Impact of Sustainability on Supply Chain: Contributions and New Performance Measurements in the Disruptive Technology Era

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EXECUTIVE SUMMARY

Industry 4.0 technologies, also called disruptive, have become a part of the new world. When disruptive technologies are investigated in terms of supply chain, they have many effects on supply chain performance. Sustainability is one of the positive contributions of these technologies to supply chain performance. When measuring supply chain performance, it is necessary to keep up with the times and therefore constantly update the performance measurements. Previous studies did not address the sustainability dimension of supply chain performance measurements comprehensively. In this chapter, the authors examine supply chain sustainability performance measurements based on the existing literature and taking into account the contributions of DTs to determine them. The authors briefly explain disruptive technologies and examine the contributions of these technologies to supply chain sustainability performance separately. The main aim of the study is to guide companies and their supply chains to enhance their supply chain sustainability performance by using disruptive technologies.

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INTRODUCTION

The evolution of technology has shown rapid development in the last 20 years. Nowadays, new technology is discovered almost every day. The main purposes of these technologies are to identify customer needs, evaluate profitability, and provide rapid solutions to process improvement (Bower & Christensen, 1995). Therefore, technologies utilized in the supply chain (SC) play a crucial role in developing operational competence and augmenting supply chain performance (SCP) (Bharadwaj et al., 2007).

Industry 4.0 (4IR), also called the Fourth Industrial Revolution, has brought with it the digital transformation of industrialization or physical manufacturing and cyber technologies by disruptive technologies (DTs), which are also called new technologies or 4IR technologies. They have significant advantages over other technologies used in SCs. Further, these technologies are called "disruptive" because they dramatically change the way consumers, industries, and businesses operate (Bower & Christensen, 1995). They destroy the systems or habits they replace because of their recognizable superior characteristics. In this respect, contrary to their name, they make significant contributions to companies and SCs in a constructive sense (Walsh et al., 2002). The implementation of them is expected to result in significant performance improvement in SCs (Fatorachian & Kazemi, 2021).

The concept of sustainability encompasses many issues, including survival and well-being. The continuity of sustainability is also crucial. Future generations should be supported as well as the current generation for continuity. Sustainability is the creation of the necessary situations for humans and nature to exist in productive conformity and the continuation of these conditions (United States Environmental Protection Agency, 2022). In other words, it is an intelligent balance between economic development, environmental management, and social equity. To establish this balance, sustainability is considered in three dimensions: Environmental, social, and economic (Panwar et al., 2006).

Environmental sustainability relates to the companies carrying out their activities with the least possible negative environmental impact (Blewitt, 2014). Social sustainability is the dimension of sustainability that requires companies to provide equal opportunities to their employees, promote social cohesion in society, and act considering their employees and society (Rogers et al., 2007). It includes people in the society, called the outer communities, and workers called the inner communities (Gimenez et al., 2012). Economic sustainability is meant to realize traditional economic goals by acting in accordance with the above-mentioned social and environmental sustainability (Carter & Rogers, 2008). Economic sustainability ensures the efficient utilization of existing resources and the long-term sustainability of profitability (Elliott, 2012).

Before addressing the affair of sustainability in SCs, supply chain management (SCM) only deals with operational and economic issues. Factors such as high-volume production, pollution, solid or waste emissions, and similar serious environmental problems in SCs (Vonderembse et al., 1997, p. 2584), environmental issues arising from SCs, acid rain, and global warming have caused environmental concerns in SCs (Moffatt, 2004; Sarkis, 2006). The significance of the concept of sustainability has been better understood with the shift of consumers towards environmentally friendly products (Nelson et al., 2012), the shift of production activities from systems focusing on economic goals to systems that also consider environmental goals, and the understanding of the significance of realizing social and environmental goals (Nahm & Vonderembse, 2002). In this way, sustainability in SCs has also been understood. The company and the SCs of which it is a member should carry out their activities by addressing social, economic, and environmental issues, and SCM should be carried out in this direction (Carter & Easton, 2011).