

Chapter 66

Security Issues of Blockchain–Based Information System to Manage Supply Chain in a Global Crisis

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ABSTRACT

Global supply chain crisis management has become increasingly crucial for tackling unusual incidents (e.g., natural disaster, terrorism, pandemic). While crisis management has focused on a few organizations involved in supply chain operations (manufacturers, governments, carriers, and the consuming public), it has primarily received a functional focus. Due to their decentralized network structure, supply chains are prone to suffer from disruptive events solved by supply chain crisis management. This chapter presents the blockchain technologies' possibilities and limits used in an integrated IoT-based information system architecture. The chapter describes how the scalability limits of blockchain technology affect the proposed architecture performance that uses it. Also, the chapter presents a review of the academic literature, pointing out how some solutions use a centralization process to improve response time and security of the blockchain-based architecture. Finally, the chapter provides security threat models, which consider by blockchain protocols in IoT networks.

INTRODUCTION

In recent decades, many academics and practitioners have conducted empirical and conceptual research studies on various business crisis (Lagadec, 1990) (Lagadec, 1993) (Shrivastava, 1993). However, as with many new research areas, these studies lack adequate integration (Shrivastava, 1993). The interdisciplinary nature of organizational crisis has explicitly resulted in this lack of integration (Shrivastava, 1993). Mainly, organizational crisis inherently are phenomena for which psychological, social-political, and

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technological-structural issues act as motivational sources in their creation and management (Pauchant & Douville, 1994). Because the study of organizational crisis involves many disciplines, researchers believe that crisis must be researched and studied using a systems approach (Pauchant & Mitroff, 1992). Also, academics and practitioners believe that psychological, socio-political, and technological issues should be explicitly considered and used when studying and managing organizational crisis.

Some researchers, in their studies, wholeheartedly pursue a multidisciplinary research approach (Shrivastava, Mitroff, Miller & Miglani, 1988). However, some other researcher uses causal reasoning, and management techniques to understand organizational crisis (Shrivastava, 1993). This chapter assumes that this lack of integration has kept research on organizational crisis at the management theory periphery. To take a required step toward a multidisciplinary approach to the study of organizational crisis (Lagadec, 1993) (Shrivastava, 1993), the chapter illustrates an alternative view on organizational crisis by handling the situation with a scenario planning activity. This scenario planning is not a prediction about what will happen, but it represents hypotheses about what could happen and the effect on the manufacturing (e.g., apparel, automobile) business world.

This chapter serves as a beginning point to help businesses and policymakers think through the potential implications for manufacturing industry operations management and success in the marketplace. The disruption had always existed in the manufacturing supply chain network operations even before the term supply chain management (SCM) became part of today's business (Pal, 2017). Disruptions have changed their abilities and types over centuries from supply chain disruptions due to ecosystem changes, business model transformation, and security attacks in emerging information and communication technologies (ICT).

Global manufacturing supply networks' fragility is increasing due to disruption risks that directly or indirectly endanger the industry's stability and security. As an example, the spread of coronavirus globally has affected the movement of people and materials worldwide. The resulting manufacturing business network disruptions have led to delivery delays and shortages of products and essential items. Simultaneously, demands for objects utilized for pandemic control have increased dramatically, and the forecasting of demand patterns for many consumer goods has become more challenging (Taghipour, 2020) (Radhour et al., 2018) (Cliché et al., 2020).

In addition, the apparel manufacturing industry inclines to worldwide business operations due to the economic advantage of the globalisation of product design and development. In this way, a typical apparel manufacturing network consists of organisations' sequence, facilities, functions, and activities to produce and develop an ultimate product or related services. This activity starts with raw materials purchase from selective suppliers and products produced at one or more production facilities (Pal, 2019). Next, these products are moved to intermediate collection points (e.g., warehouse, distribution centres) to store temporarily to move to the next stage of the manufacturing network and finally deliver the products to intermediate storages or retailers or customers (Pal, 2017).

The connecting path from supplier to the customer can include several intermediaries, such as warehouse, wholesalers, and retailers, depending on the ultimate products and markets. Global apparel manufacturing networks are becoming increasingly complicated due to a growing need for inter-organizational and intra-organizational connectedness, which enabled by advances in modern technologies and tightly coupled business processes. The essential strategic asset in apparel business operational information has been a critical strategic asset. Also, apparel business networks use information systems to monitor manufacturing network activities (Pal, 2020).

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