

Usage of Logistics Technologies in Slovak Enterprises

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Abstract: To survive in a competitive environment, enterprises need to improve their business processes, prosper, make changes and be open to new opportunities. One way to make a business more competitive is to use logistics technologies. By applying and using logistics technologies, the enterprise manages to improve the quality of products, processes and applies a harmonious course of business activities. The main aim of the paper is to introduce selected logistics technologies based on the knowledge base, which consisted of studying domestic and foreign literature and through the survey to find out their application and usage in the Slovak enterprises. In processing and comparing in the theoretical part of the paper, a literature search, analysis and synthesis, induction and deduction, comparison and scientific abstraction are used. In Results, sorting method, elimination method and graphical method are used. The object of the research, which was carried out by a questionnaire survey, were small, medium-sized and large enterprises operating in the Slovak Republic. From selected logistics technologies, respondents use Just in Time more than Kanban. Their use is mainly in large and medium-sized enterprises of a production nature.

Keywords: Logistics, logistics technologies, Just in Time, Kanban

1. Introduction

Due to the dynamic growth of new technologies, corporate logistics is transformed into modern logistics. Each enterprise should reflect this, flexibly adapting to market needs. The current dynamic era brings changes, new challenges and tendencies in logistics itself. If enterprise wants to compete in a fierce competition, it must submit to them, monitor their development and incorporate new modern technologies into logistics of the enterprise.

International integration, which intensifies international competition, also influences globalisation of the world and the scientific and technological progress in the field of communications [1].

In the current highly globalized environment, it is imperative that businesses deal with the quality of products and services provided, as competition is not only for the domestic market but

also for the world market. This is the reason why the company seeks to create a competitive advantage over other producers and service providers [2].

Continuous growth of competing claims and customer demands forces companies to analyse the attributes of their processes in detail, to use new methods, tools, techniques, and approaches to analysing, evaluating, managing, making changes and optimizing them [3].

The emerging new technologies are creating strategic opportunities for the organizations to build competitive advantages in various functional areas of management including logistics and supply chain management. However the degree of success depends on the selection of the right technology for the application, availability of proper organizational infrastructure, culture and management policies [4].

Introna (1991) says that technology comprises structured systems (knowledge, skills, tools, machines, etc.) designed to achieve a defined set of goals, within a defined system, through a well defined, structured set of processes and interfaces. The purpose of technology is the creation of utility or value [5].

In logistics systems, it is necessary to select and organize individual operations for optimal functioning using appropriate methods of access and management processes. It is therefore a question of ensuring that the required level of customer logistics services is ensured at the lowest cost, or that the maximum level of services is achieved when determining the amount of costs. This system flow of processes, tasks, and operations organized into partial steady-state processes is called logistics technology. Their development was also conditioned by the gradual development of modern logistics in the world [6].

Logistics technologies according to Viestová et al. (2007) are relatively consistent sets of information, handling, storage, transport and other operations that ensure a desirable relationship between logistics performance, and cost. The most important logistics technologies considered: creation of manipulation groups, automatic identification of goods, electronic data interchange, automated storage and retrieval systems, logistic information and communication technologies and computer-integrated technologies in production and circulation [7].

The essence of logistics technologies is to ensure the quality (fast, reliable and flexible) material supply, raw materials, components, parts, work in progress, finished products and goods external and internal customers, who are also actors in the supply chain as possible with minimal logistics costs [8].

Given that the topic of logistics technologies is very extensive, we have decided to approach selected logistics technologies (Just in Time and Kanban), which we consider important and inevitable from the point of view of current business logistics.

Toyota Motor Company was the first to use Just in Time, created by Ohno, who, along with other engineers, found it necessary to minimize inventory. Dessler (2003) defined Just in Time as a production management method that serves to achieve a minimum level of inventory by ensuring the supply of materials and components when they are to be used, also refers to a production philosophy that aims to optimize production processes by continuously reducing waste [9]. According to Slack & Brandon-Johnes & Johnston (2013), Just in Time is a way of planning and managing a philosophy that aims to meet the demand instantly with perfect quality and without wasting [10].

The whole concept of the JIT is differentiated from traditional production systems using push vs. pull systems of production. The push system of production pushes materials to the next stage of the production irrespective of whether time and resources are needed at the next level of production creating lot of inventories at each level of the production flow. The traditional manufacturing organizations adopt push system where they produce for inventory and work in progress. The pull system of production is where the materials are pulled by next level of the production only when is signaled or required by the next stage of production. This drastically reduces the inventory held as it does not keep any work in progress. JIT concept is built based on the concept of pull production which eliminates the total inventory [11].

Just in Time has several goals, but its main goal is to save time at each stage of the business. According to Lai & Cheng (2009), Just in Time has the following objectives, which can increase economy and efficiency by eliminating waste in production and materials; improve communication inside and outside the organization, with customers and suppliers; has the potential to reduce purchasing costs, which are a major factor for most businesses; it is a tool to reduce delivery time, reduce production time, improve production quality, increase productivity and increase customer responsiveness; tends to support organizational discipline and managerial co-responsibility and links the different areas of organization between production and accounting [12].

Just in time (JIT) manufacturing is one of the main methodologies used to enhance manufacturers' competitiveness through inventory and lead time reduction. However implementing JIT has some challenges, e.g. lack of required information sharing or communication between stakeholders, insufficient sound action or planning system etc. Internet of Things (IoT) technology has the potential to be used for acquiring data and information in real time to facilitate dynamic JIT manufacturing [13].

Kanban is one of the most revolutionary concepts seeking excellence in production management and logistics. The word Kanban consists of the words Kan - card and Ban - signal. In literal translation, it means a visualized record or ticket whose main purpose is to signal that more parts need to be manufactured or delivered.

Ohno (2013) defined Kanban as the backbone of the Toyota Production System. The carrier between the supplier and the customer is the Kanban card. These cards are used for production and inventory flow processes. The benefits of implementing this system in the enterprise have been extended to supply-customer activities [14]. Novotný (2002) refers to Kanban as a designation for a card that announces the customer's requirements for the delivery of a certain product or service in a defined quantity. This notification card may take the form of a paper or plastic card, but may also be a crate. Kanban carries information on supply requirements [15].

Kanban cards are vital component of Kanban System. It signals the need to move material within a manufacturing or production facility or move materials from an outside supplier to the production facility. The card indicate the signal that there is a depletion of product, parts etc. When received the Kanban will faster the replenishment of product. More consumption and this demand for more products are signalled by the Kanban card [16].

Kanban system is one of the tools under lean manufacturing system that can achieve minimum inventory at any one time. Kanban system provides many advantages in managing operations and business in the organization. Using Kanban system is a strategic operational decision to be used in the production lines. It helps to improve the company's productivity and at the same time minimize waste in production. The Kanban system requires production only when the demand of products is available [17].

Kanban represents the “pulling” of parts by the manufacturing process based on assembly requirements, without unnecessary storage. The essence of this system is that the call principle is used, according to which the control pulse becomes the pulse that is from the next production link. Otherwise, a feed, also called a delivery principle, according to which the control pulse is a pulse that originates from a previous manufacturing cell is commonly used. In this system, a Kanban card enters, which becomes the carrier of information for the need for material from the previous article to the next. Kanban meets the requirements of the customer because short production lead times reduce inventory due to prompt delivery to production.

2. Data and Methods

The main aim of the paper was to introduce selected logistics technologies based on the knowledge base, which consisted of studying domestic and foreign literature and through the survey to find out their application and usage in the Slovak enterprises.

The aims of the paper were achieved using several general methods of investigation. In processing and comparing in the theoretical part of the paper we used literature search, analysis and synthesis, induction and deduction, comparison and scientific abstraction. In Results, we used sorting method, elimination method and graphical method.

The object of the research, which was carried out by a questionnaire survey, were small, medium-sized and large enterprises operating in the Slovak Republic. The categorization of enterprises by size was based on the EU Commission Regulation no. 651/2014, where we considered as a small enterprise an organization with a number of employees up to 50 and an annual turnover up to EUR 10 million. As a medium-sized enterprise we considered the company with a number of employees up to 250 and an annual turnover of up to EUR 50 million. As a large enterprise we considered the company with more than 250 employees and annual turnover of more than EUR 50 million.

3. Results

The survey was carried out in the Slovak enterprises. The total number of enterprises addressed was 180, the return was 83.3%, which represented 150 enterprises. The high percentage of return indicates that enterprises are not indifferent to corporate logistics and its application and use of logistics technologies.

Of the research sample, 22.7% of enterprises in the Trnava Region were the most involved. The second place belongs to the Bratislava Region with 20% share. The third place belongs to the Trenčín Region, where enterprises participated in the survey with a share of 16.7%. Of the total number of respondents participating in the survey, the largest number of enterprises in the category obtained a medium-sized enterprise, representing 46%. The largest share of the research sample achieved the automotive industry with a share of 20.7%. The engineering industry with a share of 18.7% and electrical engineering industry with a share of 16.7% obtained a largest share in the research sample. Of the total number of respondents, manufacturing enterprises achieved for the largest share (77.3%).

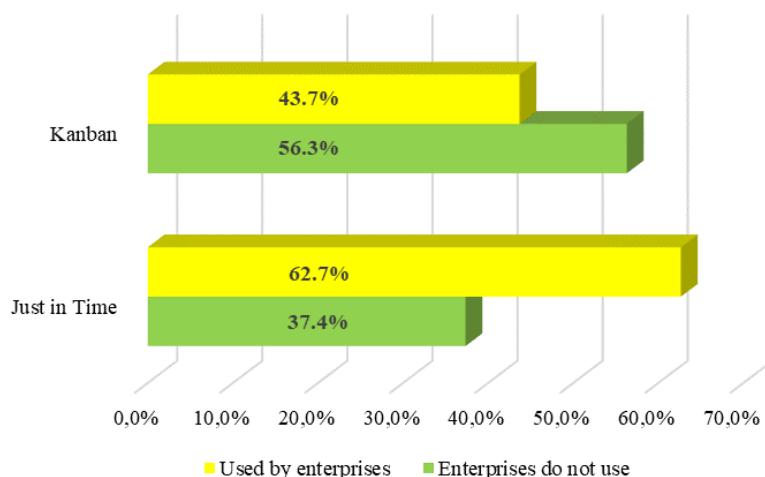


Fig. 1 Usage Just in Time and Kanban in Slovak enterprises. Source: author

Figure 1 reveals that Slovak enterprises use more Just in Time than Kanban. The percentage of use of logistics technology - Just in Time is 62.7%. This technology is not used by 37.3% of Slovak enterprises. Kanban is used by 43.7% of enterprises and 56.3% said they do not use this logistics technology.

Table 1 shows the descriptive statistics of selected logistics technologies. The mode value (0) achieved the same for Just in Time and Kanban. The highest value of median (4) achieved the technology - Just in Time. Just in Time achieved the highest standard deviation (2.362). Kanban achieved a lower standard deviation (2.311). Just in Time achieved the largest mean value (3.51). Kanban obtained the mean of value 2.50.

Table 1 Descriptive statistics. Source: author

	N		Mean	Median	Mode	Std. Deviation
	Valid	Missing				
Just in Time	150	0	3.51	4.00	6	2.362
Kanban	150	0	2.50	2.00	0	2.311

Figure 2 shows the percentage of Just in Time use in enterprises by business size. Just in Time is used mainly by large enterprises with 50.3% share. Medium-sized enterprises also have a high percentage (41.4%). The lowest percentage (8.3%) was obtained by small enterprises using Just in Time logistics technology.

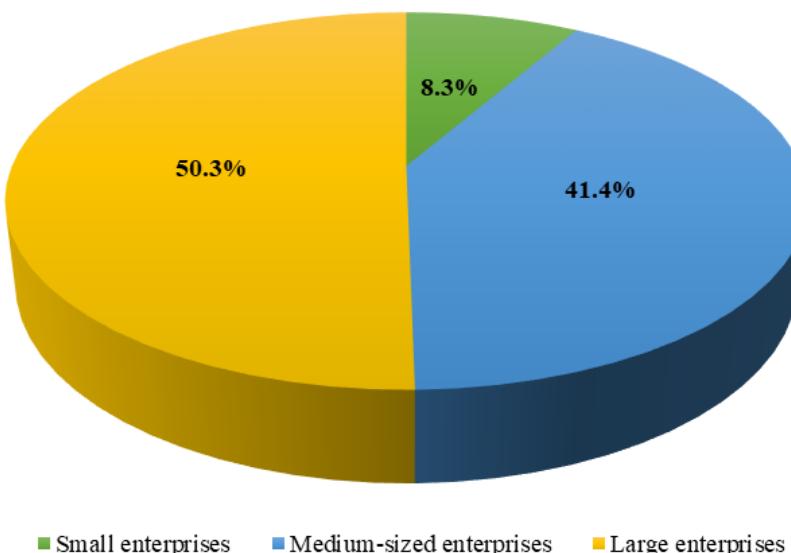


Fig. 2 Usage of Just in Time in enterprises by business size. Source: author

Kanban logistics technology is mainly used by large enterprises with a percentage of 59.2%. Medium-sized enterprises use Kanban with a share of 36.3%. The lowest percentage (4.5%) belongs to small enterprises using Kanban logistics technology. Figure 3 shows the percentage.

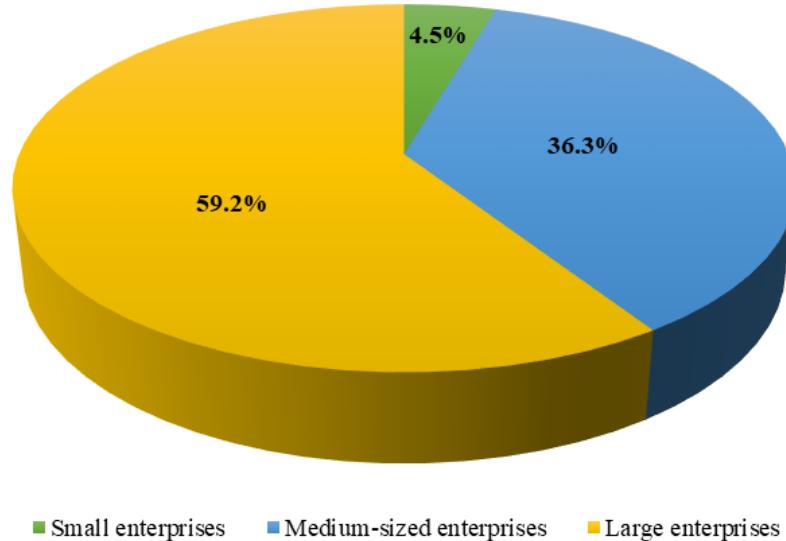


Fig. 3 Usage of Kanban in enterprises by business size. Source: author

Just in Time logistics technology is used by enterprises mainly in production logistics. This part of business logistics achieved the largest percentage of 56.6%. Enterprises use Just in Time in procurement logistics with 29.3% share. The lowest percentage (13.5%) of Just in Time usage is in distribution logistics. Figure 3 shows the percentage.

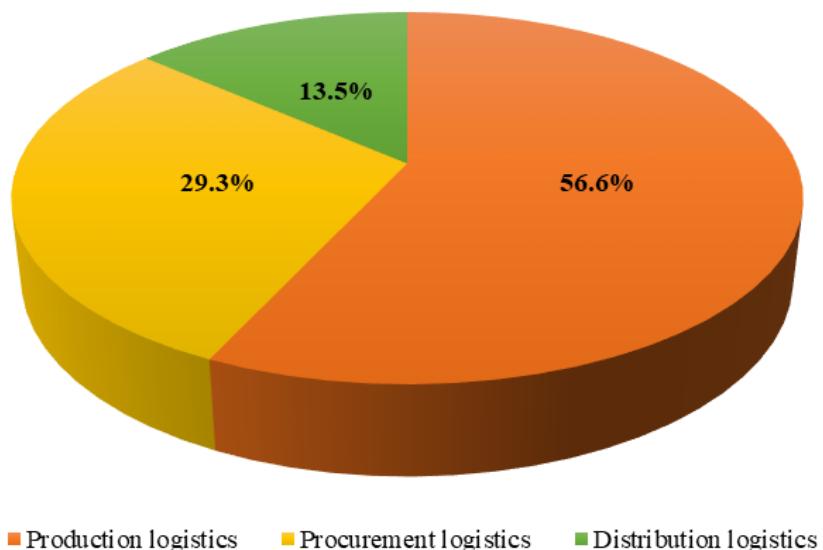


Fig. 4 Usage of Just in Time of business logistics fields. Source: author

Figure 5 shows the percentage of usage of Kanban technology in business logistics of Slovak enterprises. The enterprises usage most Kanban in production logistics. The percentage is 60.3%. Kanban is used by enterprises with a 31.8% share in procurement logistics. Kanban logistics technology is the least used (7.9%) in distribution logistics.

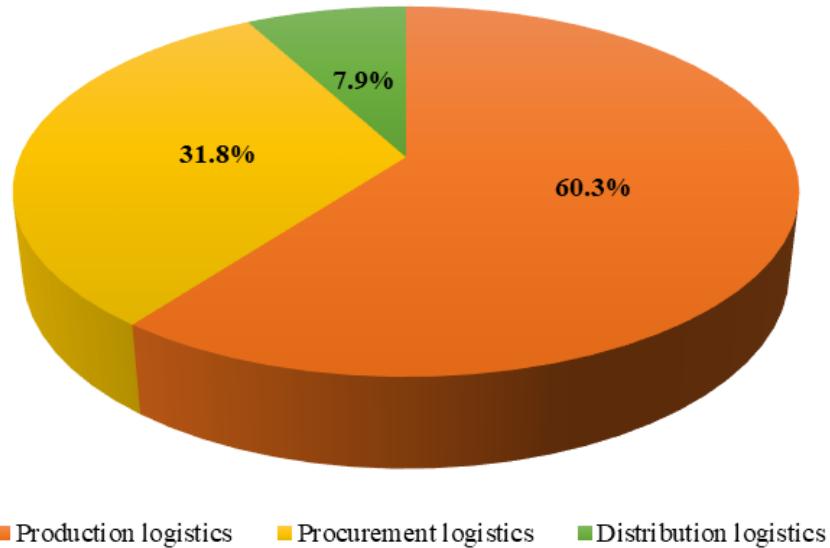


Fig. 5 Usage of Kanban of business logistics fields. Source: author

Figure 6 shows the use of Just in Time and Kanban in each type of industry. The radar graph was created based on the mean values. Just in Time is the most widely used (4.6) in wood processing industry. Just in Time also recorded a high mean usage in electrical engineering industry (4.2) and the automotive industry (4.0). The lowest mean value (1.4) of this technology was recorded in chemical industry. Kanban is the most used in electrical engineering industry (3.9). The use of Kanban logistics technology is recorded a high mean in automotive industry (3.6). The lowest mean value (0.2) was recorded in chemical industry.

Figure 7 shows the use of Just in Time and Kanban in enterprises by regions in Slovakia. The radar graph was created based on the mean values. Just in Time is mostly used in enterprises in Trnava Region. The mean value achieved 3.9. The enterprises in Košice and Prešov Regions obtained a higher mean values (3.8) in the use of Just in Time. The lowest mean value (3.2) of Just in Time technology was recorded in Trenčín Region. Kanban is the most used in enterprises in Trnava Region. The mean value achieved 3.2. Košice Region (2.6), Banská Bystrica Region (2.6) and Trenčín Region (2.5) recorded balanced mean values. The lowest mean value (1.5) of Kanban technology was recorded in enterprises of Bratislava Region.

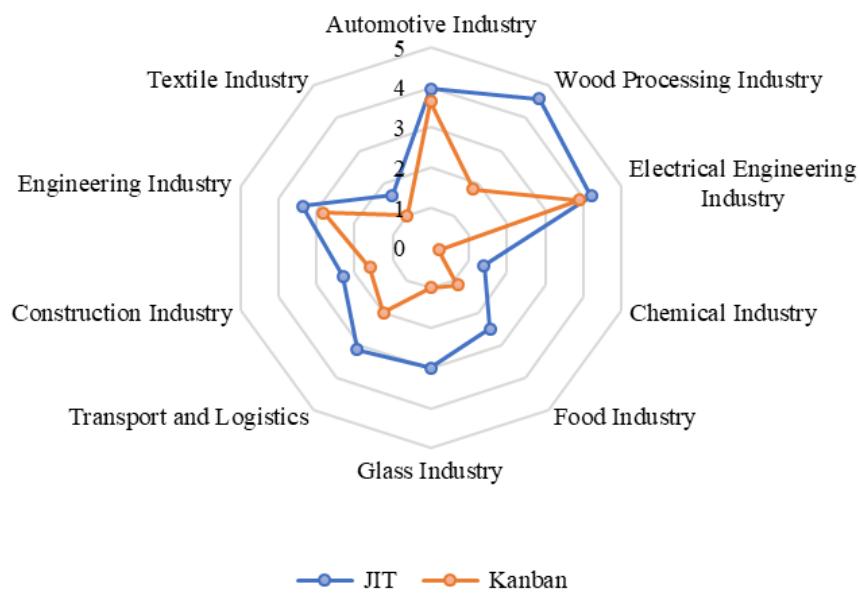


Fig. 6 Usage of Just in Time and Kanban in enterprises according to type of industry. Source: author

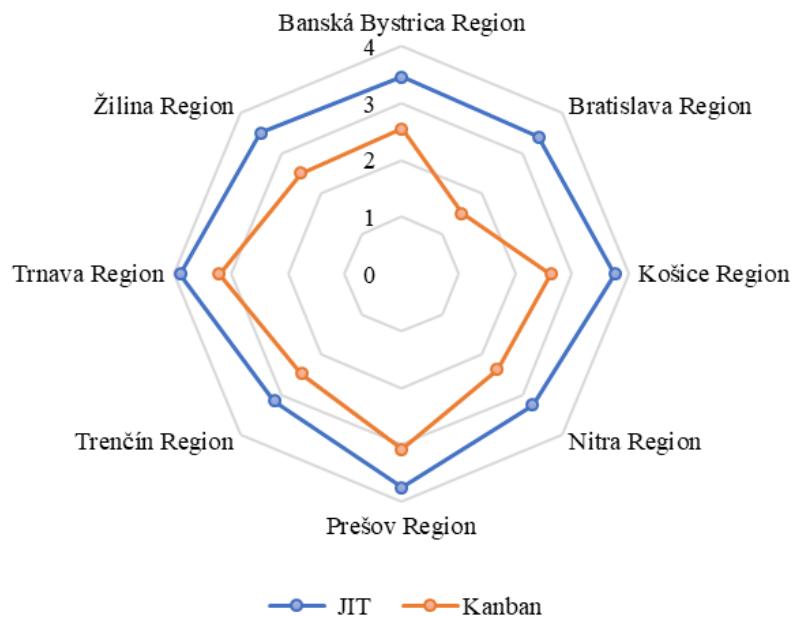


Fig. 7 Usage of Just in Time and Kanban in enterprises by regions of Slovakia. Source: author

4. Conclusion

Today's dynamic business environment brings with it a range of logistics technologies. Every enterprise has to realize that its competitive advantage in the market is not only lowering production costs and improving product quality, but also focusing on the employees themselves, so it is

important to choose a logistics technology that not only increases productivity but also helps development of motivation and creativity of employees.

The main aim of the paper was to introduce selected logistics technologies based on the knowledge base, which consisted of studying domestic and foreign literature and through the survey to find out their application and usage in the Slovak enterprises.

It is important for every enterprise to keep in mind that it maintains an excellent level of supplier-customer relations, which is possible thanks to logistics technologies. The implementation and usage of Just in Time and Kanban will streamline all business logistics processes, a prerequisite for market competitiveness.

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