

# **Understanding the Barriers and Enablers of the Adoption of Supply chain 4.0 in Large Firms**

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## **Abstract**

### **Purpose**

With the rise of Industry 4.0 (I4.0) technologies, supply chains (SC) have evolved significantly to become digital SC or the so-called Supply chain 4.0 (SC4.0). However, despite the priority on I4.0 as a prominent growth driver of sustainable economic development for many countries, the implementation of SC4.0 is limited. There is a distinct lack of in-depth research studies that identify the conditional factors determining the investment of large organisations in pursuit of SC4.0. Additionally, despite the consistently increasing number of general articles published on digital SC, no accepted consensus exists on any conceptual framework that can measure SC4.0 concept. A wide range of studies have also not fully addressed the complexity of SC's interorganisational relationships in the adoption of SC4.0. It was also highlighted that a severe lack of theories that investigate SC4.0 in a more holistic way exist. Integrating the Technology – Organisation – Environment (TOE) framework and the Inter-Organisational Relationship (IOR) model into a widely-applicable theoretical basis for SC4.0 research, this paper aims to identify the enablers and barriers of SC4.0 adoption in large organisations.

### **Research design/methodology/approach**

A systematic literature review (SLR) approach was conducted, adopting Tranfield, Denyer and Smart's (2003) three main stages: (1) Planning the review, (2) Conducting the review, and (3) Reporting. The review was carried out from two perspectives: (1) the adoption of I4.0 in general context which explores general factors influencing I4.0 adoption into a country; and (2) I4.0 adoption specifically in the field of supply chain management. Science Direct, Business Source Complete, SCOPUS, Emerald, Taylor and Francis, Google Scholar and organisations' official websites of

large consultancy firms such as Deloitte and PwC were used as sources of academic literature. Following the three stages and applying inclusion and exclusion criteria, in total 153 articles were shortlisted for this study. These papers were then coded and have been categorised into several themes and sub-themes to identify enablers and barriers to SC4.0 adoption.

## **Findings**

Several barriers and enablers from the sample of 153 articles were identified and highlighted. These barriers and enablers were classified into four themes and 13 sub-themes: Technology factors (perceived benefits, perceived costs, perceived risks), Organisation factors (top management, organisational culture, organisational structure, organisational resources and departmental collaboration); Environment factors (government's support, market uncertainty and pressure); and Inter-organisational factors (trust, trading partners' power and information sharing) that constitute the SC4.0 implementation framework.

## **Research limitations**

Factors for small and medium enterprises (SMEs) were considered out of the scope for this work, as the focus of this work was primarily for larger organizations. Additionally, this SLR was conducted in 2021; therefore only papers that were published from 2011 to 2021 were selected. Furthermore, as papers that heavily focus on technical views were excluded; technical challenges to SC4.0 have not been identified or included within this work. Papers that did not provide access to the full-text were also excluded.

## **Implications**

The framework as proposed within this work provides an initial foundation and knowledge base for large businesses and governments to more effectively make long-term strategic decisions regarding SC4.0 adoption and implementation. This new conceptual model also acts as a novel consideration and basis to explain the SC4.0 adoption as well as identifying barriers and enablers to facilitate the implementation of SC4.0, fostering Sustainable, Human-Centric and Resilient Manufacturing

## **Originality/value**

This is the first study exploring the enablers and barriers of SC4.0 implementation of large organisations using theoretical models. A novel and holistic approach for the adoption of SC4.0 within large organisations was proposed and documented to fill the gaps in literature. The research enhances the understanding of SC4.0 adoption constructs and dimensions that provides a foundation for future SC4.0 research.

**Keywords:** Supply chain 4.0, Industry 4.0, Enablers, Barriers, Large organisations

**Paper type:** Research paper

## **Biographies**

**Giang Nguyen** is currently doing PhD in Supply Chain Management and working as an Associate Lecturer at Bristol Business School, University of the West of England (UWE), Bristol, UK. She obtained a Bachelor of Business Administration at Ritsumeikan Asia Pacific University (APU), Japan and an MSc in International Management at UWE, Bristol. Her research interests mainly concern the application of Industry 4.0 technologies in Supply chain management in developing countries' context.

**Vikas Kumar** is a Director of Research and Professor of Operation and Supply Chain Management at Bristol Business School, University of the West of England, UK. He holds a PhD in Management Studies from the University of Exeter, UK and a Bachelor of Technology degree in Engineering from Ranchi University, India. Prof Kumar is a fellow of the IOEM society and has led several national/international projects generating a research income of more than £1 million. Prof Kumar has published more than 250 papers in several high ranked peer-reviewed journals and co-authored eight books and 100+ international conference papers. His research interests are mainly in the domain of sustainable supply chain management, circular economy, supply chain 4.0 and operational Excellence.

**Anabela Soares** is currently a Senior Lecturer in Strategy & Operations Management at Bristol Business School, University of the West of England. Her professional background includes management roles in the service industry, consultancy (manufacturing and services sector), and teaching in various UK institutions. She has been an educator in Higher Education Institutions in the UK since 2009 and is a Fellow of the Higher Education Academy (HEA Fellow) and a Certified Management & Business Educator (CMBE). She has published in international journals and conferences, and she is also a reviewer for various journals such as Production Planning & Control, International Journal of Production & Research, and Supply Chain Management: An International Journal, amongst others.

**Linh Duong** is a Senior Lecturer in Operations Management at Bristol Business School, University of the West of England, UK. His current research interests focus on sustainable and resilient supply chain management with the link to digital transformation, innovation, and collaboration among supply chain partners. He focuses on vulnerable contexts such as the agri-food industry, tourism industry, or small and medium enterprises (SMEs).