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# Guest editorial: learning from the Covid-19 pandemic: planning, controlling and driving change for greater resilience in supply chains.

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## Guest Editorial

### *Learning from the Covid-19 Pandemic: Planning, controlling and driving change for greater resilience in supply chains*

#### Introduction

The Covid-19 pandemic has challenged the fundamental principles of supply chain management as we research, teach and experience it unfolding. Its impact has been widespread and damaging to all aspects of our lives and the global economy. We have chosen to learn more from our experiences (both positive and negative) during this time, hence the focus of this Special Issue, *Learning from the Covid-19 Pandemic: Planning, controlling and driving change for greater resilience in supply chains*.

For decades, supply chain scholars and practitioners have diligently explored options for supply chain design and delivery to advance our knowledge of manufacturing and service supply chain management (Gremyr and Halldorsson, 2021): Outsourcing (Tsay *et al.*, 2018), offshoring, reshoring and right-shoring (Hilletoft *et al.*, 2019), going global (Olivares Tenorio *et al.* 2021), staying local (Loiseau *et al.*, 2020), just in time (Fraser, 2020) and just in case (Yoon *et al.*, 2018). As a community, we are also very familiar with our pursuits to fully understand supply chain resilience, responsiveness, agility and vulnerability (e.g., Yaroson *et al.*, 2021; Scholten *et al.* 2019; Hendry *et al.*, 2019; Mehralian *et al.*, 2015; Day, 2014; Christopher and Peck, 2004). However, the pandemic has forced us to re-evaluate this. Resilience post Covid-19 is much sought after and has fostered a contemporary and novel research agenda, bringing together experts, knowledge and experience from multi-disciplinary strands to examine all aspects of service and manufacturing supply chain literature and practice (van Hoek, 2020; Nyoman Pujawan and Bah, 2021; Singh *et al.*, 2021).

Ingenuity and versatility have been critical to ensure business viability and supply chain continuity. Being able to innovate and adapt quickly were seen not only in the immediacy of the pandemic but also in the medium to long term. Much needs to be done to consolidate this learning and use this to design resilience and flexibility into our supply chains. Examples of excellent practice are widespread, such as the ability of companies to digitalise and localise, becoming more agile and responsive to secure business sustainability (Nandi *et al.*, 2021; McKinsey.com, 2021), adopting new positions in supply chains, establishing new distribution

networks (Stoll *et al.*, 2021) and managing business relationships (Mitreğa and Choi, 2021). Brewdog, the beer manufacturer, was one of the companies cited early for repurposing their manufacturing capacity/capability to produce hand sanitiser (Shrieberg, 2020; Butler, 2020). Innovation in the form of fast-tracking manufacturing capability and vaccine creation also demonstrated how effectively resources and intelligence can be marshalled in times of crisis (Davis, 2020).

In 2020/21, partnerships and alliances came to the fore as businesses struggled to survive in a declining global economy. The complexity of supply chains and relationships has always been an area of research interest (e.g., Kalra *et al.* 2021; Aitken *et al.* 2021; Wang *et al.* 2016; Childerhouse *et al.*, 2013) and this intensified during the Covid-19 pandemic. As a response to globalisation, supply chains were proactively designed to give businesses new markets and opportunities yet during the pandemic this strategy left many open to vulnerability (Goodman and Chokshi, 2021). Countries struggled to cope with the onslaught of the pandemic, as well as other supply chain disruptions such as Brexit and the grounding of the Ever Given in the Suez Canal, reminding us of the constant challenges to our supply chains.

Within the pharmaceutical supply chain, the threat of overreliance on countries such as India and China for pharmaceutical production was very real and prompted supply chain design recalibration (Rapoza, 2020; Wilkinson, 2019). China produces up to 80% of the world's basic ingredients for manufacturing antibiotics (Research.ox.ac.uk, 2020) but the production index in February 2020 was 27.8%, reduced from 51.3% in the preceding month (National Bureau of Statistics of China, 2020). Innovative partnering was seen between pharmaceutical manufacturers working together to produce the Covid-19 vaccines to meet global demand (Irwin, 2021). This partnering extended to competing companies within supply chains working to a common agenda, previously seen in other crisis-focused supply chains (e.g., humanitarian operations, Schiffing *et al.*, 2020) and demonstrated by pharmaceutical giants such as Merck, Johnson & Johnson, Novartis, GlaxoSmithKline and Sanofi (Irwin, 2021).

Our healthcare supply chains were met with unprecedented demand for their services during the pandemic. The coronavirus impact on patients and our workforce was severe with global estimates of 185,291,530 cases and 4,010,834 deaths as reported by the World Health Organisation, July 9th, 2021 (WHO, 2021). A larger workforce was needed to respond to the increasing demand for Covid-19 patient care, emergency cases and business as usual. However,

a shortage of ventilators, personal protective equipment (PPE), medicines, oxygen and other medical equipment prevented them from safely doing so (Medecins Sans Frontieres, 2021; Cohen and van der Meulen Rodgers, 2020; Gondi *et al.*, 2020). This caused immense pressure within healthcare systems at the time and reinforces the need to build resilience within our healthcare supply chains.

### **About this Special Issue**

In response to Covid-19 the motivation for this special issue was to collate a state-of-the-art collection of empirical studies. Our selection of papers is based on research undertaken at a time of global crisis and offers a repository of knowledge from high quality research studies with a broad range of research methodology, sectors, practical learning and theoretical contribution.

We received a high number of submissions to this special issue, further illustrating the importance and timeliness of the topic. It is hoped that this special issue will provide a reference point and solid foundation for further work on Covid-19 and supply chains, and on supply chain disruption more broadly. The need to understand response and preparedness for global supply chain disruptions is at the heart of this collection. It provides the basis for grounded theory development of supply chain resilience/preparedness in times of crisis, supporting further exploration of lives and livelihoods, as well as social and economic recovery post pandemic.

In this Special Issue we have selected eight papers focusing on resilience, sourcing, agility, responsiveness and learning. The studies are timely, data driven and offer important contributions to theory and practice by drawing on research situated in the UK, USA, Austria, Brazil, Australia, India, China and Thailand. The complementary mix of research and insights from industry offer a state-of-the-art portfolio incorporating new and fresh perspectives on how supply chains survived, and for some thrived, in this tumultuous period in 2020/21. The articles present a lens through which we can gain greater insights into real time business activity that we are not always privileged to see. The impact of the Covid-19 pandemic is explored in manufacturing and service supply chains in multiple sectors, including healthcare, food, medical technology, coffee, PPE, automotive, DIY and logistics.

Summary of articles:

*Article 1: Supply chain resilience during pandemic disruption: Evidence from healthcare*

The paper offers in-depth insight into the resilience of public sector healthcare supply chains when faced with disruption due to the Covid-19 pandemic. In this context a shortage of resources puts lives at risk. This study focuses on the personal protective equipment (PPE) healthcare supply chain in Scotland. A country level exploratory case study research design is utilised to examine four phases of resilience: Readiness, response, recovery and growth. The study finds that whilst individual tiers of the supply chain had limited visibility, overall, it demonstrated resilience due to resilient nodes in the chain. These resilient nodes were developed through organisational readiness, response to disruption, ability to create redundancy through make or buy strategies and flexibility in identifying new suppliers as the pandemic unfolded. The paper concludes by offering lessons learned, which highlight how pre-existing collaborative relationships do not necessarily improve visibility during supply chain disruption, how multi-agency collaboration is crucial to developing resilience during a pandemic response and how a specific focus on the wellbeing of healthcare staff is required to build supply chain resilience by mitigating staff burnout.

*Article 2: Towards more balanced sourcing strategies — are supply chain risks caused by the Covid-19 pandemic driving reshoring considerations?*

In examining reshoring as a strategy to mitigate risk in the context of the Covid-19 pandemic, this paper offers state-of-the-art insight from senior supply chain managers as they engage in reshoring decision making. The study uses experiential knowledge capture to portray the real time decisions made by three manufacturing companies headquartered in the USA and shows how all of them were considering reshoring in 2020. Findings show how consideration for reshoring was not only driven by tariffs and supply chain risk management, but also by market growth and the faster delivery times desired by customers. By documenting the steps in the reshoring process (trigger events, reshoring decision making and reshoring implementation) and time horizons, the study shows how challenges associated with supply chain risk and logistical bottlenecks triggered reshoring considerations. Short-term decisions included opportunities for rapidly switching sources to ensure supply (both offshore and in the USA), medium-term decisions focused on collaborating more closely with existing suppliers and identifying new suppliers, and a longer-term strategy considered moving away from global sourcing by evaluating near and local sourcing options. Each of these options involves different forms of supplier collaboration depending on whether the focus is dyadic or goes beyond the dyad.

*Article 3: Supply chain agility for coping with unprecedented changes: Empirical evidence from the UK food supply chain during the Covid-19 crisis*

This paper investigates how the UK food supply chain has responded with remarkable speed to Covid-19 supply chain disruptions; disruptions that initially caused widespread consumer panic buying. In adopting an exploratory case study research design, the study examines the agile responses of three food supply chains: Meat, fresh vegetables and bread. Agile responses are theoretically framed as dynamic capabilities, specifically sensing and seizing capabilities. Findings show how the supply chains utilised sensing capabilities by understanding two sources of change: Labour and demand. In consequence, threats were mitigated, and opportunities leveraged by acquiring, combining and modifying resources. The study documents how each supply chain operationalised supply chain agility practices and provides insight into which of these practices may endure post-pandemic. The study develops a dynamic capability framework for the operationalisation and advancement of supply chain agility in times of crisis. The framework includes a ‘sustain’ capability to sustain positive changes once the crisis has diminished to leverage sensing and seizing capabilities and translate these into transforming capabilities.

*Article 4: The power of purpose – lessons in agility from the Ventilator Challenge*

Focusing on ventilator supply in response to increasing demand due to Covid-19, this study empirically examines agile procurement in times of crisis. It examines the UK ‘Ventilator Challenge’ whereby, in response to a call for assistance from the government, a consortium of UK engineering and technology companies from the aerospace, automotive and medical sector collaborated to produce 30,000 ventilators in eight weeks. The case study documents the extraordinary effort of all involved and demonstrates how production was dramatically increased in an extremely short time period against a backdrop of unprecedented uncertainty, and thus challenges the received wisdom regarding agile supply chain management. Interviews were conducted with senior managers across the consortium, and challenges and enablers to the ‘Ventilator Challenge UK’ identified. The findings show how, against the backdrop of the pandemic, supplier selection prioritised speed over all other criteria. Technology, and culture and environment were also established as crucial, and the study highlights the importance of human-centric operations in times of disruption.

*Article 5: Covid-19 and the pursuit of supply chain resilience: Reactions and 'lessons learned' from logistics service providers (LSPs)*

The focus of this paper is the resilience of logistics service providers (LSPs) in response to Covid-19. By drawing on interviews with LSPs operating in Austria, the study provides insights into the often-precarious position that many LSPs experienced during the initial outbreak of the Covid-19 pandemic, and the steps that they took to survive in the short term and build resilience over the longer term. The study analyses LSP actions and reactions to the pandemic and categorises these as follows: Create revenue streams, enhance operational flexibility, enforce digitalisation and data management, optimise logistics infrastructure and capacity, and optimise personnel capacity. This categorisation is then used to develop an LSP Resilience Framework. The paper discusses the lessons learned by LSPs with respect to transport, personnel, and organisational response. These lessons learned provide practical insights into how LSPs built resilience in the short and longer term and offers suggestions as to how supply chains can manage the downsides and leverage the upsides of external shocks characterised by low probability and high impact.

*Article 6: Supply chain sustainability learning: The Covid-19 impact on emerging economy suppliers*

This paper examines the impact of Covid-19 on supply chain sustainability learning by focusing on export-oriented Brazilian coffee producers. The study poses questions investigating how sustainability initiatives are impacted by Covid-19, and how supply chain sustainability learning is experienced by emerging economy suppliers during a pandemic. A multi-case study research design is used to collect data through semi-structured interviews with Brazilian coffee farmers during three scenarios: Firstly, prior to the pandemic; secondly, during the period in which Covid-19 spread to coffee buyers and finally when the pandemic spread to Brazil. By comparing sustainability initiatives during the three scenarios the study shows how suppliers are responding to environmental changes and how their sustainability initiatives have evolved. Social sustainability is shown to have received more attention in response to Covid-19 and the study demonstrates how emerging economy global suppliers adapted their sustainability learning orientation due to the disruption caused by an unprecedented event. The study finds that a balance between exploitation and exploration learning capabilities is required to achieve a long-term sustainability perspective.

*Article 7: Covid-19 response of an additive manufacturing cluster in Australia*

This study focuses on the PPE supply chain in Australia and examines the formation and development of a geographical cluster that utilised additive manufacturing to respond to the PPE supply crisis. A supply chain complexity lens is used to frame the study to analyse barriers and enablers to the operation. Longitudinal case study data are presented that were collected over three stages: Pre supply chain disruption, during supply chain disruption and post major supply chain disruption. Findings show how the cluster transformed from a loosely constructed arrangement into a dynamic and highly focused network to produce PPE. The challenges experienced by members of the cluster, relationship inter-dependence and governance are discussed. Further, the nature of exchanges between the organisations involved in the cluster before, during and after the major supply chain disruption caused by Covid-19 were found to have changed significantly in terms of structural, socio-political and emergent dimensions.

*Article 8: The role of digital technologies in supply chain resilience for emerging markets' automotive sector*

Focusing on the automotive industry, this study examines the role of digital supply chain technologies in supply chain resilience activities to improve supply chain performance. A survey was used to explore the performance of automotive supply chains, with the sample comprising original equipment manufacturers, tier-1 component manufacturers and lead logistics providers in Asia-Pacific emerging markets. The findings highlight the importance of digital supply chain technologies in improving supply chain performance during periods of disruption and particularly when human interaction is difficult. Business continuity is identified as an important driver for the introduction of digital supply chain technologies. Monetising the payback of such technologies has historically proven difficult. However, the findings show how benefits identified during the pandemic period have provided a more robust justification for the investment required. The study finds that adapting digital supply chain technologies influenced resilience practices to improve supply chain performance objectives during periods of supply chain disruption. In emerging markets in the automotive sector, the data show how the implementation of such technologies facilitates data sharing, speeds up transactions and facilitates supply chain recovery.

## **Summary**

The collection of empirical studies in this special issue provides an exemplar foundation for further work advancing how planning, controlling and driving change in our supply chains can result in enhanced resilience. The special issue has been developed as the Covid-19 pandemic



continues to unfold, and hence further future reflections will be necessary. We do hope however, that the learning from the papers in this special issue will prove fruitful as we continue to develop our understanding of supply chain resilience during periods of uncertainty. We encourage academics and practitioners to continue to challenge received wisdom and to push the boundaries of supply chain management research in developing relevant theory and the continuous improvement of practice.

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