

Chapter 6

The Shift Towards Operations Management 4.0: Future Trends and Insights

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ABSTRACT

It is acknowledged that the rapid advancement in technological developments has driven digital transformation in organizations. Thus, the conventional value chain management and control approaches are shifting towards smart, data-driven management and control systems through the digitalization of product/service life cycle. This study contributes to the body of knowledge with a comprehensive literature review of Industry 4.0 technologies, and its implications on operations management research. Moreover, due to the multidisciplinary nature of Industry 4.0, it was imperative to reveal, discern, and discover the interconnected research themes with operations management to identify future research trends. The synthesis of existing literature illustrates that digitalization, end-to-end value chains, real-time monitoring and control systems, smart management systems and intelligent decision-making, collaborative and sustainable ecosystems, dynamic capabilities, and intelligent organizations are all future research trends of Operations Management 4.0.

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1. INTRODUCTION

The 4th industrial revolution is considered the biggest structural change humankind has witnessed over the past 250 years. Industry 4.0 has largely transformed the way we live, consume, work, invest, trade, and how we relate to one another. This new paradigm combines the physical, digital, and virtual world into what is called Cyber-Physical Systems (CPS). Thus, has disruptive innovation effects in every industry. Nowadays, smart and connected technologies can be embedded within machines, devices, resources, people, and products. Thus, end-to-end value chains will become not only interconnected and entirely integrated, but also can communicate, analyse, and use data in real-time to drive intelligent actions autonomously back in the physical world. Industry 4.0 is marked by the emergence of smart technologies such as the Internet of Things/Services (IoT/IoS), Wearables, Digital Twin, Augmented Reality (AR), Artificial Intelligence (AI), Robotics, Big Data Analytics, 3D Printing (Henrik von Scheel, 2019). Yet, till now Industry 4.0 is still considered in its beginning stages (Awan, Sroufe & Shahbaz, 2021).

The integration of advanced operations and production techniques with smart technologies has created a digitalized enterprise with intelligent, real-time, decision-making capabilities across operational and strategic levels (Choi *et al.*, 2022). Industry 4.0 proven benefits in the literature, have motivated researchers to further understand data-driven ecosystems, intelligent human-machine interactions, business models innovation, sustainable value chains, and smart production/services. Accordingly, new hybrid concepts such as Smart Factory, Smart Products and Services, Maintenance 4.0, Logistics 4.0, Quality 4.0, Operator 4.0, and Sustainability 4.0 among others have emerged as new research topics (Cimini *et al.*, 2020; Leng *et al.*, 2021; Shi *et al.*, 2020; Rifqi *et al.*, 2021).

Moreover, the COVID-19 crisis has accelerated businesses' adjustments to the next normal. Organisations are rethinking the viability of its supply chain networks to increase its capabilities to deal with disruption risks, to sustain itself and survive in a rapidly changing environment. The next era is characterised by the fusion of physical, virtual and digital world. In this sense, firms are shifting their focus from only operations efficiency, into creating value through collaborative data-driven business models, smart end-to-end operations, and sustainable value chain management. As a result, the role of Industry 4.0 smart technologies has been reinforced to transform value

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