Chapter 10
Blockchain Technology for the Internet of Things Applications in Apparel Supply Chain Management

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ABSTRACT

Adoption of the internet of things (IoT) and blockchain technology opens new opportunities of business process automation in apparel supply chain management. The IoT technology helps to capture real-time information from different aspects of garment manufacturing activities by using radio frequency identification (RFID) tags and sensors. Blockchain technology is an emerging concept of computing that enable the decentralized and immutable storage of business transactions. In combination with IoT, blockchain technology can enable a broad range of application scenarios to enhance business value and trust. This chapter presents some of the blockchain-based IoT technology applications in apparel business processes. Moreover, the chapter provides a classification of threat models, which are considered by blockchain protocols in IoT networks. Finally, the chapter provides a taxonomy and a side-by-side comparison of the state-of-the-art methods towards secure and privacy-preserving blockchain technologies concerning the blockchain model, specific security goals, performance, and limitations.

INTRODUCTION

Apparel (i.e. textile and clothing) industry is an integral part of the world economy and society (Pal & Ul-Haque, 2020) (Pal, 2020). In recent decades, global apparel manufacturing businesses are inclined to worldwide activities due to the economic advantage of the globalization of product design and development (Pal, 2020a). In a typical textile and clothing supply chain is the sequence of organizations – their facilities, functions, and activities – that involved in producing and developing a product or service. The sequence begins with raw materials purchase from selective suppliers and products are made at one or more manufacturing plants (Pal, 2019). Then these products are moved to intermediate collection points (e.g., warehouse, distribution centers) to store temporarily to move to next stage of supply chain and ultimately deliver the products to intermediate-users or retailers or customers (Pal, 2017) (Pal, 2019). The path from supplier to the customer can include several intermediaries – such as wholesalers, warehouse, and retailers, depending on the products and markets. Also, global apparel supply chains becoming increasingly heterogeneous and complicated due to a growing need for inter-organizational and intra-organizational connectedness, which is enabled by advances in modern technologies and tightly coupled business processes. Hence, information has been an important strategic asset in apparel business operational management. The apparel business networks are also using the information systems to monitor the supply chain activities ((Pal & Ul-Haque, 2020).

As a result, many global textile and clothing businesses are investing in new information and communication technology (ICT) to harness the smooth information sharing ability in supply chain operations (Pal & Ul-Haque, 2020). With the recent progress in Radio Frequency Identification (RFID) technology, low-cost wireless sensor hardwires, and world wide web technologies, the Internet of Things (IoT) advance has attracted attention in connecting global apparel business activities and sharing operational business information. These technologies promise to reshape the modus operandi of modern supply chains through enhanced data collection as well as information sharing and analysis between collaborating supply chain stakeholders. In this way, IoT technology supports the capability to connect and integrate both digital and physical business world. The process is quite simple: (i) collect data from real-world objects, (ii) communicate and aggregate those data into information, and (iii) present clear results to systems or users so that decisions can be made or object behaviour adapted.

Different research groups analysed IoT technology deployment-related issues in SCM and logistics (Atzori et al., 2018) (Gubbi et al., 2013). Particularly, a group of researchers reviewed the energy management in smart factories and concluded that IoT powered manufacturing can improve supply chain competitiveness through

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