

SELECTED INNOVATIVE SOLUTIONS IN SUPPLY CHAIN MANAGEMENT

WITKOWSKI Krzysztof¹, STAJNIAK Maciej², SZOPIK-DEPCZYŃSKA Katarzyna³,
KONECKA Sylwia⁴

¹University of Zielona Góra, Faculty of Economics and Management, Poland, EU

²Institute of Logistics and Warehousing (ILiM), Poznan, Poland, EU

³University of Szczecin, Faculty of Economics and Management, Poland, EU

⁴Poznan School of Logistics (WSL), Poland, EU

Abstract

In the changing market managers have to use modern methods, techniques and ideas of management. They have to learn how to implement them into practice. In this paper the authors present selected issues connected to innovations and sustainable development, which allow many companies to improve their market position. Authors pay special attention to the need for efficient communication, both inside of organization and with cooperating companies. This aim can be realized thanks to modern information technology. This could play the key role in connecting the engineering knowledge with the economical effectiveness represented by the managerial board.

Keywords: Innovation, Sustainable Development, smart solutions, logistics

1. INTRODUCTION

In the era of globalization logistics plays a very important role. This applies not only to individual companies, but also to the national economy, and even to the world - we are seeing competition not just for individual companies but for entire supply chains. The pace of development of the modern economy means that companies are forced to constantly introduce new solutions. This innovation drives market progress. Companies are out in search of innovation in the logistics services market, and the technology is developing at a rapid pace. Bearing in mind the conditions and objectives of supply chain management, it should be emphasized that the development of innovation is increasingly a result of cooperation between business partners. Companies should use both external and internal sources of innovation. The cooperation of the supply chain actors for the development of innovation is open-minded and gaining increasing interest in research and business practice. The cooperation, collaboration and competition between engineers and managers should stimulate invention and innovation.

The European Union, in order to reduce the gap between itself and the USA in the area of economic development, requires an industrial and technological base to provide the citizens in the EU and beyond its borders solutions for communication and movement in increasingly urbanized areas [16].

2. INNOVATION

Innovation today is synonymous with progress and modernity in every area - from the social sphere, through the educational system, to the economic sphere in science and economy, looking for new solutions that contribute to competitive advantage in the market and thus raise the level of economic and social development and ensure a high quality of life. "Innovation is the difference between leaders and followers," Steve Jobs, Apple's famous CEO, would say [12]. Confirmation of this can be seen in graphs presented in the illustration, which show that most of projects based on innovation and high technologies are implemented in the US and thus the US economy is leading the world economy.

The concept of innovation was introduced to world economic literature by J. A. Schumpeter in 1912. He described development as historical process of structural changes, substantially driven by innovation which was divided by him into five types [14]:

launch of a new product or a new species of already known product;

- application of new methods of production or sales of a product (not yet proven in the industry);
- opening of a new market (the market for which a branch of the industry was not yet represented);
- acquiring of new sources of supply of raw material or semi-finished goods;
- new industry structure such as the creation or destruction of a monopoly position.

This definition is the starting point for a discussion about the importance of innovation in the economy. In terms of Schumpeter's definition, where innovation means putting new solutions into practice ("process of industrial mutation, that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one"), the author focused primarily on technical innovation and its impact on the economy. He is the creator of the so-called concept of "Creative destruction", which is a continuous destruction of old structures and the constant development of new, more effective ones. For Peter F. Drucker [3], in turn, "...innovation is the specific tool of entrepreneurs, by means of which the changes make them an opportunity to take up a new business or the provision of new services." In his opinion, "innovation does not have to be technical, it need not even be something material." Yet another definition of innovation can be found in the Operational Programme Innovative Economy, where innovation is understood as putting into practice new or significantly improved solutions regarding a product (good or service), process, marketing or organizational system within a company. According to the Oslo Manual: "an innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations" [10].

There are many definitions of the concept of innovation, however all boil down to determining that innovation is a process and not something that occurs in the short term. It is a process during which something completely new or improved is created, or which transforms something which already exists. It could be said therefore that it is a consequence of the progress of the processes of science and technology. Innovative strategies can raise the level of logistics customer service and logistics services, thereby enhancing the work and its conditions. This results in the shortening of customer service times, and a consequent increase in demand for such services.

3. INNOVATION IN LOGISTICS AND SUPPLY CHAIN MANAGEMENT

Innovation and time are the main competitive advantages [17]. Time, here, is understood as the frequency of the introduction of new or significantly upgraded versions of the product. Its growth changes and shortens the life cycle of such products in comparison to conventional products. The different phases of the life cycle are short in-time and rapid demand-dimension [18].

The development of innovation in the perspective of supply chain management is defined as the process of making changes in products, services and processes, resulting in the creation of new value for the organization and its customers through the cooperation of that organization and / or its partners in the supply chain [9]. In turn, innovation within supply chain network has been defined as a breakthrough or incremental change in processes, structures and / or technologies aimed at creating value for stakeholders [1].

Numerous authors have long been noticing the significance of innovation in building the competitive advantage of the enterprise as well as the entire supply chain [7]. Beside costs, quality and flexibility, innovations constitute the top priority of competitiveness of the supply chain [13]. General improvement, in terms of competitive advantage, of the entire supply chain is mainly determined by innovation diffusion [15]. However, leading logistic periodicals have not devoted too much attention to the wider comprehension of innovation [5]. Even a view that in logistic studies innovations were largely ignored has been formulated [4].

As a result, the scope of literature concerning the innovation diffusion in the supply chain is limited. The literature focusing on the innovation diffusion in the field of logistics focuses mainly on the diffusion of specific technologies (Gan, Clemens, Hui Kao & Xin, 2007, p. 78).

The authors examining the phenomenon of innovations in the supply chain concentrate mainly on the cooperative dimension of innovations and their contribution to the networks or supply chains. It is obviously a substantial matter, but also a mechanism of the diffusion of previously developed innovations in the supply chain of a given company is worthy of notice [7].

On the basis of the literature review, it is suggested that the innovation diffusion in the supply chain should be understood as the process of spreading innovation within the supply chain of one company leading in the field of the supply chain. There exists a distinction into an intrinsic innovation diffusion in the supply chain and a top-down managed innovation diffusion. The top-down managed innovation diffusion is intentional in its character, and it is the process controlled by the highest management level in the supply chain. The term "innovation diffusion in the supply chain top-down managed" integrates itself into the wider notion of "innovation diffusion in the supply chain"[6].

A consequence of the booming market, which is set up to meet increasing customer demand, has led to changes in the organization of enterprises. The most important are shortening product life cycles. The first generation Volkswagen Golf, for example, was produced from 1974 until 1983. (Convertible version until 1993, and the Caddy van to 1992, while in South Africa the car was produced continuously until 2009). The latest (sixth) generation VW Golf was produced from 2008 to 2012 (only 4 years). On the other hand, extensions to the range can be seen eg. cars of the same model are offered with many variations in engine, bodywork and equipment; all this in order to better meet the needs of increasingly informed and de-manding customers. In this specific race for customer acquisition companies are seen to offer newer products but with a lower level of quality than the previous versions, a phenomena that is especially noticeable is the consumer goods market. This leads to the creation of simpler, cheaper and more attractive products for the less affluent and less prepared customers. From this premise, it can be assumed that the life cycle of that product will be shorter than its earlier versions [16]. Such products are technologically excellent and good value, however their shelf life is limited - high technology and quality level but at the durability is poor. Such market changes have led to the appearance of the phenomenon of disruptive innovation [17].

4. THE INTERNET OF THINGS

The concept of the Internet of Things was created by a British entrepreneur and founder of start-ups named Kevin Ashton. The Internet of Things is a network of people and objects connected via the internet, each with their own unique identifier and they are capable of transmitting data over a network without any direct human interaction [8]. It is believed that there are more devices connected to internet than there are people in the whole world, currently approximately there are 1.6 devices per user which are linked to the internet. It is expected in the next 5 years there will be an increase of about 33% of users which would be connected to the internet and about 400% increase in the devices or things which would get attached to the internet. **Figure 1** illustrates the increase of number of users and devices in the next couple of years.

The Internet of Things (IoT) offers new possibilities in the area of performance. For example, road transport trucks can be automatically controlled to the specification of hosts, which will allow them to operate in predefined intervals and with a standard speed, so as to maximize fuel economy. The Daimler Group has invested in the development of mobile services such as car2go, myTaxi or moovel; General Electric, likewise, has invested in systems to operate equipment and factories use a system called "industrial design" (Internet industry); LG is preparing for "smart homes", producing televisions and household appliances which can connect to the Internet, enriching the offer of related services [11].

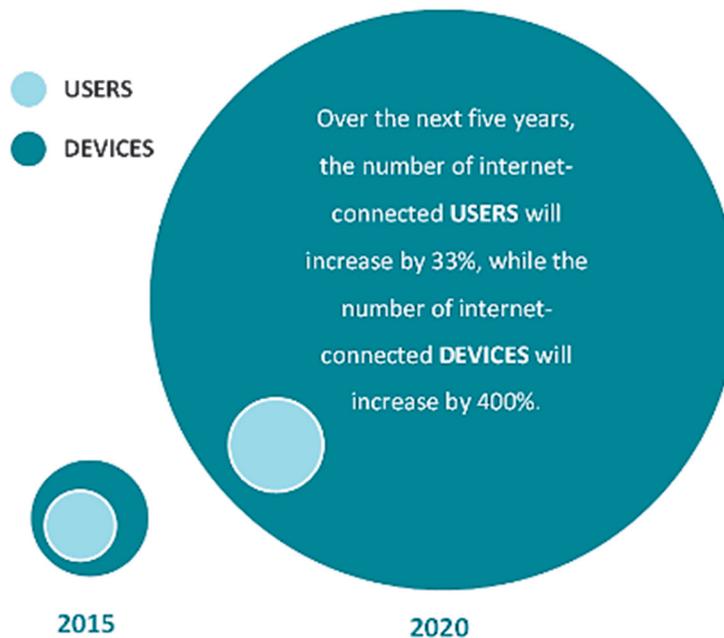


Figure 1 Estimated increase in number of users and IoT devices in the next couple of years [8]

The opportunities with Internet of Things are enormous, there are many companies and consulting firms who are analyzing the prospect and figuring out how big in terms of numbers is the opportunity with IoT. Some industrial analysts and pundits (in year 2014) predicted that by year 2020, the global market of the connected things could be between 50 billion and 100 billion devices [2].

The logistics sector, among others transportation industry like shipping, trains, aviation, etc. are already benefiting using Internet of Things technology. To fully understand the scale of the phenomenon and the number of devices that can be found within the Internet of Things, below is a list of selected potential areas where the use of IoT solutions can be seen, according to the classification adopted by O. Vermes and P. Friess [12]:

- (Smart) environment is a category of solutions, Internet of Things, which from the daily consumer perspective are the least visible. However, these are the basis for the safe operation of the entire anthropogenic environment (man-made - eg. Urban, industrial areas, agricultural areas) that make the ecosystem friendly to economic development and the functioning of societies.
- (Smart) water management, a wide range of issues related to the administration and management of key resources for the functioning of the environment. This category includes, for example: The impact of water resources on the environment, their use and protection deficits, regulation of rivers and protection against floods, waterways, hydropower or security.
- (Smart) industry is entering the area of the Internet of Things in solutions related to particular sectors of the national economy.
- (Smart) production as well as intelligent industry, includes solutions that fall within specific sectors of the economy. These are both issues related to agriculture (eg. Temperature control and irrigation to prevent drought or the formation of fungi), breeding (monitoring living conditions and grazing livestock), and control of production lines (readers, sensors, video surveillance - useful in the management and inspections) as well as control of the rotation of products on store shelves and in warehouses.
- (Smart) transport should be - apart from the above mentioned - a key element of supporting the economy. This category includes issues such as: the location of transported goods (eg. checking routes of hazardous, delicate or precious materials) control of the conditions of transport (eg. shock) or storage conditions (eg. flammable materials).

- (Smart) energy includes a number of solutions that enable management of utilities. These include the monitoring of individual consumption, as well as the processes for its production and use (eg. solar systems, windmills and water management).
- (Smart) cities is another area in which the Internet Things can play an increasingly important role. Its capabilities promise a lot of applications - from the organization of pedestrians and traffic (eg. monitoring traffic congestion, parking spaces, intelligent roads, providing information about the state of roads, traffic problems, monitoring of weather or accidents on the road), the diagnosis of safety threats (eg. vibrations and strength of materials in buildings, bridges, historic buildings), noise, lighting (eg. adaptive to the level of cloud cover) and waste management (eg. filling level of containers).
- (Smart) buildings is a whole range of facilities, which can be used both at the individual as well as industrial level: monitoring the property (eg. fences, windows, doors), motion sensors, smart irrigation, learning thermostats.
- (Smart) apartments is a category of equipment, which are typically for individual application, eg. refrigerators (informing content, shelf life, the need to replenish), remote machines (allowing use of energy at lower tariffs), cookers (for remote setting of the oven).
- (Smart) health covers a wide range of applications used in the monitoring of health and physical activity (eg. the elderly), vitality (eg. people active in sport), patient safety (both in hospital and at home).
- (Smart) life is a whole range of consumer solutions aimed at comfort and safety.

At present, several solutions based on Internet of things in transport have already been developed. These include the delivery of parcels to the boots of cars belonging to the recipients. Such solutions have been implemented by Audi, Volvo, Amazon and DHL. Through the use of appropriate systems, deliveries can be supplied directly to the car, even when it is locked. By using appropriate technology, the couriers themselves can track down customers' vehicles. The driver receives a one-time access code that can be used at certain times. Late arrival requires waiting to generate a new sequence number. A special digital key allows a courier to open the boot and leave the package intended for the owner of the vehicle.

Internet of Things is a very vast field and it covers almost all the industries available globally. Logistics and supply chain management are the areas of application where the pace and scope of changes can be clearly seen. IoT combined with the Big Data concept create the next industrial revolution noted as Industry 4.0. The term "Industry 4.0" refers to the fourth industrial revolution. The "Fourth Revolution" will use digital product models, which will be formed to a large degree in compliance with the requirements of customers, and will be produced in Smart factories.

5. CONCLUSION

Logistics in all aspects requires constant and thorough improvement, and this is achieved mainly through the use of knowledge, competence, experience and what is widely understood as the intellectual capital of the organization. Nowadays, the vast majority of businesses, including logistics companies, are determined to implement product, technical, technological and organizational innovation. Enterprises are focused on creating value for the customer, who is becoming more aware and demanding in terms of increased customer requirements relating to lead time delivery services, product availability and reliability.

Enterprises have to introduce innovative solutions, particularly in logistics because supply chain is responsible for the time and reliability of delivery. Today, companies are winning a competitive battle with efficient and efficiently managed supply chains. Well organized supply chain is becoming a key factor of competitiveness.

Information and communication technology, and particularly mobile technology allows access to the system at a convenient time and place. This changes the image of traditional trade, business, government, education, introducing e-commerce, e-business, e-government, e-learning, and many other solutions.

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