

Sustainable Development of Information Systems for Logistics as a Tool to Strengthen the Competitive Ability on Global Markets

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Abstract

The main purpose of the article is to motivate experts and researchers in the field of business informatics and logistics to interdisciplinary integration in order to develop a new concept of an information system that will help to strengthen a company's competitive ability. The article analyzes the research carried out between top managers, strategic managers and managers of logistics in the largest Slovenian companies. Two hundred companies were included in the primary survey; 60 managers were selected in a representative sample and at the end 30 leaders in statistical analysis. We sent questionnaires to our managers via e-mail. The data were processed with the statistical program IBM SPSS Statistics 19, as a method we used linear regression and multiple correlation. With the primary survey, we measured satisfaction of the managers with existing information support for logistics and found that logistical, strategic information professionals need to be even more connected, so that management decisions can then be developed and sustained. On the basis of the obtained data, it can be concluded that sufficient investment of funds in the creation of an appropriate information system fosters the development of business logistics. The originality and value of the article are reflected in the interdisciplinary view of the concept of information support of logistics in the development of new products, in the original connections of various business functions, in the possibility of designing new information solutions and in the sustainable development of new services for the market.

Keywords: sustainable development, information system, logistic process, global supply chains, strengthen the competitiveness ability, strategic development of company

Introduction

The article presents thoughts and theoretical insights, and it is also a sort of challenge to combine its experience in the economy and services with scientific thinking and approach. The work offers a provocative note that encourages use of systematic and complex thinking, which will be increasingly present in business logistics, IT, the development of new products and the strategic and sustainable development of companies. Logistics is becoming a knowledge management, with the right product / service at the right time and space and with the right price to create added value for a company.

ORIGINAL SCIENTIFIC PAPER

RECEIVED: APRIL 2019

REVISED: MAY 2019

ACCEPTED: JUNE 2019

DOI: 10.2478/ngoe-2019-0006

UDK: 004.775:339.137.2:005.412

JEL: L86, M15, O32

Citation: Štor, M. (2019). Sustainable Development of Information Systems for Logistics as a Tool to Strengthen the Competitive Ability on Global Markets. *Naše gospodarstvo/Our Economy*, 65(2), 3–10. DOI: 10.2478/ngoe-2019-0006

**NG
OE**

**NAŠE GOSPODARSTVO
OUR ECONOMY**

Vol. 65 | No. 2 | 2019

pp. 3–10

On the basis of many years of experience we see an urgent problem in regard to how to launch the right information at the right time, the right place and with the right decision-makers. Globalization and strengthening the competitive capabilities of companies places new challenges ahead of management, capital, professions and science, which continue to produce more and more new products, which require appropriate logistics and information support. Obviously, there are slightly different views on the same subject matter. We want to do business as efficiently as possible, which means that we want to use the available resources efficiently, to effectively implement procedures, and to manage relations with suppliers and customers well. The harsh borders of the aforementioned views on the company's business are difficult to figure it, all depends primarily on the look of at the company and on the nature of the business.

An interdisciplinary approach enables to conclude that the areas of strategic and development management, logistics and IT are those that are not yet used, too often ignored, and hide important potentials for maintaining and increasing a company's competitive ability. As the market demands ever-improved products and services, after careful consideration, it can be found that among the most important generators of strengthening the competitive ability of companies in the future, the modern concept of logistics development in new products is supported by state-of-the-art information technology.

The subjects of the research will be strategic management and product development, links between the process of product development and logistics processes as well as information systems in companies, research and study of good practices and analysis of them and the creation of guidelines for the compilation of logistics optimization models in connection with the development of products using qualitative mathematical methods or using computer simulations. The subject area is highly interdisciplinary, and the foreseeable concept of the information system model for supporting logistics in the development of new products has many assumptions that are constantly changing via the turbulent modern business world. The relevance of this article is thus illustrated by the fact that the problem is considered interdisciplinary, because in addition to logistics and the development of new products, we also touch upon other areas, such as: strategic, marketing and product management, business economics, accounting and finance, business informatics, etc. The connection between these areas represents the uniqueness of the theme. The results will be interesting both for science and for companies, because we all want personal sustainable development and wider social well-being.

Strengthening the competitiveness of individual companies in terms of strategic development also affects strengthening of competitiveness of the global economy. According to Porter, the competitiveness of a country depends on the productivity of its enterprises, as they are intertwined with the quality of the national economic environment. The basic competitiveness therefore lies in the productivity of production of high-quality products and the services of recognized brands, which enables the creation of a strong currency and high wages, resulting in a high standard and prosperity in the country (Kregar-Brus, 2009, p. 25).

The development of management should take into account the advanced technologies of the new industrial revolution, the digitization of the world, the changing habits and the form of consumption, which is aimed at finding technical, technological and professional solutions that will meet the needs of people (Zelenika & Pupovac, 2008). Certainly, the characteristics of modern sustainable development have sought in the development of Industry 4.0, in which a great leap in thinking has been made. Industry 4.0 refers to the intelligent networking of industrial machines and processes with the use of ICT technology, which has made it possible to directly connect subjects (Plattform 4.0, 2018).

Regarding the correlation between logistics processes and the development of new products, no significant results are yet to be found; thus we can examine only part of the thinking, which has a basis in the sense of managing new products separately from logistics management. It is common to both areas to be overwhelmed with the elements of project management, where there is a high level of risk. A new product can thus be a completely "missed" project if it does not work systematically, decisively and persistently; it is exactly the same with logistics, where it is necessary to move goods along the planned transport route. In any case, in the future, more synergy effects will be needed between product development and logistics (e.g., strengthening competitiveness and increasing profits) in order to identify and eliminate "hidden reserves" in companies, institutions, organizations, technology and the workforce. The synergy effects between the management of new products and logistics are undoubtedly influenced by factors such as, specificity of the industry, sales markets, purchasing markets, competition, etc. (Andersson, 2007, p. 27).

The introduction of new logistics services in the development of new products or services will have to be absolutely supported by modern management and owners in modern companies. Managers and business owners can forget about congestion and excitement by including executors of set business strategies into the phase of strategy formation, which can also be called the missing elements of strategy design (Dandira, 2011, p. 30). Problems arising in the

development of new products or services, therefore, begin to arise in the event of a strategy without intelligence or that when using intelligence one does not have a clear strategy (Gilad, 2011, p. 4). In order to avoid such problems, it will be necessary to globalize research on strategies, maintain continuous pluralism in this area, create a new synthesis of the current research, support cooperation between scientists and experts in companies regarding the implementation of business strategies and determine the criteria for measuring their effects (Lampel, 2010, p. 4, Antonacopoulos, 2010, p. 391). It is also worthwhile to monitor the competitive ability of the company, which is reflected in the market results (market share, share of sales to foreign markets, coverage level), through the market characteristics of products (competition prices, product quality) and through the quality of business functions (marketing, logistics, HRM, technology and development), which together constitute a company's strategic position (Kovač, 2010, p. 71) and the need for the creation of an information system for supporting logistics in the development of new products.

Managers are increasingly aware of reliable and effective decision-making processes, thus the emergence of demand for information support for processes and decision-making has prompted developers of information systems to begin to develop managerial information systems. Most of these systems are based on artificial intelligence methods and a simple user interface and open possibilities for using different data operations (Kovač, 2010, p. 84). Through the full spectrum of the logistics chain from the manufacturer to the final consumer, companies want to improve their services and reduce costs; in short, they want to optimize their production. For effective control and optimization of logistics chains, SCM solutions have proved to be the most important ones, which means Supply Chain Management, which is among today's popular shortcuts, e.g., ERP, CRM and the like.

Methods

The key weaknesses of information systems in logistics, which are most often mentioned in research (e.g., Andersson (2007), Bobek&Sternad (2007), Dandira (2011), Gillad (2011), Grover, Berghel&Cobb (2011), Klasing, Markue&Pelc (2008), Kovač (2010), Manuj et al (2010), Zelenika&Pupovac (2008), Wong (2009) and others), were the long response times from the receipt of the order to the delivery of the ordered goods, which usually resulted in errors in the supply, insufficient traceability of the goods according to the chosen criteria, and problems with the marking of goods upon shipment. Often the causes for the

goods reclamation were multiple manual entries, which increased the likelihood of errors. In any case, there may be problematic time delays during the implementation of physical manipulation and entry into the information system.

This article investigates the means of sustainable development, logistics process and business information systems, which are the most widespread in business logistics. We present the results of a study whose purpose was to examine the basic information for sustainable development of business logistics. In exploring these issues, we have sought the following goals:

- to find good concepts for sustainable development for a modern economy;
- to examine new ideas, solutions and innovations in the field of information system for logistics in Slovenia and abroad;
- to find good concepts for logistics management in companies;
- to connect good practices in the economy with the findings of the profession

Using the deductive method derived from general observation, defined by the theory or the study of secondary sources and practical conclusions on the dependence between the analyzed phenomena, we want to evaluate the following hypothesis:

H1: IT support positively influences corporate management including logistic processes.

The observed variables will thus be appropriate IT support, key elements of the logistics process, and strategic, corporate management because on the basis of literature review and many years of our own experience, we have concluded that these are the main building blocks of sustainable development and a tool for strengthening the competitiveness of companies.

Research

For the needs of primary research, we involved major companies in Slovenia, which have formed departments of information technology and logistics and their leader. The research sample consisted of 60 managers from the automotive cluster of Slovenia. The companies of the Slovenian Automotive Cluster (ACS) have been selected because they are among the most developed enterprises of the Slovenian economy with a high competitive advantage, and for smooth operation and development, information support of logistics in the development of new products is important. Most

enterprises in this group of companies are in the majority of cases, large and medium-sized (from 100 to over 3,000 employees) thus representing an appropriate sample of companies, as they need to work hard on the development of new products in order to strengthen their competitive ability. A sample of quantitative research consists of representatives of the top and strategic management of ACS members, representing 95 managers, 30 replied. This is a random sample. Individual units were not previously selected according to predefined criteria, and the structure of the sample reflects the structure of the entire population.

First, we surveyed top management by e-mail and then, if necessary, strategic management by phone. A questionnaire was first tested on a small sample of companies in cooperation with experts and scientists. Primary data obtained in the quantitative survey were analyzed by methods of descriptive statistics. In the empirical analysis we included 30 managers, where logistics is a part of the strategic development of a company and, together with the development of information systems, strengthens its competitiveness. After the execution of the survey, we appropriately analyzed the collected data using statistical methods (multiple linear regression) and statistical software tool, IBM SPSS Statistics 19.

Analysis

In the questionnaire we checked this hypothesis with the question:

- Are employees of the company aware of the importance of information support in the development of logistic processes and corporate management?

The response rate was as follows: 50% of responses were affirmative, 25% negative and 25% undefined.

Due to the fact that processes in information technology and logistics are also important in corporate management, we have to define the status of the variables for statistical processing purposes. Multiple regression analysis helped us to determine how much appropriate information support and key elements of logistics (independent variables) contribute to clarifying the variability of corporate management (dependent variables). The results are presented in tables 1-3.

Table 1. Summary of the model

Model	R	R ²	Estimated R ²	Standard error rating
1	0.489 ^a	0.239	0.183	0.886

a. Variables: (independent), key elements of logistics, appropriate information support

Table 2. ANOVA

Model ^{a,b}	Sum of Squares	Number of Units	Square squares	F	Sig.
Regression	6.663	2	3.332	4.242	0.025 ^a
1 The rest	21.203	28	0.785		
Together	27.867	30			

a. Independent variables: Key elements of logistics, Appropriate information support

b. Dependent variable: Corporate management

The influence of relevant information support and key elements of logistics to corporate management was verified by the following regression model:

- Corporate management = f (relevant IT support, key elements of logistics);
- R (multiple correlation coefficient) is 0.489, and we can speak of a medium strong link between variables (relevant information support, key elements of logistics and corporate governance);
- R² (multiple determination coefficient) is 0.239 and testifies that 23.9% of corporate governance depends on adequate information support and key elements of logistics, while 76.1% on other factors;
- The F statistic of 4.242 is statistically significant, which confirms the overall significance of our model.

Table 3. Multiple Linear Regression

Model ^a	Non-standardized Coefficients		Standardized Coefficients	t	Sig.
	b	Stand. error	Beta		
Constant	1.174	1.152		1.020	0.317
Appropriate information support	0.556	0.211	0.458	2.639	0.014
Key elements of logistics	0.130	0.255	0.089	0.512	0.613

Dependent variable: Corporate management

The results in Table 3 can be interpreted as follows. The multiple linear regression equation can be written as:

$$Y = b_0 + b_1X_1 + b_2X_2$$

$$Y = 1.174 + 0.556X_1 + 0.130X_2$$

Corporate management = 1.174 + 0.556 * (relevant information support) + 0.130 * (key logistics elements)

The estimated t-statistics indicate that the estimated coefficient of relevant information support is statistically significantly different from 0 at 5% significance level. This result

applies that the relevant information support influence the corporate management of observed companies. Thus, on the basis of the estimated regression model (corporate governance = f (relevant information support, key elements of logistics)), we can claim that each EUR invested in appropriate information support on average improves corporate management by 0.556 EUR.

We can also argue that insofar as management and company owners invest funds in modern information support including logistics; on the other hand, they reduce operating costs and increase the efficiency of corporate management. At the right time, management typically has the right information at the right place, on the basis of which it makes the right business decisions for the realization of strategic goals, business strategies, goals, mission and company policies. Finally, on the basis of testing and argumentation, we can confirm the H1 hypothesis, which means that the relevant information support has a positive influence on corporate governance including logistics. In the end, we should mention that managers will be able to evaluate the positive impact of adequate information support on logistic processes in the future, once we carry out this type of research again.

Discussion

The particularity of the sustainable development of logistics management in the industry is in its continuous technological and organizational development. With the help of appropriate management, it is about introducing completely autonomous processes of preparation of production, of the production itself and especially of production processes, which should enable better preparation of goods for the buyer (Seitza & Nyhuisa, 2015). It is the sustainable logistic development, which is reflected through the introduction of autonomous packaging, palletizing, storage, supply, etc., consistently applying industry guidelines 4.0 (Mayer et al., 2018). The goal of sustainable development of IT support in logistics is to provide a completely autonomous system for data processing, orders, preparation of a production plan and implementation of the production itself. This enables us to combine mathematical optimization with data intelligence, which is the basis for the development of IT tools for planning and operation in industrial production systems, taking into account the achievements of lean production. It is a set of tools, skills and knowledge of logistics management for the detection and on-going elimination of unwanted waste of production, improvement of product quality, reduction of production times and reduction of the costs of business operations (BMW, 2018).

At the global level, industry and the whole economy are striving to introduce the latest smart technology. This need is especially evident in the automotive industry, which has introduced a virtual world in which a new, modern and technologically improved mode of production is based. With the help of digitalization and computer equipment and simulation programs, the development departments now enable, for example, the construction of individual tools for the manufacture of motor vehicle parts. We have found that the task of sustainable development is to transform the industry, to transform human beings and to establish production, which will be oriented toward the protection of the human environment: further in the production of those products, devices will assist a person in development. The introduction of smart technology is the main module of sustainable development; therefore any modernization of production and logistics processes is a systemic improvement. The field of research goes back to the development of Industry 4.0 and using automated equipment and intelligent systems goes beyond the limits of current development, which tells us that the development guidelines for Industry 5.0 are already in development, which will fully digitize the world. Today, it is impossible to compete in the market competitively if there is no adequate information support for a company's business, as it is impossible to manage business logistics without the use of bar codes, RFID and GPS navigation systems. Concrete support is reflected in the development of robotized and intelligent transport of complete traceability of goods on the road, in the introduction of new ways of identifying even with several dimensional bar codes, in RFID and more widely in GPS navigation systems (Mehami et al., 2018).

Many authors (Dandira, 2011, p. 31, Grover et al., 2011, p. 5, Shanuanu et al., 2010, p. 268) find that the paradigm of supply chain management extends to the field of enterprise resource planning (ERP) systems and customer relationship management (CRM) systems. The fact is that IT support must be treated integrally; otherwise, we would only transfer costs from non-optimal operating procedures to nonoptimal information procedures. In manufacturing organizations, the core of the business mostly based in production, which is why integrated information support is usually based around the ERP system. These systems are traditionally based on a combination of material planning (MRP) and capacity. Today, it is a modern term for combined Advanced Planning Systems (APS), integrated into supply chain management (Bobek & Sternad, 2007, p. 3, Klasing et al., 2008, p. 27).

Information logistics support will be required in the entire information system of a modern enterprise based on the study of secondary sources (Wong, 2009, p. 148, Manuj,

2010, p. 53, Grover et al., 2011, p. 2) and our own thinking on at least three conditions:

- the planned IT system should cover the points of contact among the three main areas (logistics, IT and corporate governance);
- the planned information system of this kind must be robust to the extent that sufficient flexibility and adaptation according to the life cycle of the product;
- the planned IT system must enable the implementation of theoretical models, which can be applied to the business environment with minimal changes.

In empirical research, we focused on the development of information support for logistics and corporate governance, which demonstrated how it is possible to detect bottlenecks in the goods flow (lack of attention is devoted to managing inventory of goods, optimizing the costs of logistics and development, further mistrust is typical among employees, along with non-transparent and inefficient processes that lack the proper knowledge and human resources, etc.), where it is necessary to establish certain mechanisms (appropriate logistics management that sets the right goals and strategy of logistics, which is possible with appropriate information support), which must be harmonized so that a logistics infrastructure becomes the subject of strategic development of the company and logistics profession.

Conclusion

We presented various approaches and concepts of logistics support for the development of new products that relate to a sample of companies from a highly developed and competitive industry in Slovenia, which, according to other available research, are the most suitable for comparison. According to our survey for the identification of information needs in the development of logistics and corporate governance, which are important for the design of the concept of information support logistics, we found:

- modern enterprises interconnect creativity and innovation of all employees;

- that in the observed companies logistics has been developed in the past unsystematically;
- that logistics and development are not sufficiently complementary;
- that employees' awareness of the importance of information support in the processes of logistics development is insufficient;
- bottlenecks in the links among logistics, development and informatics (all these areas are too low in the hierarchy of decision-making, lack of information flow, etc.);
- that key personnel in the logistic profession are important in the development of new products;
- the main obstacles to cooperation among logistics and development are insufficient knowledge of these areas of top management and strategic management;
- important links between logistics, development, information technology and competitiveness of the company;
- there is still insufficient awareness of the overall organization of business logistics and the development of new products;
- that the influence of modern entrepreneurial approaches and strategic management on the management of logistics, development and IT costs are significant and
- significant influence of strategic management on the optimization of the observed business functions: business logistics, development and informatics on the profit of the company.

The results of quantitative research have shown that management of the observed companies is aware of the connection among logistic, development and informatics, but there are obstacles such as:

- too-late integration of logistics into development;
- insufficient awareness of the intertwining of logistics, development and informatics;
- lack of staff with specific technical skills;
- lack of professionals with interdisciplinary skills;
- lack of developers;
- absence of strategic management;
- presence of functional silos and
- lack of ideas, approaches and concepts for strengthening competitive capabilities of companies, etc.

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Trajnostni razvoj informacijskega sistema za logistiko kot orodje za krepitev konkurenčnosti na globalnih trgih

Izvleček

Glavni namen članka je motiviranje strokovnjakov in raziskovalcev na področju poslovne informatike ter logistike k interdisciplinarnemu povezovanju, da bi razvili nov koncept informacijskega sistema, ki bi pomagal okrepiti konkurenčno sposobnost podjetja. Članek analizira raziskavo, ki smo jo izvedli med top in strateškimi menedžerji ter vodji logistike v največjih slovenskih podjetjih. V primarno raziskavo je bilo vključenih dvesto podjetij, v reprezentativni vzorec jih je bilo izbranih šestdeset menedžerjev in na koncu trideset vodij v statistično analizo. Menedžerjem smo poslali vprašalnike po elektronski pošti. Podatke smo obdelali s statističnim programom IBM SPSS Statistics 19, kot metodi pa smo uporabili linearno regresijo in multiplo korelacijo. S primarno raziskavo smo pri vodstvenih delavcih izmerili zadovoljstvo z obstoječo informacijsko podporo za logistiko in ugotovili, da morajo biti logistični, strateški informacijski strokovnjaki še bolj povezani, da so potem vodstvene odločitve lahko tudi razvojne ter trajnostne. Na podlagi pridobljenih podatkov lahko sklepamo, da zadostno vlaganje finančnih sredstev v oblikovanje ustreznega informacijskega sistema pospešuje razvoj poslovne logistike. Izvirnost in vrednost članka se kaže v interdisciplinarnem pogledu na koncept informacijske podpore logistike pri razvoju novih izdelkov, v izvirnih povezavah različnih poslovnih funkcij, v možnosti oblikovanja novih informacijskih rešitev in v trajnostnem razvoju novih storitev za trg.

Ključne besede: Trajnostni razvoj, informacijski sistem, logistični proces, globalne dobavne verige, krepitev konkurenčne sposobnosti, strateški razvoj podjetja