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EXPLORING THE INFLUENCE OF INDUSTRY 4.0 TECHNOLOGY ON SUPPLY CHAIN AGILITY

Abstract

Considering the important role Information Technology (IT) plays in achieving performance improvements in business processes, this paper aims to investigate the potential impact of the Industry 4.0 and its associated technological advances on Supply Chain performance. Hence, by conducting a systematic literature review, the paper attempts to explore the impact of Industry 4.0 on Supply Chain performance. Based on this study, the implementation of Industry 4.0 enabling technologies is expected to provide significant performance improvements in SCM by enabling a holistic approach to supply chain management as a result of extensive supply chain integration as well as information sharing and transparency throughout the supply chain.

Keywords: information technologies, supply chain, industry 4.0, competition.

JEL: L7

UOT: 338

DOI: <https://doi.org/10.54414/LIZC5904>

Introduction

Technology is the driving force behind leaps and bounds in all aspects of life in the 21st century. It has become an essential part of our life making it easy. A lot has changed with the introduction of the Fourth Industrial Revolution. More serious examples can be presented from different fields, such as health, education, diverse industry or trade. Well, while we believe that human labor should never be underestimated – we are the creators of all this top-notch engineering – yet we must confess that advanced technologies improve our quality of life significantly.

The fourth industrial revolution, like the industrial revolutions before it, has an impact on many areas and results in changes. For this reason, it is noted that it is necessary to acquire many skills to adapt to these changes.

Tomorrow's workforce must be prepared by conducting an assessment to reduce these negative effects and turn them into a positive direction.

In order to take advantage of the positive aspects of the 4th industrial revolution, it is necessary to be ready for it, to prepare jobs and the workforce with the necessary skills to improve the welfare of the population. We think that we can use it in a better direction by being ready for this industrial revolution. Also, the study of the 4th industrial revolution will lead to the release of its negative effects in the competitive market.

As we know, industrial revolutions change our life in several directions. It can be said that the impact of the 4th industrial revolution is greater than the previous industrial revolutions. When we evaluate, we will see that the 4th industrial revolution has as many positive effects as negative effects. For example: although the 4th industrial revolution helped increase productivity, it led to the elimination of some jobs, which could lead to unemployment in the future. There are various differences of opinion between techno pessimists who exaggerate the negative consequences of these effects and techno optimists who emphasize their positive aspects. Techno pessimists oppose the 4th indus-

trial revolution and the development of technology. Techno optimists willingly support the 4th industrial revolution. Therefore, it is very difficult to avoid disagreements in order to take advantage of the positive aspects of the industrial revolution [1].

Industry 4.0 and how do technologies shape the competition

The Fourth Industrial Revolution is changing the competition in a number of ways. Some of these directions are economic growth and economic development, business and entrepreneurship, labor market, employment, nature of work, productivity, income and well-being [8].

In Klaus Schwab's book "The Fourth Industrial Revolution", these changes are grouped together and four main effects of the fourth industrial revolution on companies in all sectors are noted: customer preferences vary; data improves products, which increases asset productivity; as companies learn the importance of new forms of collaboration, new partnerships are formed; operating models are becoming new digital models [10].

As mentioned above, the fourth industrial revolution is causing a number of changes in the direction of the economy and with a number of effects on companies. Tomorrow's workforce must be prepared by conducting an assessment to reduce these negative effects and turn them into a positive direction.

Workforce Readiness, soft skills, technical skills, entrepreneurship are the main key skills that will help candidates face the wave of the fourth industrial revolution.

Although many jobs and fields of work have disappeared, experts believe that the demand for job roles such as Data Analysts and Data Scientists, Artificial Intelligence (AI) and Machine Learning (ML) Specialists, Digital Marketing Specialists, Internet of Things (IoT) Experts, Cybersecurity Specialists may increase in the future.

There is competition between companies in terms of price, quality, features and offerings. The main interest of the business is to increase the sales, get high profit and attract more customers. Competition is part of the success or

failure of companies. In order to gain a competitive advantage, all companies try to develop themselves in a certain way and differentiate themselves from their competitors by creating their own sustainable development model. Technological changes and innovations are the main criterion of competition. Technology plays a major role in the structural change of the industry and helps in restructuring the business framework. Before the transition to the 4th Industrial Revolution, many advanced firms could not sustainably compete because they lacked sufficient technological capabilities and knowledge.

In modern society, technological development and enlightenment have resulted in a noticeable rivalry among the countries of the world. That's the reason why companies pay so much attention to technology, trying to increase their productivity and provide better service to their customers. Technological innovations can have a significant impact on individual companies and industries. But not all technological changes are strategically beneficial; they can aggravate a firm's competitive position and industrial charm. High technology does not guarantee profitability. Because of their disadvantageous structure, many high-tech industries are much less profitable than some low-tech industries.

The fourth industrial revolution has emerged as a crucial period of technical developments that are reshaping how companies run and compete. The integration of digital technologies and automation, which characterizes this transformational period, has a significant global impact on many different businesses and economies. By examining earlier studies and research in the subject, we hope to analyze the topic of the fourth industrial revolution and its impact on competition in this literature review.

In the fast changing digital environment of today, the subject of the fourth industrial revolution is of the utmost importance. It signifies a substantial change in how companies approach innovation, production, and customer involvement. The emergence of technologies like the Internet of Things (IoT), artificial intelligence (AI), big data analytics, and robotics has presented sectors with opportunities and challenges that have never before existed.

Boston Consulting Group (BCG) explores Industry 4.0's technical enablers, which include automation, data analytics, the Internet of Things (IoT), and artificial intelligence (AI) [2]. These technologies have the power to transform industrial operations, boost productivity, and open up new commercial opportunities. The necessity of digital transformation for organizations to take advantage of Industry 4.0's potential is emphasized in the article.

Boston Consulting Group (BCG) found that the adoption of Industry 4.0 technologies can significantly increase the productivity and growth of manufacturing industries. They give instances of businesses who effectively applied these technologies and saw considerable performance improvements [2].

Industry 4.0 – Smart Manufacturing

The improvements in smart manufacturing—which incorporate cutting-edge technologies like IoT, cloud computing, and big data analytics—are covered by the writers in this article. They draw attention to the advantages of smart manufacturing, including raised output, quality, and sustainability [7].

Industry 4.0 – Cyber-Physical Systems

The integration of physical and computational components, real-time monitoring and control, and the ability to adapt and react to changes are just some of the key features of CPS. Furthermore, CPS has the potential to revolutionize industries such as manufacturing, transportation, healthcare, and energy [8].

CPS affects industrial operations, highlighting how it can increase production, efficiency, and safety. The authors also discuss the difficulties in implementing CPS, such as security worries, interoperability problems, and the requirement for professional labor [8].

The impact of the fourth industrial revolution

The effects of Industry 4.0 are compared on a national and regional level. The goal is to evaluate the preparedness and acceptance of Industry 4.0 technologies across various nations and regions and to examine the ramifications for the economy, society, and environment [5].

Some of the potential economic benefits of Industry 4.0 such as higher productivity, more employment opportunities and competitiveness

are described. In addition, social and environmental impacts are covered, including workforce adjustments, skills requirements and sustainability initiatives. It also recommends that governments encourage the use of Industry 4.0 technologies, such as creating supportive regulations, spending on research and development, and promoting digital literacy and skills [9].

Smart Factory for Industry 4.0

Here, the idea of smart factories is thoroughly explored in relation to Industry 4.0. Describing the main features and principles of “smart factories”, special attention is paid to the connectivity, automation and data-driven decision-making capabilities of these devices. It is emphasized that modern technologies such as the Internet of Things (IoT), artificial intelligence (AI) and big data analytics exist in smart factories, enabling seamless integration and communication between equipment, systems and people [7].

Literature Synthesis

It can be said that Industry 4.0 – the effects on productivity and growth means that this industrial revolution leads to the development of technology and artificial intelligence, which in turn increases productivity [2]. When Industry 4.0 – Smart Manufacturing is mentioned, it is understood that it means smart manufacturing and serves to increase productivity as a more advanced form of technology [6]. Industry 4.0 – Cyber-Physical Systems has been highlighted as having the potential to revolutionize industries such as manufacturing, transportation, healthcare, and energy, and CPS has been highlighted as having the potential to revolutionize industries such as manufacturing, transportation, healthcare, and energy [8].

Impact of Industry 4.0 on supply chains

As discussed in the previous section, Industry 4.0 is helping to redefine traditional industrial processes by using several advanced tools and technologies. Supply chains are making great strides towards becoming digital, automated and agile in their operations. Today's digital SC networks use many different technologies to develop efficient, transparent, adaptive and sustainable systems at different stages of SCs, including new product development, procurement, manufacturing, planning, logistics and market-

ing. The effects of Industry 4.0 can be felt at different stages of SCs, as well as supply chain management (SCM) strategies; for example, more accurate forecasting and planning through integrated flow and increased traceability of materials and products, improved supplier performance due to real-time information exchange and synchronization with suppliers, and intelligent warehouse and vehicle routing systems [6].

The disruption caused by digitization demands companies to rethink the design of SC networks. The transparency and easy access to multiple choices of where to shop, what to buy and when to buy, enabled by e-commerce platforms intensifies competition in supply chains. In particular, IoT plays an important role in the transformation of SCs by providing a wide range of capabilities such as remote and real-time monitoring of the location and speed of vehicles, the status of perishable products through temperature sensors, the performance and status of machines, etc. The increased connectivity between SC stakeholders and the growing importance of stakeholder collaboration require an assessment of the impact of Industry 4.0 implementation on the SC network level. Alejandro Germán Frank define the Smart Supply Chain as a dimension of Industry 4.0 that encompasses digital platforms with suppliers, retailers, customers and partners. The information sharing and synchronisation of operations between SC partners help to decrease overall costs and increase the agility and efficiency of SCs [3]. The improved transparency and collaboration along the SC network also leads to increased trust and stronger relationships between SC members.

Industry 4.0 enabled opportunities including highly organized interactions and real-time monitoring and control of materials, equipment, location, speed of vehicles, and SC parameters, help to improve the overall value chain performance and reduce risks. Incorporation of Industry 4.0 technologies lead to the transformation in management strategies and business models in these networks [3]. In addition to the requirements and trends that drive digital transformation in supply chains, new obstacles and risks arise as a result of the evolving business environment and digital transformation trend, such as lack of information, information security risk,

and lack of skilled labor. Therefore, both conceptual frameworks and empirical research are needed to guide companies to develop successful and robust Industry 4.0-adapted supply chains and rapidly adapt to ever-evolving technologies and markets.

Conclusion

In modern society, technological development and enlightenment have resulted in a noticeable rivalry among the countries of the world. That's the reason why companies pay so much attention to technology, trying to increase their productivity and provide better service to their customers. Technological changes are one of the main factors of competition and play a major role in the structural change of the industry. Technological innovations are helping to restructure the business framework. Technological innovations can have a significant strategic impact on individual companies and firms and can have a major impact on entire industries as a whole.

Continuous assessment is essential to better understand how supply chain relationships and performance are affected by the proliferation of advancing technologies, such as those examined in this study. The motivation for this study began with a desire to learn more about the return on investment of Industry 4.0 technologies. This study examine the intangible benefits by investigating whether and how Industry 4.0 technology affects supply chain agility.

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SƏNAYE 4.0 TEXNOLOGİYASININ TƏCHİZAT ZƏNCİRİNİN ÇEVİKLİYİNƏ TƏSİRİ

Xülasə

İnformasiya Texnologiyalarının (İT) biznes proseslərində performans təkmilləşməsinə nail olumasında oynadığı mühüm rolu nəzərə alaraq, bu məqalə Sənaye 4.0 və onunla əlaqəli texnoloji irəliləyişlərin Təchizat Zəncirinin performansına potensial təsirini araşdırmaq məqsədi daşıyır. Beləliklə, sistemə ədəbiyyat araşdırması aparmaqla, məqalə Sənaye 4.0-in Təchizat Zəncirinin performansına təsirini araşdırmağa çalışır. Bu araşdırmaya əsasən, Sənaye 4.0-a imkan verən texnologiyaların tətbiqinin geniş təchizat zənciri inteqrasiyası, eləcə də tədarük zənciri boyunca məlumat mübadiləsi və şəffaflıq nəticəsində təchizat zəncirinin idarə edilməsinə vahid yanaşmanı təmin etməklə SCM-də əhəmiyyətli performans təkmilləşdirmələri təmin edəcəyi gözlənilir.

Açar sözlər: informasiya texnologiyaları, təchizat zənciri, sənaye 4.0, competition.

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ВЛИЯНИЕ ТЕХНОЛОГИЙ ИНДУСТРИИ 4.0 НА ГИБКОСТЬ ЦЕПОЧКИ ПОСТАВОК

Резюме

Учитывая важную роль, которую информационные технологии (ИТ) играют в повышении производительности бизнес-процессов, цель данной статьи — изучить потенциальное влияние Индустрии 4.0 и связанных с ней технологических достижений на производительность цепочки поставок. Таким образом, путем проведения систематического обзора литературы в статье делается попытка изучить влияние Индустрии 4.0 на эффективность цепочки поставок. Согласно этому исследованию, внедрение технологий Индустрии 4.0, как ожидается, обеспечит значительное повышение производительности SCM за счет обеспечения единого подхода к управлению цепочкой поставок в результате широкой интеграции цепочки поставок, а также обмена информацией и прозрачности во всей цепочке поставок.

Ключевые слова: информационные технологии, цепочка поставок, индустрия 4.0, конкуренция.

Daxil olub: 12.10.2023