RESEARCH PAPERS OF WROCŁAW UNIVERSITY OF ECONOMICS No. 147
Advanced Information Technologies for Management – AITM 2010 2010

Paweł Fajfer
Poznań School of Logistics, Poznań, Poland
e-mail: pawel.fajfer@wsl.com.pl

INTEGRATION AMONG SUPPLY CHAIN PARTNERS

Abstract: Supply chain management enables the physical transfer of goods and information. During the transfer of information among business partners, in the logistics supply chain this information is often modified by them. Therefore, information systems of business partners must ensure the integration of the different elements of the logistics supply chain. In this article the question why should companies implement IT systems is answered, and benefits of e-commerce in SCM, and benefits of using GS1 standards are described.

Keywords: ERP, SCM, GS1, EDI, information.

1. Introduction

Effective management of the flow of goods includes both the physical transport of goods and the flow of information concerning a given transport. As the goods go through various stages of the supply chain, the information undergoes numerous changes. For this reason, the IT systems used by all business partners to control the flow of goods and information within the supply chain must guarantee the integrity of information at every stage. This article will discuss how to ensure the information integrity.

Purchase and implementation of an IT system not only enhances the company's image in the eyes of its customers, but also improves the effectiveness of the processes which take place within the company [Ehie, Madsen 2005, pp. 545-557; Fajfer et al. 2009, pp. 74-85; Hong, Kim 2002, p. 25-40]. Such an implementation allows the managers to solve a number of issues and problems with which they constantly had to cope before. Since the system takes care of the internal processes, it is possible to focus on other areas of the company's operation, which used to be neglected. The managers understand that efficient cooperation with suppliers and consumers within the supply chain provides the company with a greater competitive advantage. They realize how important each piece of information about the market, the competitors and the customers is, and they recognize the necessity to store and further process this information (e.g. within the marketing or sales department).

Apart from the internal process supervision, the management concentrates on establishing and strengthening relations with suppliers and consumers. Cooperation with external companies is no longer concentrated solely on finding the lowest prices possible. The customers' expectations grow increasingly higher, and providing them with a complex service translates into economic success. The price of the goods manufactured, discounts, quality, distribution, warranty service and the ability to adapt for evolving market demands are only some of the factors that determine the competitiveness of modern companies. The more creative and flexible the company, the more popular it grows. Companies would be unable to meet growing expectations if they operated on their own. This is why they should expand their scope of operation, focusing on both suppliers and consumers, and find their place as a link within the whole supply chain. Such an approach allows for more opportunities, as each link works towards the same economic goal: to stay on the market while enhancing the relations with the customers and business partners [Fajfer, Koliński 2009].

In order to enhance these relationships companies take advantage of advanced IT systems. Depending on its role within the supply chain, the company will choose such a system as will prove most suitable for its specific purposes and provide desired functions related to the customer service, supply tracking and many other areas. Such a system becomes a basic means by which the company exercises control over the internal information flow. The article will focus on ERP (*Enterprise Resource Planning*) systems [*APICS Dictionary*], because these are most commonly used.

2. Benefits of good implementation

A well-implemented system of this class offers the following advantages: a lowering of storage levels; precise planning and production, which shortens the supply cycle and lowers the amount of ongoing work; a cut in material costs, since orders are divided into groups (EOQ – *Economic Order Quantity*); a smoother production flow thanks to more efficient planning and less stoppages; swift reaction to order changes and supply problems; supervision over settlement arrangements; current reporting and analysis.

A well-implemented ERP system provides the company with a stable basis for further development. The system controls individual process stages, computes the provided information and acts as a tool for managers to perform real-time analyses, thus facilitating the process of preparing reports concerning the key areas of the company's operation.

The above-described supervision processes concern one specific company (see Figure 1). In other words, the functionality of the system is tailored to the company's needs. To order materials required for production, the system utilizes information from the production plan which has been created according to the sales plan and to the orders placed by the customer. The sales plan is based on sales from previous years. Suppliers and consumers use their own IT systems.

The demand for materials is determined depending on the system's forecasts based on the sales history in the other companies' systems. Each of these systems is adjusted to the company's current requirements. In such a configuration, we still cannot speak of a quick and flexible reaction to the market's changing demand: each company is focused on executing its own production plan, and the inter-company relationships are limited to asking who ordered what from whom and who sold what to whom. The situation changes, however, once the suppliers and the consumers start to cooperate and the supply chain is established.

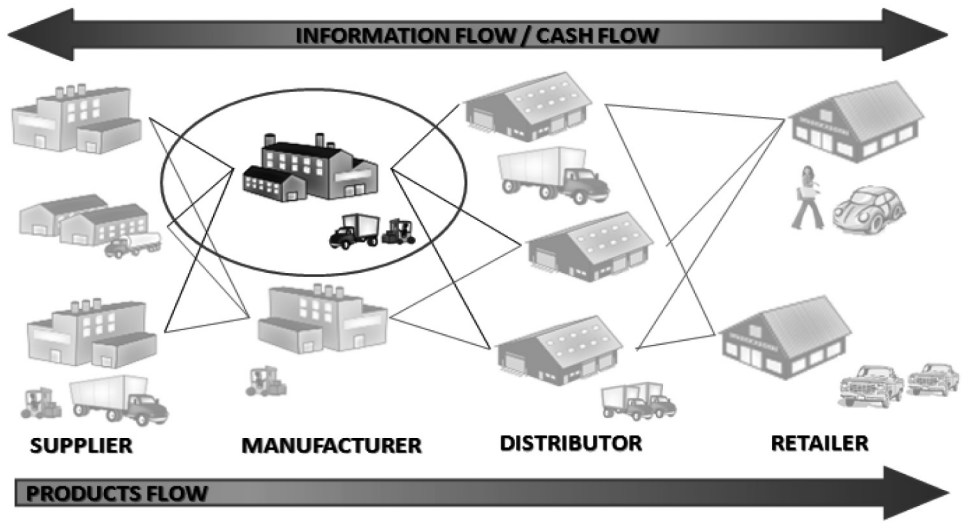

Figure 1. Example of ERP functionality within the logistic chain of supply

The supply chain comprises a network of partners who jointly cooperate in order to turn a raw material into a finished product sold at a specific price to an end consumer, as well as to relocate resources that are returned at every stage. Each company participating in the supply chain is directly responsible for the value addition provided to the product. The supply chain is shown in Figure 2.

One of the main tasks in supply chain management is storage monitoring across the whole chain, limiting uncertainty which might cause unnecessary purchases and extra storage kept in case of shortages, and preventing any other suboptimal actions within the chain [Harrison, von Hoek 2010, p. 34].

The companies' managers are aware of the fact that competition with other companies of similar profile requires a lot of effort. In order to keep the customer, it is not enough only to sell a quality product and provide warranty service. Nowadays, customers do not remain loyal to the supplier as often as they used to. Hence, there is a substantial risk that they will choose a competing company in the future. The

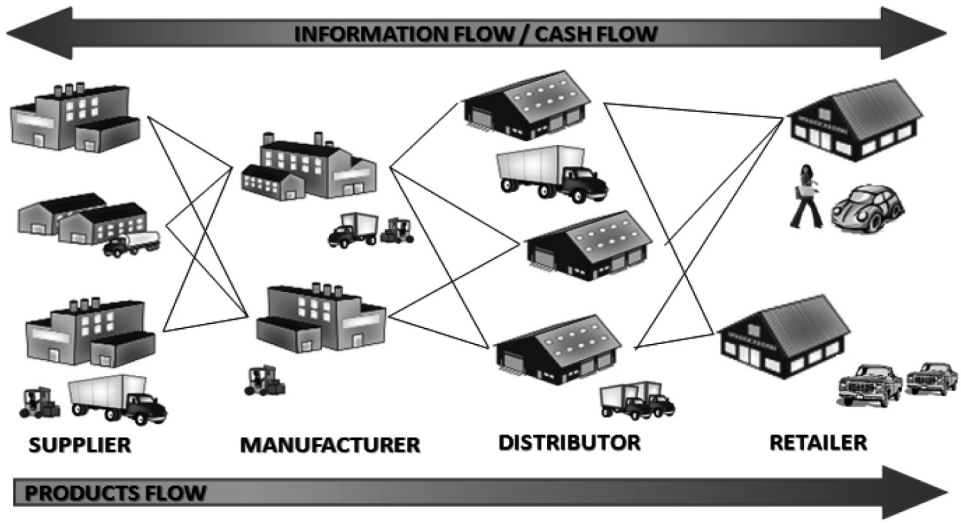

Figure 2. Example of a logistic chain of supply

capability to react swiftly to market demand fluctuations is a key aspect of effective management. Swift reaction is impossible as long as at least one company (whether it acts as a supplier or a consumer) remains inflexible and does not adapt to changes on the market. For this reason we can observe a growing tendency to create supply chains comprising partners that share a common goal: to provide what customers expect. It is important, then, to have such IT tools as to ensure that each chain participant can react to market changes.

Information on market changes should reach every participant in the supply chain as quickly as possible. A system is needed that facilitates cooperation between suppliers and consumers. An ERP system can process supplier and consumer data, but this is not enough. It must be complemented with CRM (*Customer Relationship Management*) and SCM (*Supply Chain Management*) systems which gather and process more details than ERP could do alone [Chen 2001, pp. 374-386]. Customer--related information (e.g. end product orders, orders for customized products tailored to specific needs, etc.) is gathered by the CRM system and its results are then transferred to ERP. Supply chain management works in a similar manner: SCM information is sent to ERP, which allows the company to place production orders in accordance with the current market demand [Su, Yang 2010, pp. 456-469].

The chief task of SCM systems is to facilitate data exchange between the links of the logistic supply chain. The system controls the flow of information, goods and services, thus integrating the whole chain. The basic negative aspect of this solution from a short-time perspective is that its project and implementation in the logistic supply chain entails significant costs. For this reason, SCM in itself cannot be treated

as a means to generate savings in the short run. From a long-time perspective, however, it proves to be an efficient measure to cut costs by improving quality and reducing problems related to storage management within the supply chain. Another advantage offered by SCM is that it simplifies and streamlines complex processes taking place within the chain, improves the quality of customer service and increases work time efficiency. It must be also mentioned that a well-configured SCM system will not allow a situation to emerge where the customer places an order for a product which is no longer manufactured or which is undergoing a design change [Coyle et al. 2002, p. 31]. SCM systems are technologically advanced and provide tools to manage the whole supply chain, from design and finding material supply sources, through demand forecasting and distribution, to providing the customer with a finished product.

3. The importance of the Internet in SCM

In the era of the Internet it is no longer possible to ignore the opportunities it creates. The growing access to the global network has created an increasing demand for facilitating remote communication between Internet users and companies. E-commerce popularization has created a basis for further development of IT systems and helped create new tools for building B2B and B2C relationships. This, in turn, has forced vendors of IT systems to provide electronic management features [Möller 2005, pp. 483-497].

Figure 3 shows cooperation opportunities between ERP and specialized systems with the use of e-commerce tools.

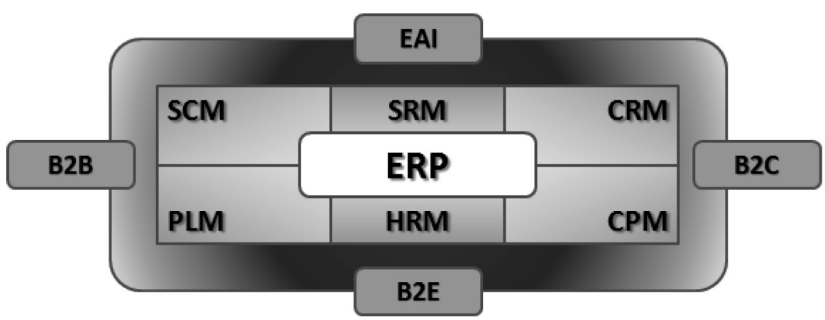

Figure 3. Modern ERP systems utilize e-commerce tools, as well as other systems which facilitate cooperation between supply chain partners

Source: own development based on [Möller 2005].

The basic unit of the system is a single database which eliminates the risk of duplicating information and makes the system more efficient. Central to the system

is ERP which helps execute individual processes within the company environment and manage business processes. Based on the computed data, various analyses and reports are compiled which provide the managers with an accurate assessment of the company's condition. Thanks to additional, more advanced systems it is possible to manage relationships with the supply chain partners (SCM). A detailed analysis of relationships with suppliers (SRM – *Supplier Relationship Management*) and customers (CRM) further complements the main system data. Information processing may also concern products manufactured/distributed by the company (PLM – *Product Lifecycle Management*, HRM – *Human Resources Management*) or utilize Business Intelligence applications for controlling the company's performance (CPM – *Corporate Performance Management*). The variety of e-commerce tools used within the system provides the company with substantial benefits by facilitating relationships between companies (B2B), between companies and customers (B2C), as well as between the company and its employees (B2E). The last area of future IT systems is inter-system integration. EAI (*Enterprise Application Integration*) software features real-time information processing, stimulates business processes and, most importantly, integrates information spread across various systems [Möller 2005, pp. 483-497; Jung et al. 2006, pp. 321-334].

Discussing issues of information management, it is impossible to ignore the problem of information control, automation and standardisation. SCM system can become more flexible, the supply chain will be structured so that the information transmitted in parallel with the logistics units can be collected and processed by the computer system found in every link of the logistics supply chain. For this purpose, a standard must be implemented which would ensure that a given piece of information is always interpreted in exactly the same way by all the IT systems used by the supply chain participants.

A good solution to this problem might be the use of logistic labels (SSCC – *Serial Shipping Container Code*) which help control the flow of goods through individual stages of the supply chain and at the same time ensure uniform interpretation by all the chain links [Majewski 2004]. The GS1 logistic label presents information in two different views: one is human-intelligible, and the other one machine-readable. The latter is automatically entered into IT systems by means of bar codes, a cheap and safe method for information transfer and storage. Thanks to the logistic label each shipping unit from any supply chain link can be identified (see Figure 4) [Fajfer 2010; Majewski].

All that needs to be done in order to receive a unit supplied with a label is scanning the bar code. Once the code has been scanned, the information contained within it enters the system. The employee only has to compare the information displayed by the system with the actual shipment. The automation of the whole process eliminates potential errors that could occur if the contents, quantity and expiry date were entered manually into the IT system. As a result, the palette can be moved into the storage area at once after code scanning and receipt confirmation.

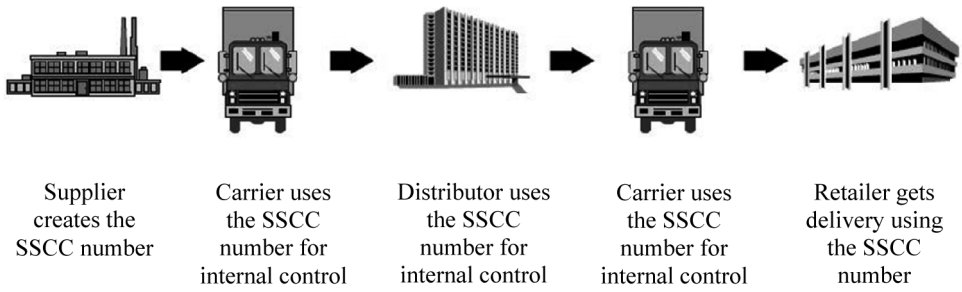

Figure 4. Application of SSCC within the supply chain

The GS1 organization not only conducts the standardisation process with a view to create information identification standards, but also promotes the use of e-commerce tools, such as electronic catalogues (EANIC) [www.eanic.ean.pl] or the EDI communication system.

The EDI project aims to eradicate the risk of entering duplicated data from documents, as well as to make the flow of information quicker and more efficient. EDI helps improve the access to information in terms of time, broaden the scope and accuracy of collected information, and decrease labour intensity. An effective implementation of EDI requires direct communication between IT systems in both the supplier and consumer companies, but the systems themselves may differ [Matulewski et al. 2008, pp. 153-155].

Thanks to uniformed communication standards the information transferred with the use of EDI is always interpreted unambiguously, regardless of specific document formats used within a given company.

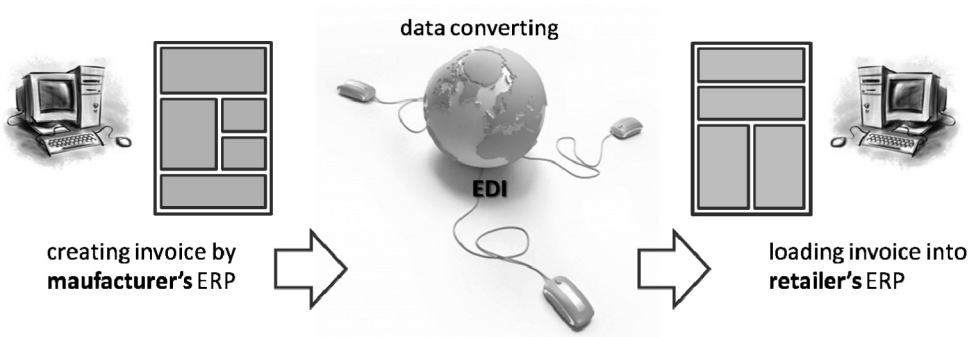

Figure 5. EDI system used for invoice generation

The list of advantages offered by EDI includes: time and cost savings, error risk minimisation, improved resource management, the expansion of consumer market.

4. Conclusions

Given the challenges inherent in SCM, it is imperative that firms carefully analyze their specific competitive positions to verify that the integration journey is worth taking. Without commitment and an understanding of the associated challenges and requirements, they may be better off focusing their efforts and resources elsewhere. They must also seriously consider their potential to learn and change [Fawcett, Magnan 2004, pp. 67-74]. The implementation of an EDI system facilitates control over processes taking place within the company. By establishing relationships with suppliers and consumers, creating logistic chains of supply and swiftly reacting to changing demand, business partners can attract and keep more customers. Cooperation with the chain partners would be impossible without complex IT systems and e-commerce tools (such as EDI). The advancing standardisation allows companies to go beyond the local market and expand into global market horizons. Investments into the creation of complete supply chains and advanced IT tools ensure a protection against market fluctuations and additional costs resulting from frozen capital and planning errors. This development tendency is unavoidable, and once more it provides businesses with new opportunities for achieving a strong position on the market.

References

APICS Dictionary, 11th Edition.

Chen I.J. (2001), Planning for ERP systems: Analysis and future trend, *Business Process Management Journal*, Vol. 7, No. 5.

Ciesielski M. (red.), *Instrumenty zarządzania łańcuchami dostaw*, PWE, Warszawa 2009.

Coyle J.J., Bardi E.J., Langley Jr. C.J. (2002), *Zarządzanie logistyczne*, PWE, Warszawa.

Ehie I.C., Madsen M. (2005), Identifying critical issues in enterprise resource planning (ERP) implementation, *Computers in Industry*, Vol. 56, No. 6.

Fajfer. P. (2010), Integracja partnerów w logistycznych łańcuchach dostaw, [in:] *E-gospodarka w Polsce. Stan obecny i perspektywy rozwoju. Część 2*, Eds. H. Babis, J. Buko, R. Czaplewski, Wydawnictwo Naukowe Uniwersytetu Szczecińskiego, Szczecin.

Fajfer P., Koliński A. (2009), *Przyszłościowe kierunki w integracji systemów informatycznych partnerów w logistycznych łańcuchach dostaw*, WSL Forum 2009, Poznań.

Fajfer P., Pawlak R., Swoboda B. (2009), *Procesowe zarządzanie w zintegrowanych systemach informatycznych na podstawie systemu iScala. Tom I*, WSL, Poznań.

Fawcett S.E., Magnan G.M. (2004), Ten guiding principles for high-impact SCM, *Business Horizons*, Vol. 47, No. 5.

Harrison A., von Hoek R. (2010), *Zarządzanie logistyką*, PWE, Warszawa.

Hong K., Kim Y. (2002), The critical success factors for ERP implementation: An organizational fit perspective, *Information & Management*, Vol. 40, No. 1.

Jung J., Kim H., Kang S. (2006), Standards-based approaches to B2B workflow integration, *Computers & Industrial Engineering*, Vol. 51.

Majewski J., *Standardy wymiany informacji w systemach zarządzania łańcuchem dostaw*, www.logistyka.net.pl.

Majewski J. (2004), Łączenie ogniw, *Computerworld*, No. 42.
Matulewski M., Konecka S., Fajfer P., Wojciechowski A. (2008), *Systemy logistyczne – komponenty, działania, przykłady*, Biblioteka Logistyka, Poznań.
Möller Ch. (2005), ERP II: A conceptual framework for next-generation enterprises systems?, *Journal of Enterprise Information Management*, Vol. 18, No. 4.
Su Y., Yang C. (2010), A structural equation model for analyzing the impact of ERP on SCM, *Expert Systems with Applications*, Vol. 37, Issue 1.
www.eanic.ean.pl.

INTEGRACJA PARTNERÓW ŁAŃCUCHA DOSTAW

Streszczenie: Sprawne zarządzanie łańcuchem dostaw umożliwia zarówno fizyczny transfer towarów, jak i przepływ informacji dotyczących danego transferu. W trakcie przepływu towaru w łańcuchu dostaw informacja jest bardzo często modyfikowana. Z tego względu systemy informatyczne poszczególnych partnerów biznesowych, nadzorujące przepływ informacji i towarów w łańcuchu dostaw, muszą gwarantować integralność wszystkich jego ogniw. W artykule opisano, dlaczego przedsiębiorstwa wdrażają systemy informatyczne, a także korzyści z wykorzystania narzędzi e-gospodarki w łańcuchach dostaw oraz standardów GS1.