

THE USE OF IT SYSTEMS SUPPORTING THE REALIZATION OF BUSINESS PROCESSES IN ENTERPRISES AND SUPPLY CHAINS IN POLAND

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Abstract: In the dynamically changing environment, businesses increasingly cooperate within the framework of a supply chain which coordinates and integrates processes. Such tasks can be realized through the implementation of appropriate IT systems, especially those for resource planning in individual enterprises and those for supply chains management in systems of enterprises. The goal of the article is to analyze of the level of use of IT technologies in resource planning and supply chain management in the sector of small, medium and large-sized businesses in Poland. We look closely at the following variables: the number of enterprises using ERP software packages for transmitting information between different departments (e.g., accounting, marketing, production), and the number of enterprises using information technology in supply chain management. The years 2010-2012 is the analyzed period.

Key words: supply chain, supply chain management systems, enterprises resource planning

Introduction

Businesses nowadays are increasingly looking for cooperation opportunities in order to improve their efficiency and effectiveness. They show some inclination to sharing the risk with their partners. An accepted method of cooperation can minimize the risk on one hand and determine the management tools and methods on the other. The supply chain is one of the ways in which businesses can cooperate. Supply chains can have various structures to fit the type of functions of their participants, e.g. operational activity, marketing activity, the achieved results. (Dass and Fox, 2011).

One of the main challenges in supply chains management is the distribution of profits and benefits among participants. This requires an effective information flow which is vital for the process of economic integration (Ding et al., 2011). The exchange and management of information is possible through supply chain management (SCM) systems. They are based on applications with integrated information concerning the functioning of individual members of a supply chain and the integration of information is realized with help of enterprise resource planning (ERP) systems. The article points to the common problems connected with IT systems supporting resource planning in an enterprise and information management in supply chains.

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The role of Information Technologies in supply chain management

Consumers' expectations concerning products, services and support are constantly growing which makes businesses increase their specialization and cooperation within supply chains. Nowadays the supply chain is seen as a major ingredient of success in an enterprise (Estampe et al., 2013). It is understood as a network of businesses cooperating with a view to create a value in terms of products and services and thus becomes an answer to the growing importance of the relationship between customers and suppliers (Rakowska, 2008). The most frequently mentioned definitions of a supply chain are listed in table 1.

Table 1. Definitions of supply chain (adapted from Pettersson and Segerstedt, 2013)

Author	Definition
Christopher	Supply chain is „the network of organisations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate customer”
Ballou	„A supply chain refers to all those activities associated with the transformation and flow of goods and services, including their attendant information flows, from the sources of raw materials to end users”
Shapiro	„A supply chain comprises geographically dispersed facilities where raw material and inter- mediate or finished products are acquired, transformed, stored or sold, and the transportation links that connect the facilities along which products flow”

The main goal of a supply chain management is to deliver the right product to the right place at the right price and right cost which can only work out if the supply chain members coordinate their decisions, share information (Zhang and Chen, 2013), and realize what matters most in making themselves competitive (Cheng and Fu, 2013). Table 2 presents the definitions of supply chain management.

Supply chain management organizes effective and efficient material flows between the partners in the chain. Most definitions of both the supply chain and the management of supply chains underline the importance of networking between cooperating entities. It determines the number of connections and the ways of information exchange between partners. However, it is not possible to share information and knowledge between businesses organized into a net without the use of IT systems. They help maintain relationships between sellers and buyers (Strzelecka, 2012) and “help managers analyze problems, visualize complex objects and create new products” (Pieńskowska and Sołtysik-Piorunkiewicz, 2013).

Table 2. Definitions of supply chain management (adapted from Croom et al., 2000)

Author	Definition
Tan et al. (1998)	Supply chain management encompasses materials/supply management from the supply of basic raw materials to final product (and possible recycling and re-use). Supply chain management focuses on how firms utilise their suppliers' processes, technology and capability to enhance competitive advantage. It is a management philosophy that extends traditional intra-enterprise activities by bringing trading partners together with the common goal of optimisation and efficiency.
Berry et al. (1994)	Supply chain management aims at building trust, exchanging information on market needs, developing new products, and reducing the supplier base to a particular OEM (original equipment manufacturer) so as to release management resources for developing meaningful, long term relationship.
Jones and Riley (1985)	An integrative approach to dealing with the planning and control of the materials flow from suppliers to end-users.
Saunders (1995)	External Chain is the total chain of exchange from original source of raw material, through the various firms involved in extracting and processing raw materials, manufacturing, assembling, distributing and retailing to ultimate end customers.
Ellram (1991)	A network of firms interacting to deliver product or service to the end customer, linking flows from raw material supply to final delivery.
Christopher (1992)	Network of organisations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate consumer.
Lee and Billington (1992)	Networks of manufacturing and distribution sites that procure raw materials, transform them into intermediate and finished products, and distribute the finished products to customers.
Kopczak (1997)	The set of entities, including suppliers, logistics services providers, manufacturers, distributors and resellers, through which materials, products and information flow.
Lee and Ng (1997)	A network of entities that starts with the suppliers' supplier and ends with the customers' custom the production and delivery of goods and services.

Information technologies ensure easy access to vital information for every enterprise in the chain which makes the realization of business processes smoother and more effective. That is why IT are indispensable for gaining competitive advantage (Liu et al., 2013) both as an individual business and as the whole supply chain. Table 3 shows the functions of IT according to different places in the supply chain.

Table 3. Role of IT in supply chain management (own elaboration based on Prajogo and Olhager, 2012)

Areas	IT functions
Communication	IT allows firms to increase the volume and complexity of information which needs to be communicated with their trading partners
Management and control	IT allows firms to provide real-time supply chain information, including inventory level, delivery status, and production planning and scheduling which enables firms to manage and control its supply chain activities
Coordination	IT facilitates the alignment of forecasting and scheduling of operations between firms and suppliers, allowing better inter-firms coordination

One of the key reasons for using IT in an enterprise is the maximization of business benefits (Szajt, 2006). Therefore, although there have been doubts concerning the positive effects of using IT in supply chains (Li et al., 2009), their functioning would not be possible without IT support.

Supply chain management systems and enterprise resource planning systems

Cooperation within a supply chain requires efficient inter-organizational information systems (IOIS). Systems of this type “comprise boundary spanning technologies and value-added networks that link suppliers and buyers” (Rajaguru and Matanda, 2013). The supply chain management system (SCM) is a technology allowing for the synchronization of information and material flows. “A SCM system is a key enabler of effective SCM, which provides information and information processing capability to support the strategy, operations, and decision-making functions for the firm’s supply chain network” (Cao et al., 2013). The SCM system integrates interior and exterior business processes of an enterprise with the use of Internet websites or electronic data exchange (XML, EDIFACT etc.). Biggest benefits of employing SCM are (Cao et al., 2013):

- minimizing the bullwhip effect,
- maximizing the efficiency of activities,
- reducing inventories,
- lowering cycle times,
- and achieving an acceptable level of quality.

For the implementation of SCM it is essential that the data allowing for the optimization of the supply chain is accessible. This is assured by a reliable ERP system. The two systems complement each other as the SCM takes information from applications in which the ERP integrates it all (Ciesielski ed., 2009). Therefore, the success of the SCM depends on the implementation of the ERP systems by individual partners in the supply chain. The contemporary ERP systems “are embedded by the promise of integration that standardizes operations and

thereby enables their centralized management” (Teittinen et al., 2013). Investigation on the implementation of ERP systems in an enterprise led to the following conclusions (Uwizeyemungu and Raymond, 2012):

- “Once the implementation of an ERP system is achieved, the positive effects of the system outweigh its negative effects.
- The ERP system’s impact on organizational performance results more from using the business process information made available by the system than from the automation or transformation of these processes by the system.
- The relative weight of ERP informational effects in comparison to automational and transformational effects is directly proportional to the size of the firm, that is, the bigger the firm, the greater the relative importance of ERP informational effects.
- ERP transformational effects will be more significant in small firms than in large ones.
- The contribution of an ERP system to organisational performance is inversely related to the level of vertical integration (subset of ERP integration capabilities) induced in the firm by the system.
- The ERP potential realised is greater for the firms that have developed all three ERP capabilities (integration-flexibility-transversality) more or less equally than for the firms that have highly developed only one or two capabilities at the expense of the others.
- The nature and magnitude of ERP value realised by the firm depend on the type of ERP capabilities that it has developed”.

And so the SCM system is actually an extension or an advanced version of the ERP system. They both are complementary and an effective ERP system installed in a firm is a basis for the implementation of the SCM system.

Enterprises with ERP or SCM systems in Poland

ERP and SCM stems are much interrelated. The analysis looks at their use in Polish businesses, at the number of enterprises using ERP software packages for transmitting information between different departments (e.g., accounting, marketing, production) and at the number of enterprises using information technology in supply chain management. That is done individually for the groups of small, medium and big enterprises in the years 2008-2012.

Figures 1-2 show the structure indexes for enterprises using IT systems supporting their logistic processes according to the enterprise size.

In all examined years, small enterprises had the biggest share in enterprises using ERP software packages for transmitting information between different departments (Figure 1), and it grew slightly every year. The smallest group using IT systems for resource planning are large-sized enterprises. Their percentage among all enterprises using ERP systems in 2012, 2010 and 2008 was not higher than 4%,

20% and 8% respectively. The percentage of medium and large-sized enterprises in enterprises using IT systems for supporting decisions concerning their resources went down in 2012 compared to 2008.

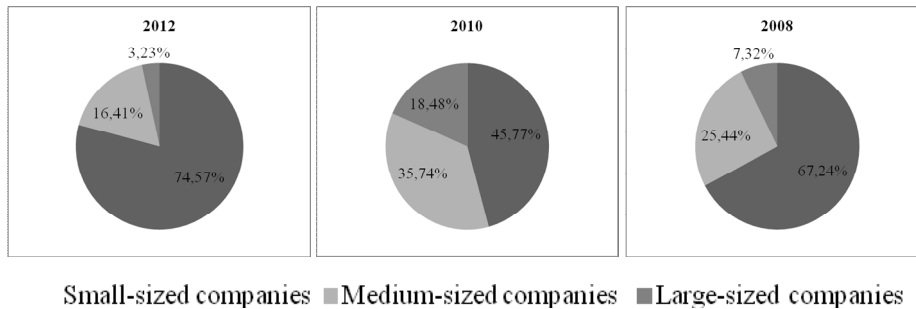


Figure 1. Frequency coefficient for enterprises using ERP software packages for transmitting information between different departments (e.g., accounting, marketing, production) (Author's calculation based on GUS database)

Much bigger differences are to be observed in the years 2008-2012 in the structure of enterprises using information technology in supply chain management (Figure 2).

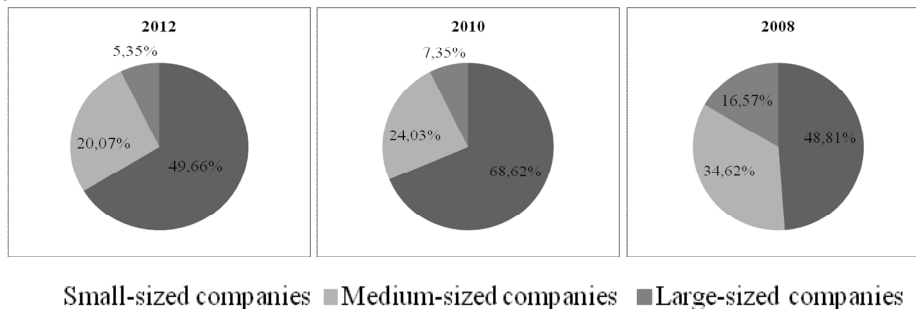


Figure 2. Frequency coefficient for enterprises using information technology in supply chain management (Author's calculation based on GUS database)

Similarly to the number of enterprises using ERP systems, small businesses are the biggest percentage of enterprises implementing IT systems supporting the realization of logistic processes in a supply chain. And again, the large-sized firms make the smallest part of such enterprises. In 2012 compared to 2008, the percentage of small firms in this respect grew slightly and the percentage of large-sized and medium firms dropped considerably. The percentage of small enterprises in enterprises using information technology in supply chain management in 2010 compared to 2008 increased by as much as 19.81%, but in 2012 was only 0.85% higher than in 2008. Table 4 presents the percentages of individual enterprise groups with respect to the use of ERP and SCM systems.

Table 4. The percentages of individual enterprise groups with respect to the use of ERP and SCM systems [%]

Specification	Enterprises using ERP software packages for transmitting information between different departments			Enterprises using information technology in supply chain management		
	2012	2010	2008	2012	2010	2008
Small-sized companies	23.20	6.63	12.17	8.33	15.07	7.56
Medium-sized companies	30.59	21.96	19.65	27.79	22.39	22.89
Large-sized companies	41.43	57.86	26.28	68.99	34.90	50.91

IT systems supporting the decision making processes concerning logistic processes in an enterprise and in the whole supply chain are implemented by large-sized enterprises. In 2012 41.43% (a result higher by 15.15% in comparison to 2012) of large-sized companies used ERP software packages for transmitting information between different departments and 68.99% (a result higher by 18.08% in comparison to 2012) of those enterprises used information technology in supply chain management. This means that a supply chain accompanied by appropriate IT systems supporting management is an increasingly preferred form of cooperation between large-sized companies. Table 5 shows average annual change rate for the analyzed variables in the years 2008-2012.

Table 5. Average annual change rate for analyzed variables [%]

Specification	Enterprises using ERP software packages for transmitting information between different departments	Enterprises using information technology in supply chain management
Total (excluding the financial and insurance services section)	21.61	8.36
Small-sized companies	24.79	8.82
Medium-sized companies	14.62	7.71
Large-sized companies	12.45	8.28

The steepest increase in the number of both enterprises using ERP software packages for transmitting information between different departments and enterprises using information technology in supply chain management is visible in small and medium enterprises. It is smallest in large-sized enterprises but the increase rate is much higher in the case of enterprises implementing material resource planning systems. On the whole we can say that the number of all enterprises using ERP software packages for transmitting information between different departments was on an increase in the years 2008-2012 by 12.45% every

year, while the number of all enterprises using information technology in supply chain management grew by 8.36% on average.

Conclusions

Cooperation of companies within a supply chain is possible thanks to the implementation of appropriate IT tools. The basic IT systems used in the realization of business processes are the SCM systems based on ERP systems which are the source of data for SCM applications. Polish firms use them on different scales which is connected with their size which determines their readiness for the participation in supply chains and implementation of proper IT systems. Although it is the large-sized enterprises that use the ERP and SCM systems most often, the biggest dynamics in this area is observed in the group of small enterprises. In 2012 more than half of large-sized enterprises were using IT tools for the supply chain management and more than 40% of them implemented the ERP system. Yet in the period of 2008-2012 it is the small firms sector where we see the biggest annual average increase in the use of IT tools, mostly for resource planning. We should also point out that because of the big percentage of small enterprises in all enterprises (80%) it is this group of enterprises that has the biggest share in the number of both enterprises using ERP software packages for transmitting information between different department, and enterprises using information technology in supply chain management. It seems that the significance of small enterprises in the cooperation within supply chain will continue to grow and they will be implementing IT systems supporting business processes in a supply chain more and more often.

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WYKORZYSTANIE SYSTEMÓW INFORMATYCZNYCH WSPOMAGAJĄCYCH REALIZACJĘ PROCESÓW BIZNESOWYCH W PRZEDSIĘBIORSTWIE I ŁAŃCUCHU DOSTAW W POLSCE

Streszczenie: W dynamicznie zmieniającym się otoczeniu przedsiębiorstwa coraz częściej podejmują współpracę w ramach łańcucha dostaw, którego głównym zadaniem jest integracja i koordynacja procesów. Zadanie to może zostać zrealizowane jedynie dzięki implementacji odpowiednich systemów informatycznych, a w szczególności systemów planowania zasobów na poziomie pojedynczego przedsiębiorstwa i systemów zarządzania łańcuchem dostaw na poziomie całej sieci podmiotów. Celem artykułu jest analiza stopnia wykorzystania technologii informacyjnych w planowaniu zasobów i w zarządzaniu łańcuchem dostaw przez małe, średnie i duże przedsiębiorstwa w Polsce. Badaniu poddano następujące dwie zmienne: liczbę przedsiębiorstw wykorzystujących pakiety oprogramowania ERP w celu przekazywania informacji pomiędzy różnymi obszarami działalności przedsiębiorstwa (np. księgowością, marketingiem, produkcją) oraz liczbę przedsiębiorstw prowadzących elektroniczną wymianę informacji dotyczących zarządzania łańcuchem dostaw. Badaniem objęto lata 2010-2012.

Słowa kluczowe: łańcuch dostaw, system zarządzania łańcuchem dostaw, planowanie zasobów przedsiębiorstwa

利用信息系統支持企業業務過程和實施供應鏈波蘭

摘要: 在快速變化的環境中，企業越來越多地將在供應鏈，其主要任務是整合和協調配合的過程。此任務可僅通過適當的信息系統，特別是，資源規劃的執行，在各企業和供應鏈管理系統在整個網絡實體的電平的電平來實現。本文的目的是分析信息技術在資源規劃和供應鏈管理的利用率為小型，中型和大型企業在波蘭。該研究涉及以下兩個變量：為了傳送不同業務線（例如會計，銷售，生產）和公司的與信息有關的供應鏈管理的電子交換的數量之間的信息使用ERP軟件產品的公司的數目。這項研究涵蓋了2010-2012年期間

關鍵字： 供應鏈，供應鏈管理系統，企業資源規劃