless, forefront technologies are rising, with a prominent possibility to advance the supply chain operations frameworks and to interrupt ineffective existing frameworks.

2.1 Problem Worth Solving

Supply chain should take on block chain for their logistics and financial functions because almost all dealings with block chain are securer, added crystal clear, noticeable and proficient **[Shanley A. 2017]**. In summation, the collaboration among supply chain associates inclines to enhance, thinking over on prices drop and enhanced effectiveness in supply chain **[Apte S. et al., 2016]**. Moreover, the block chain implementation can increase clients' faith and permit them to verify the whole expedition of supplies all around the supply chain in full assurance **[Stolze H. J. et al., 2015]**. In this view, the traceability systems of the block chain will

maintain goods fraud avoidance and forged practices all over the value chains **[Toyoda K. et al., 2017]**.

Nicky Morris (2018) recommended Block Chain as one of the apparent applications is supply chain. He proposed that manufactures such as carmakers could form syndicates. It adds up for producers to figure a Block Chain motivated supply chain the approach they need it, instead of container parties aiming demands. Chris Ballinger, The Founder and CEO of MOBI, said "block chain and related trust enhancing technologies are poised to redefine the automotive industry and how consumers purchase, insure and use vehicles. The block chain innovation can rely on its debasement verification highlight to recreate association standards among all accomplices of the inventory network **[Glover D. G. et al., 2017]**. As block chain employed to LSCM is yet at its early life phase, nearly all of the formations are even to go further than analyses extending to the adoption stage. Therefore, as pointed by the writing on technology acceptance models, several writers have devoted noteworthy attempts to aid realize how someone act when it pertains accepting to adopt a technology **[Mackey T. K. et al., 2017]**. The unified theory of acceptance and use of technology (UTAUT), whose extension is UTAUT2, is an appropriate way to achieve agreement of the block chain taking up in the domain of supply chain **[Mansfield-Devine S. 2017]**.

2.2 Opportunity

Looking at the supply chain environment, there is a well-defined significance with linked conventional factors like "trust between the participants, cooperation, knowledge, information exchange, etc **[Zou J. et al., 2018]**. The latest researches have been inquiring the effect of block chain in supply chain and logistics management. Spotlight has been on essential factors like as cost, quality, risk reduction, and flexibility, goods traceability, and opposing-forgeries. Nearly every establishments desire to acquire benefit of the huge pact of betterments gave rise by block chain, which extent improved procedure and functioning all the way through the whole supply chain, securer, crystal clear and proficient dealings, and trust and dependability throughout the supplier network, all deals and associated data being public by all supply chain members [**Michelman, P. 2017].**

Block Chain technology was brought in by Nakamoto (2008) to avoid mediate players like as financial organizations by permitting direct peer-to-peer dealings **[Nakamoto S. et al., 2008]**. To attain this ambition, Nakamoto recommended a peer-to-peer distributed ledger. In this way, spender and receiver can interchange instantly over the electronic network, employing encryption and consensus mechanisms **[Guo Y. et al., 2016, Tsai W et al., 2016]** to build deals tamper proof since any change to the historic information documentation is noticeable by active block chain network nodes **[Lee B. et al., 2017, Lee J. H. et al., 2017, Tapscott D. et al., 2017].**

Accepted as one of the major problematic advances, the block chain (a peer-to-peer distributed data infrastructure) modifies the conception of decentralized currencies (e.g. Bitcoin), self-accomplishing digital contracts (smart contracts) more, canny resources that can be instructed over the net (smart property) **[Kosba A. et al., 2016, Wright A. et al., 2015]**. Firstly doveloped by Nakamoto (2008), present day research on the block chain has focused for the most part on monetary dealings and distributed ledger systems **[Nakamoto S. et al., 2008, Pilkington M. 2017].**

Square chain innovation utilizes a public information base that changes itself in simultaneous and can measure and accommodate dealings in moments utilizing PC algorithmic standard, without any interest for outsider check. Inside the monetary sector, the block chain is aimed as an agency for the administration of fiscal communication exclusive of the call for confided mediators such as banks **[Veuger, J. 2018**]. Nevertheless, the block chain as a technology has prospective to interrupt many other fields of formations, like as the supply chain. As a block chain grants safer exchange of information in a disseminated approach, it begins to affect

upon the way organizations are controlled, supply chain relationships are prearranged and dealings are carried on integrated with other technologies, like the Internet-of-Things (IoT), the block chain could be accustomed to create a enduring, shareable, unjust record of every instant of a product's journey throughout its supply chain, making efficiencies across the universal economy. Enhanced visibleness helped through such technology may also yield product tractable, genuineness and authenticity **[Viriyasitavat W. et al., 2018]**.

Though a lot of guess about the affect of block chain technology over supply chains existing agreement of its possibility remain restricted. As the development and dispersion of this innovation is as yet in its outset, a organized review of recent believing is potential to support both academicians and industrialist' sense making, where they turn out to be mindful of this technical advancement, sense its probable disrupting consequence, make an preliminary investigation of its effectiveness and determine whether to either adopt or dismiss it [**Wagner S. M. et al., 2005, Wang J. et al., 2017]**.

A systematical literature survey about potential benefits of block chain Technology in supply chain management as shown in table 1 will take apart the hype from realness by discovering facts where the block chain has prospective to disrupt supply chains (both optimistically and pessimistically), recognize confronts to its upcoming transmission and propose schedules for further research opportunity.

Table 1. : Potential benefits of Block Chain Technology

Classes	**Potential Benefits**
Informational	Data integrity and Higher Data Quality **[Tapscott D. et al., 2016]**
	Reducing Human Errors [**Tapscott D. et al., 2016**, **Cai Y. et al., 2016]**
	Access to Information **[Palfreyman, J. 2015, Swan M. 2015]**
	Privacy [**Swan M. 2015**, **Zyskind G. et al, 2015**]
	Reliability [**Tapscott D. et al., 2016**, **Swan M. 2015**]
Technological	Resilience [**Tapscott D. et al., 2016**, **Swan M. 2015**]
	Security [**Tapscott D. et al., 2016**, **Swan M. 2015**, **Gervais, A., et al., 2016**]
	Persistency and Irreversibility **[Underwood S. 2016, Ølnes, S. 2016]**
	Reduced Energy Consumption **[Ølnes, S. 2016, Atzori, M. 2015]**
	Energy Management **[Burger C et al., 2016, Lavrijssen S. et al., 2017]**
	Supply Chain Management **[Lansiti M. et al., 2017, Korpela K. et al., 2017, Tian F. 2017]**
	Healthcare Management **[Hoy M. B. 2017]**
Economical	Reduced Costs [**Tapscott D. et al., 2016**, **Cai Y. et al., 2016**, , **Atzori, M. 2015**]
	Increased Resilience to Spam [**Gervais, A., et al., 2016**]
Stralegical	Transparency **[Underwood S. 2016, Atzori, M. 2015]**
	Avoiding Fraud and Manipulation [**Palfreyman, J. 2015**]
	Reducing Corruption **[Kshetri, N. 2017]**
Organizational	Increased Trust **[Palfreyman, J. 2015, Zyskind G. et al, 2015, Mainelli M. et al., 2015]**
	Transparency **[Tapscott D. et al., 2016, Palfreyman, J. 2015]**
	Auditability **[Atzori, M. 2015]**
	Increase Predictive Capability **[Zyskind G. et al, 2015, Kraft, D. 2016]**
	Increased Control **[Mainelli M. et al., 2015]**
	Clear Ownerships **[Yermack, D. 2017]**

Block stream and the side chain projects that follow will grow the block chain into a global platform that can be applied for something involving signatures or verification. It will interrupt whole industries **[Webb, A., 2015]**. These findings provide an alarm to practitioners, especially the network adaptor, of the want to look after network affairs between associates taking part and to build up a common importance amid all associates **[Wang Y. et al., 2019]**. Blockchains, the distributed ledger technology reinforcement 'crypto currencies such as Bitcoin', symbolize a novel and modern scientific advance to actualizing decentralized trustless systems [**Russon, G. 2018**].

Results and Discussion

To the best of our know-how, this research is one of the initial efforts to examine the authority of block chain technology on the competencies of supply chains of Indian manufacturing organizations. Furthermore, it comprises other fundamentals of uniqueness. First, it offers an Interpretive structural modeling framework to identify the relationships among elements of block chain adoption in supply chain functioning by concurrently employing diverse operational performance attributes.

In another way, offered literature considers only explicit performance indicators. Subsequent, it brings out the existence of novel performance measures associated to the strategic aspect of the business firm which are yet absent in the accessible block chain research work. In particular, the empirical examination foregrounds the existence of a strategic aspect connected to the adoption of block chain technology which influences optimistically supply chain's vertical interactions and organization's in-house resources and competences.

A survey of the research works on block chain technology discloses that almost all of the related articles are paying attention on demonstrating the prospective gains and disputes of adopting block chain technology. There has been slight spotlight on examining the acknowledgment of BT pragmatic applications in various fields. The current investigation will be one of the primer examinations to look at the reception and impact of block chain innovation on supply chains competences.

Conclusion

Research studies on the applications of block chain in the domain of supply chain are now well-known as a verified theoretical arena, and the quantity and worth of publications are escalating speedily from last few years. This development is too evident in the universal Supply chain management field. Because of the dominating significance of asserting trust while satisfying a growing requirement for exchange of data in between the customers, manufacturers and other supply chain stakeholders. This new data veracity and persistency are in critical demand for new and improved trust-preserving solutions.

The pioneers of this field, as portrayed in this review, presented block chain-based solutions & their applications in a various domains of supply chain. There is extensive research is being conducted in the remaining domains. There is a need to study the concrete areas in depth to find the solutions on issues related to block chain-based problems, to preserve trust and eliminate threats arises from within and outside in manufacturing units.

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