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Digitization in Logistics

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Abstract. Quality of logistics activities plays an important role in corporate competitiveness. The appreciation of the role of logistics as a material and information flow is related to the rapid development of informatics and its technological background. The existence of intelligent devices, distributed intelligent hierarchical systems, a variety of management and control solutions, automatic identification systems, network communication systems, GPS tracking systems, cyber-physical systems, standardized data communications networks, web-based cloud solutions can be traced to the development of information technology. The use of digitization in logistics contributes even more to the better functioning solutions, the real-time management of large amounts of information using applications of Internet of Things, the use of simulation methods for making real-time decisions. These changes, of course, will significantly affect the functioning of the economy, the labour market and competitive situations as well.

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Keywords: logistics, development of information technology, digitization, Internet of Things, economic changes.

1. Introduction

Logistics activities basically refer to the material flow and related information flow. Design, development, operational, monitoring and evaluation tasks related to the material flow and information flow are also generally linked to these activities. Logistics activities appear in both the manufacturing and the services sector. The rapid and dynamic development of information technology, computer science and cybernetics considerably contributes to the expansion of the key role of logistics in the economy. The appearance and application of cyber-physical systems in the logistics processes will lead to further significant changes in the functioning of the economy [1]. Of course, we must not forget that logistics is a system of human-computer-material based on material-handling machines, machine systems, computer systems and networks, all related technique and technology as well as the appropriate level of vocational training of human resources. Online management of things and digitization today and in the coming days thoroughly change the structure and functioning of economies and also the realization of the logistics activities. [2]

2. Impact of Digitization on Certain Sections of the Population

Digitization and online handling of things and related information cause notable changes in employment. Predictions indicate that there will be losers and winners. In the following, we present some data. Table 1. shows, by way of example, the losers and the winners.

Activity	Decrease 2012-	Activity	Increase 2012-
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2022			
postal service	-28%	IT security analyst	37%
consumption readings	-19%	system analyst	25%
agriculture	-19%	software developer	22%
journalism	-13%	web developer	20%
jeweller	-10%	development	17%
		consultant	
wood processing	-9%	data controller	15%
working with drilling machine	-6%	computer and IT	15%
		researcher	
insurance organization	-6%	network developer	15%
tailor	-4%	system administrator	12%
		programmer	

Source: Focus Money, April 2016

Table 1. Changes Caused by Digitization.

Digitization is closely related to automation and robotics. Taking into account these, Table 2. reveals interesting correlations. The table shows that through digitization and related automation, the level of automation of certain professional activities will increase significantly until 2022 [3]. The table gives an example of the rate of changes of some activities taking place by 2022.

Activity	Expected level of automation
sales activity	85,5%
factory work	84,4%
administrative activities	80,4%
assistant service	78,4%

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driving transport vehicle	52,7%
public safety activities	25,9%
business research	21,9%
management	15,8%
education and training development, research	4,3%
health care research	2,1%

Source: Focus Money, April 2016

Table 2. Expected Level Of Automation After Digitization.

Since logistics is present both at services and manufacturing activities, these changes are also related to the developments in logistics.

3. Impact of Digitization on Logistics

The current logistics trends are influenced by the changes taking place in the field of economy and society. The most important parameters affecting the economy are shown in Figure 1.

Among them, we would like to focus on the digitization (see Figure 1, development of informatics and information technology). Digitization has changed fundamentally the market demands and opportunities required for the logistics. Web-based applications provide the following possibilities in the manufacturing and services sectors:

- managing rapid changes of product structure,
- reduction of the manufacturing depth,
- shortening the product life cycles,
- product line rationalization,
- management of make or buy philosophy,

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- Just-in-Time-based supply chain,
- a new interpretation of quality,
- addressing globalization and localization,
- operation of distributed intelligence networks,
- providing a clear overview of activities of the world,
- giving real-time information from the business area to the customers,
- development opportunities of new business models,
- 3D printing,
- E-commerce operation,
- implementation of open innovation,
- development of international research cooperation,
- accessing real-time data management services,
- Big Data management,
- using EDI communications.

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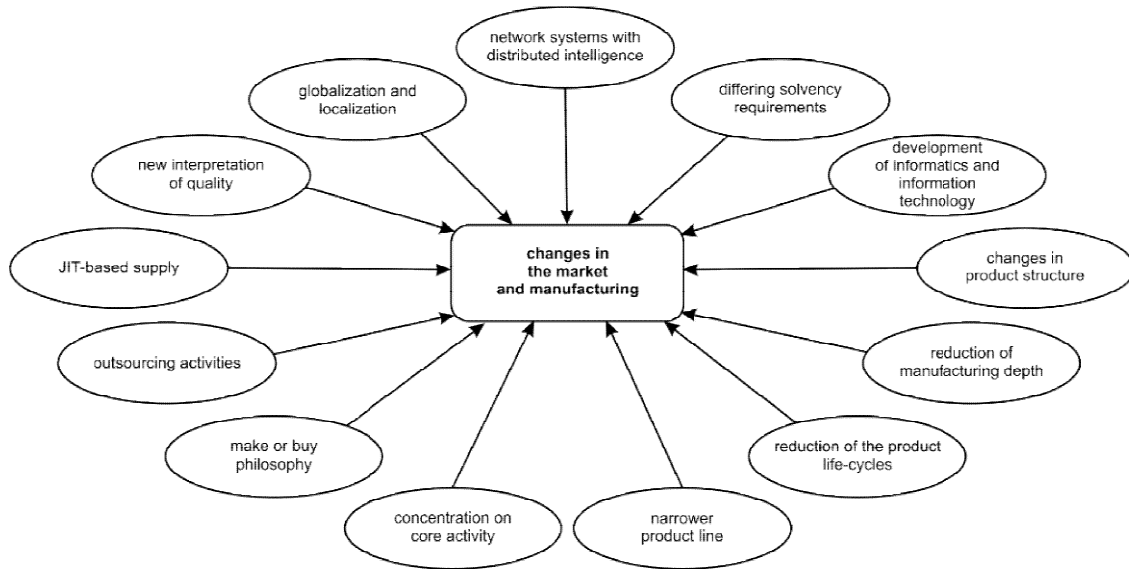


Figure 1. The most Important parameters affecting the economy (Source: own construction)

In logistics the variety of handled products, the introduction of new techniques and technology at manufacturing and services, the operation of various networks and globalization make it necessary to increase the complexity of logistics systems, on the other hand to ensure transparency of these systems. It can only be solved by using automated and optimized complex structures, processes and sub-processes [4].

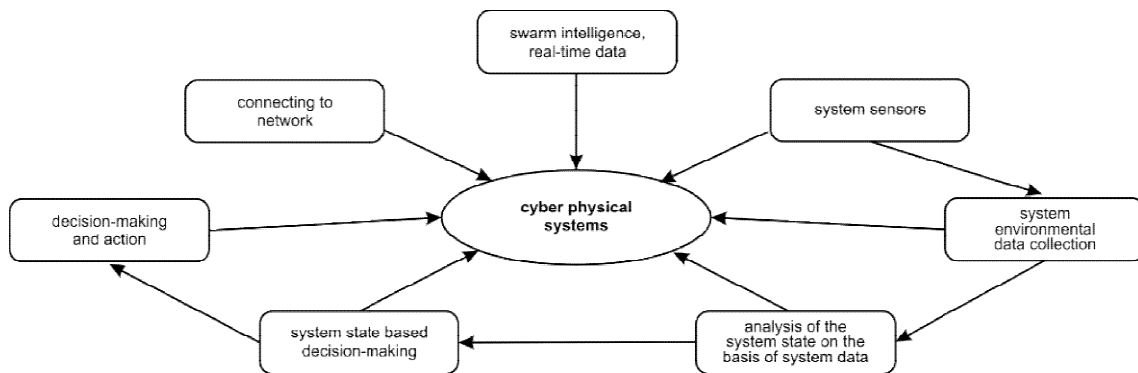


Figure2. Cyber-physical systems (Source: own construction)

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Cyber-physical solutions acquire an increased significance in the design of such systems. The operation of the complex logistics processes is influenced by a wide range of parameters. The real-time values of the parameters can be collected with system sensors. By collecting, digitizing and real-time processing data related to the operation of the system, the actual state of the system or a component can be defined [5].

Using an adequate optimization method chosen in accordance with the actual state of the system and the possible decision set the best intervention can be performed in the logistics system. The system or system element can be connected to network, where a similar cyber-physical system can also be found [2]. With digitalization large amounts of real data can flow between systems and system components that ensures optimum performance of the complex system on the basis of specific criteria by using an appropriate operational strategy [4].

The model and the method of operation of a cyber-physical system is shown in Figure 2. In the next period, digitalization will fully reshape the economy and the lives of all mankind. In the area of manufacturing and services, a growing number of operating parameters of the logistics activities will become available, providing the management of data sets by the Internet of Things the customer-driven logistics solutions will be significantly strengthened.

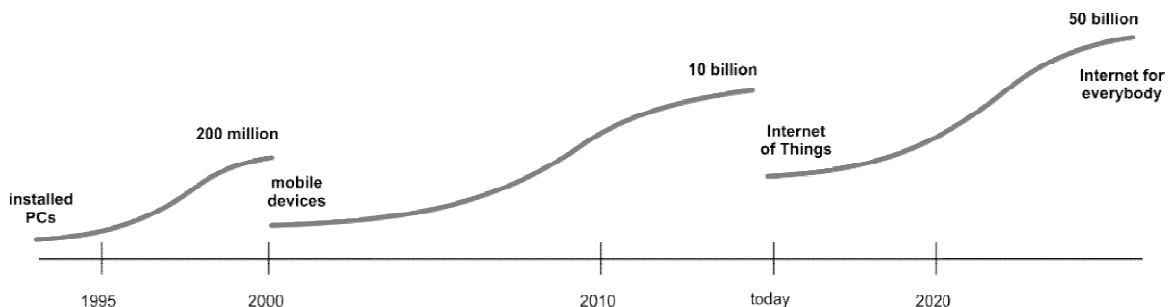


Figure 3. Number of computing devices

(Source: ZukunftskongressLogistik, 33. DortmunderGespräche)

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Digitization in logistics will occur in standard connections instead of individual and business processes, later in two-directional direct links between the internal and external partners of a given supply chain providing integrated communication and access to large amounts of information. All of these development trends will also affect the number of computing devices as shown in Figure 3.

It can be seen that in 1990 the installed PCs accounted for a significant portion of the assets. Today, a notable increase in the number of mobile devices can be observed. In the future, by using a variety of smart devices everybody will connect to the Internet and the digital world.

In the world of tomorrow, using digital technology, the role of logistics will be further enhanced. Smart city developments, intelligent transport systems, smart homes, smart manufacturing and services systems are based on intelligent material and information flow systems.

The digital shift and networking enhance competition between companies and increase the level of customer satisfaction. All this, of course, leads to the development of new business models that result in the best services to customers.

4. Summary

Digitization affects a wide range of logistics activities. IT tools and methodologies to be used in the future will particularly influence the structure of manufacturing and services activities. The spread of 3D printers will make production activities decentralized, the mobilization of the workers employed will become more flexible, intelligent product handling processes and autonomous self-organized units will be implemented, as well as new business models will be defined. These changes lead to new challenges in the field of logistics, where compliance can be ensured by the use of digital technology and Internet-based management of the parameters of things.

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