



Impact of Industry 4.0 on supply chain performance

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Abstract: The term "supply chain disruption" refers to a breakdown in such a supply chain's manufacturing or distribution process that is triggered by an unexpected event or danger. Chains are more vulnerable than ever to a wide range of threats and disruptions because they are more global, complicated, and stretched. Smart technologies and real-time data interchange are known as "industry 4.0," and they provide considerable chances to modify traditional business operations and successfully deal with supply chain failures that were not foreseen. In the process of reducing supply chain interruptions and their associated risks, industry 4.0 technologies have gotten very little attention. This gap in knowledge can be filled by bringing together topics that are generally considered to be unrelated but are actually intertwined. In this post, we put our approach to the test using data from 48 Bhopal-based (SMEs). Mismatches between supply and demand are now the most common cause of supply chain disruptions, followed closely by risks associated with processes and transportation.

Keywords: Supply chain, SMEs, industry 4.0, technologies

1. Introduction

Advanced technology advances are being hailed as the answer to today's ever-changing business and consumer demands and need for organizations to be more flexible and responsive "(Oberg and Graham 2016; Genovese et al. 2014; Lang et al. 2014; Chung and Swink 2009; Jonsson 2000)". Technological advancements are now seen as a powerful strategic weapon by organizations to ensure long-term performance (Chavarra-Barrientos, Ivanaj, and Ivanaj, 2016), as well as future success (Davenport 2006). Electronic business technology are already being used by many firms for process integration and streamlining their business operations (Sanders, 2007). "(Chen and Holsapple 2012; Wiengarten et al. 2013; Srinivasan and Swink 2015)". For the fourth industrial revolution, they're spending a lot of money on automation and robotics, which will allow them to take advantage of ever more sophisticated technical advancements (Chung 2015). As a result of the tremendous process integration enabled by this industrial revolution, smart factories have been created that provide major benefits to production (Rashid and Tjahjono 2016).

Recent academic and industrial publications have mostly examined operational aspects of Industry 4.0 from the perspective of production. Supply chain and logistics management are two areas where Industry 4.0 is expected to make major advances “(Macaulay, Buckalew, and Chung 2015; Baur and Wee 2015; Blau 2014)”. As automation of business processes continues to develop, companies are increasingly looking to incorporate Industry 4.0 operating principles into other aspects of their operations, such as supply chain management “(Lopez Research 2014; Redelberger 2014; Schuh et al. 2013)”. In light of the growing importance of technology in business operations, this study aims to investigate the impact of Industry 4.0-related advanced technological innovations on supply chain performance, one of the most difficult challenges for businesses today “(Neely 2005; Bhagwat and Sharma 2009; Martinez, Pavlov, and Bourne 2010; Bititci, Firat, and Garengo 2012)”.

“Industry 4.0 technologies (I4Ts) have also recently emerged as a new frontier in challenging and reshaping traditional corporate processes and assisting to cope with any unanticipated disruptions.” Industry 4.0 technologies Despite the lack of a unified taxonomy, I4Ts encompass the “Internet of Things (IoT), big data analytics, blockchain, cloud computing, robotics, smart sensors, and three-dimensional printing,” among other things. Revolutionizing SC procedures is possible thanks to these new technologies. As a result of this requirement, this paper aims to bridge a knowledge gap in the present literature in India by examining how the three critical SCRs described above affect FP and how I4Ts may be able to moderate this effect.

2. Literature review

Fatorachian (2020) As mentioned, the use of Industry 4.0-enabling technologies is predicted to bring about considerable SCM improvement through implementation of supply chain integration and information exchange and transparency throughout the whole supply chain. In order to assess the influence of emerging technologies and concepts on the supply chain, the Pfohl (2020) theoretical framework is recommended. “Three fascinating hypotheses are given by Cachon (2012), concluding on the influence of Industry 4.0 from a structural, technical and organizational standpoint. All findings are based on a systematic review of the relevant literature.” This study by Okwu (2020) demonstrates how Industry 4.0 technology may help supply chain operations in industrial settings progress. The findings of this study reinforce the benefits of implementing cutting-edge technology throughout the supply chain network in order to achieve high levels of performance improvement (s). Productivity would rise, as will sales and profit margins, as well as the general health of the manufacturing industry's supply chain, when Industry 4.0 technologies are successfully implemented. “Supply chain management in the context of Industry 4.0 was the focus of Müller's 2018 research. Case studies of a German Engineer-to-Order manufacturing firm and its five logistics partners, which together comprise a whole supply chain, are used in this research to identify difficulties, potentials, and suggestions for Industry 4.0 integration.”

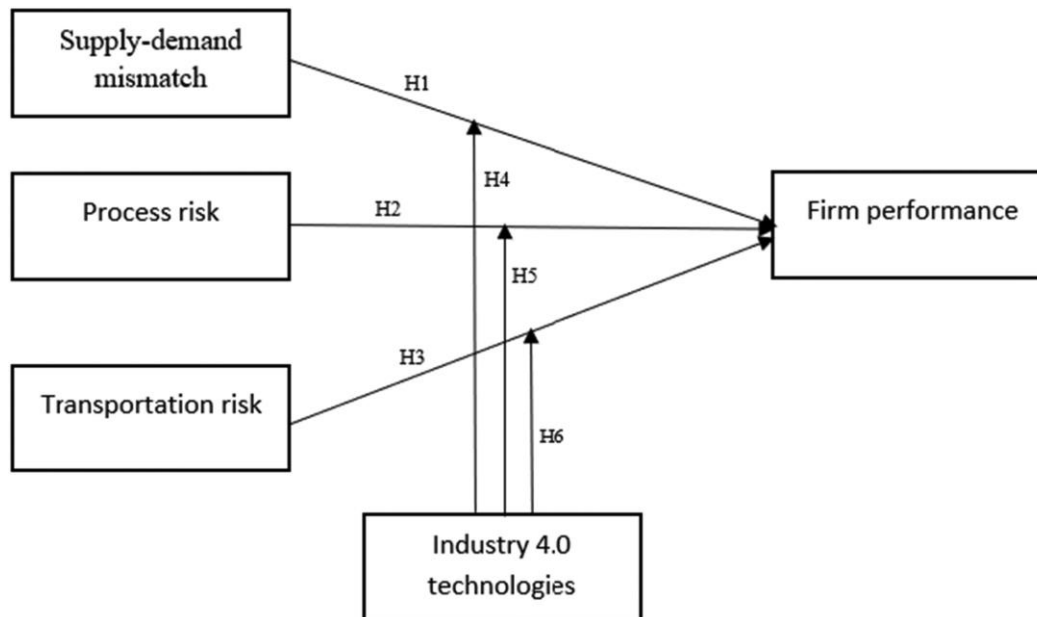


Fig. 1. Conceptual framework (Ali et al., 2021)

Hahn (2019) i4.0-enabled SCI Scalability and flexibility are added to the basic focus on improving productivity in SC processes. For the most part, existing i4.0 solutions are based on analytics and smart objects, but they do not include the human-centric approach associated with the i4.0 paradigm and the use of smart people technology. To put it another way, established businesses use i4.0 to maintain their current organizational structures, but startups completely overhaul their business models, depending primarily on data analytics and also the platform economy to accomplish it. Furthermore, Sassi et al. (2021) conducted an extensive literature assessment of Supply Chain 4.0 (SC4.0), Industry 4.0 (I4.0), and the interaction between all these parties, to provide the basis for further research into the impact of SC4.0 adoption on automotive industry performance in Morocco.

3. Research methodology

Natural disasters, a pandemic, financial concerns, same-day supply difficulties, and unexpected client habits have all plagued the sector in the last decade. However, very little known about just the multiple sources of disruption and then if 21st century digital technologies has helped it develop a long-term competitive edge in the digital era. They used a quantitative research approach with an online survey as the major data collection instrument in accordance with the study topics. The information was gathered from the proprietors of Bhopal-based businesses. “Researchers used a widely established method of sample selection and questionnaire design to get our results.” As a means of ensuring that all eligible participants had an equal chance of being picked and that they represented the whole population, researchers used a random sampling technique. By reducing selection bias and increasing the generalizability of the data, this approach can also assist to uncover and quantify any sample flaws. After that, researchers sent out around 100 copies of the amended questionnaire to our target respondents, and they obtained a total of 48 viable replies after sending out two reminders.

Constructs and Measures

It must have been determined that Ali et al. 2021 was the benchmark for measuring supply-demand mismatches, process risks, transportation hazards, industry 4.0 technologies, and business performance. The Likert scale was used to score every item. There was a wide range of measuring items for SCRs and FPs, from "nothing at all" (1) to "to a very big extent" (5). (5). The items for I4Ts were based on previous research "not adopted" (1) to "successfully adopted" (5).

4. Results and discussion

Regression analysis to examine the empirical model the with help of SPSS software.

Table 1. Regression analysis

Relation	Regression Coefficient	T-statistic	p-value	R ²	Adjusted R ²	F-value
SMM vs i4.0	5.041	13.408	0.000	0.87	0.79	26.59
PR vs i4.0	4.243	14.289	0.000			
TR vs i4.0	3.328	12.433	0.000			

Employing Regression analysis, it really is obvious whether industry 4.0 technology moderates the link between supply-demand mismatch and firm performance.

5. Conclusion

The need to understand how I4Ts could minimize the effects of various important risks on the business, and how this helps to maintain a competitive edge. Even though research on SCRM and I4Ts has grown rapidly over the last decade, little empirical work has been done to explore the junction of these two subject areas so far. In other words, most studies on SCRM and I4Ts were still conceptual, normative, simulation-based, or qualitative. An empirical investigation of the effects of three crucial SCRs and I4Ts on FP was carried out in this study to cover a present knowledge gap. Our study found that all three SCRs had a substantial negative influence on performance, but SDM was the risk that needed the greatest attention at the time. They discovered that the supply-demand mismatch, process risks, transportation hazards, and firm performance are all moderated by industry 4.0 technology.

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