ASPECTS REGARDING THE ROLE OF INFORMATION TECHNOLOGIES IN THE ASSURANCE OF SUPPLY CHAIN MANAGEMENT PERFORMANCE

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Abstract: This paper is intended to outline the importance of e-logistics programs, based on the new information technologies and successful e-business applications in the case of Romanian companies that activate in the production and services field, namely producers, suppliers or distributors. The redesigning of the logistic system and the reconfiguration of the supply chain management (SCM) challenge the firms, especially the small ones, to explore new e-business applications, on the basis of feasibility studies before getting implemented. For a long time, firms considered that commercial changes are the last solution to resolve SCM problems, however many supply chains have been a failure. The explanation resides in the fact that a number of companies that had integrated their supply chains noticed that there was little or no response to the existing requests in this field. Although commercial changes represent an important part of Business to Business programs, actually very few managers understand the way to deal with them, which is integrating them in e-business programs. This paper outlines the companies’ need to develop e-business programs and the importance of these programs for the whole supply chain to obtain performances, taking into account that many firms that get integrated in the supply chain lack the technological capacity to implement electronic means for processing, transmitting and receiving data. One remedy might be their initiative to use Business to Business programs, with the purpose to offer easily configurable optimized networks and interactive solutions based on Web, at competitive prices. This system should have different assisting functions to help the partners of a supply chain, especially the small firms, to easily integrate up-to-date management and informational system refinement methods, in an efficient and effective way. As it has been pointed out in the paper, a major role for the enhancement of SCM performances is information technology such as Internet and ERP systems. Internet offers important opportunities to all partners from the supply chain to get information about consumption tendencies and changes in consumption request, virtual information about a product and the clients’ requests regarding the logistic services. As for ERP systems, it can be said that they mostly influence the designing of business processes, in order to assure coherence between them and the effective integration of different firm components. Even though the internal integration is an important aspect, an approach to management at the supply chain level, in an efficient and effective way, cannot be done without external integration with suppliers and clients. That is why we consider that companies belonging to the business field must focus on structuring key processes, to collaborate with their clients and
suppliers and to integrate their internal systems, with the aim to support business operations.

**Keywords**: logistic management, supply chain, supply chain management (SCM), e-logistics, ERP(Entrepreneurial Resource Planning) systems

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1. Introduction

Firm competitiveness in the market is more and more contingent on the attempts to enhance supply chain management competitiveness. This is to be achieved by means of improving the integration level with providers and clients, taking into account the influence of raw material prices, materials and other aspects regarding the production costs on one hand, and the clients’ requests dynamics of change on the other hand.

Firm management is more and more concerned to identify logistic problems, such as: keeping supply chain and logistic network control, obtaining and processing information from suppliers, sending them out to other departments and finding out ways to deal with them on the basis of analysis and options emerged from new situations and opportunities (i.e. stocks expiry date, changes in transportation technologies and ware handling, freight and reorientation of cargo, when necessary). Equally, the firm must be prepared for taking into account the threats that may come out (i.e. new technologies in the informational flux, new e-business applications, e-logistics) in the view of assuring the background for effectively and efficiently putting into practice the strategies and the logistic programs.

An important factor that has a major role for the enhancement of SCM performances is information technology (Internet, ERP systems). Internet offers important opportunities for suppliers to get information about consumption tendencies and changes in consumption request, while ERP systems enable a blending of managerial practices with information technology. By means of this blending, the business processes of a company get integrated into the informational system of the entire supply chain, aiming to meet some specific logistic objectives. It offers to the clients a new channel to obtain virtual information about a product and even to purchase. All these aspects influence the producers to become more sensitive towards their clients, by anticipating their needs and requests. (Ghiani, G., Laporte, G., Musmanno; 2004)

A major role in enhancing SCM performances is the employing of new information technology, more exactly the development of a management based on electronic solutions and appropriate organizational change, which allows the use of the most effective and efficient e-business applications and e-logistics.

In order to be sure that the clients are in control, a completely appropriate new set of management practices and tools must be put into practice. The initiatives in the field of e-business application development firms, in general, and e-logistics in particular, attempt to align functional processes of SCM with information technology, aiming to improve its effectiveness, efficiency and performances.

Redesigning the logistic system and reconfiguring SCM represent for the firms a challenge to explore, acquire and implement new e-business applications, on the basis of feasibility studies that are to be conducted before being implemented. For a
long time, firms considered that commercial changes are the last solution to resolve SCM problems, however many supply chains have been a failure. The explanation resides in the fact that a number of firms that had integrated their supply chains noticed that there was little or no response to the existing requests in this field. (Murphy, P.R., Wood, D.F., 2004)

2. Need and opportunity of using information technologies with SCM
Although commercial changes represent an important part of Business to Business programs, actually very few managers understand the way to deal with them, which is integrating them in e-business programs. Despite the fact that e-business programs development is crucial, we have to point out that a lot of firms that get integrated into the supply chain, especially the small ones lack the technological capacity to implement electronic means of data processing, transmission and reception. One remedy might be their initiative to use Business to Business programs, with the purpose to offer easily configurable optimized networks and interactive solutions based on Web, at competitive prices. This system would have different assisting functions to help the partners of a supply chain, especially the small firms, to easily integrate up-to-date management and informational system refinement methods, in an efficient and effective way. A global logistic strategy and a strategy to use common tools for the logistic operations, activities and processes must be developed, taking into consideration the client and market typology. Companies must have at their disposal the necessary capacity to deliver products to clients in short and exact time and to reliably complete an order-to-delivery cycle. Therefore, firms must be willing to significantly transform their processes, business activities and IT system, their internal processes of SCM, even if this measure takes great investment efforts for changing the uncompetitive systems with systems based on new information technology.

Another concern for the improvement of SCM, using the help of e-business, is related to the producers’ interest to assure an effective and efficient control of production and logistics, that outlines the importance of activities optimization and logistic processes. The effective control of production and logistics will improve the relationship with the suppliers and the clients, who, at their turn, will be in control of the logistic operations they perform. This is easy to achieve for the direct distributors and suppliers (level 1), but as one moves backwardly among the different levels of a supply chain, where materials and other components are delivered for the subassemblies producers, the stock level can increase significantly because of the incapacity of partners belonging to the same supply chain to correctly identify the request. The stock-out, considered as a “break” between request and offer, is to be assured by means of components, subassemblies and raw material availability, which is based on reliable information in real time. This can often cause last moment changes in the manufacturing programs and it consequentially amplifies the variability factor from inside the system. At the other end of the SCM, the distributors/retailers make up their sizeable stocks, in order to deal with the clients’ request (Bowersox, D.J., Closs, D.J., Cooper, M.B., 2002). There are moments when changes in manufacturing program bring about stock-outs at the distributors level (distribution chain). The suppliers react slower as they need longer terms to deliver a requested component therefore they increase the period of time needed for the order-to-delivery cycle, which, as a consequence, determines a stock growth. The
same risk of a stock growth is caused by the possibility that they undergo obsolescence, which generates additional costs to the system, but some clients are not willing to wait when dealing with a stock-out and they will choose competitors’ products.

Firm management has to take into account that assuring the product availability, as an aspect of the service they offer, will contribute to clients’ satisfaction, and therefore it will build consumers’ loyalty, being a fact that considering a service competitive standard, for the most part, the costs to regain a client are up to 2-5 times higher than to retain a client. Therefore, the use of Internet and ERP systems facilitates the implementation of logistic and production control improvement actions, by means of transmitting information in real time. (Ballou, R.H, 2004).

Another action concerning SCM efficiency and effectiveness is related to the building up of a value generating system, which implies large changes in the organizational culture, inside each function and each firm belonging to the supply chain, starting with raw material suppliers and ending up with the final clients. The increase of the capacity to immediate reaction to the new final client requests must be an important goal, and this can come into being by means of interconnecting clients, distributors, producers and suppliers over Internet. This will allow logistics and production control improvement, and the suppliers will represent an important segment of this process. Information regarding request and offer must assure good visibility for partners with the use of logistics functions. For example, suppliers’ communication site, also known as “supply power”, will provide important information to: designing, supply, production control, internal logistic operations, production, external logistic operations, sales and services. This will enhance the client service level, by shortening the delivery deadlines and order-to-delivery cycle. SCM reconfiguration is facilitated, in a collaborative approach, by the assurance of good visibility of clients’ requests during the whole supply chain. (Ballou, R.H, 2004)

All these critical change factors in the field of logistics should be well assessed and taken into consideration as important opportunities in the view of the shift of industrial Romanian enterprises from traditional organizational model to a value generating integrated system that reacts to international and national market conditions, changing technologies and clients requests, which implies SCM redesigning. To solve these problems, an infrastructure must be created, that enables the use of the tools offered by the new information technologies, the assurance of the building up of a value generating integrated system and the optimizing the coordination of functions for partner firms in the supply chain, on the basis of a functional strategy aligned to the purpose of maximization of value offered to client. Romanian enterprises, suppliers, producers and distributors have to act in the following directions, in order to compete with the fore mentioned changes and to successfully implement the new information technologies:

- putting forward professional development programs for managers to finely understand the system and particularities of SCM, to adopt e-business, e-logistics, SCM models and programs, with the purpose to get solutions to the really important problems that refer to large and non-functional procurement center, to freight networks and fragmented logistics, to tensioned client/supplier relationship, to communicational barriers;
- developing alignment and collaboration not only with first level clients and suppliers, but with the entire dimension and structure of SCM (level 2 and 3
clients and suppliers), in order to create a value generating integrated system. Currently, Romanian industrial enterprises possessing functional logistic systems have direct relations only with strategic clients and suppliers, which decreasing SCM efficiency and effectiveness. Managerial decisions within SCM must be based on performance assessment criteria, which are well defined for all participants (suppliers, producers, distributors, clients), in terms of quality, delivery deadlines, technology, without neglecting the financial impact upon the entire logistic chain. Key processes must be coordinated by inter-functional teams that should include: designers, engineers, marketing specialists, logistics specialists, etc., with the aim to determine client services standards; (Handfield, R.B., Nichols, E.L).

- advocating some collaborative forms in the product designing, processes and services field, by developing informational systems, in the view of suppliers and clients active involvement in the optimization of activities and logistic processes; (Donath, B, 2002)
- long and continuous partners’ performance improvement, their integration in the supply chain, by point of contact identification within the chain;
- assuring employees professional competences in the field of e-business applications and programs, by the means of a rigorous selective process and continuous development of these competences, starting with top management and continuing to the bottom of the managerial pyramid;
- implementing an integrated strategy for a SCM administration, based on the most appropriate e-business programs, aiming to improve collaborative planning and to maximize internal and external performances of the logistic chain.

The effectiveness of degree of internal integration activities and of logistic processes, as well as the extent to which they are externalized, depend on managers competences in the field of SCM and e-business applications, e-logistics and e-SCM, on company strategies, on partners within supply chain requests and standards and on intra-organizational and inter-organizational communicational development, facilitated by e-mail and Internet. (Stock, Lambert, 2001: p.587) Internet enables the practicing of outsourcing, as it assures visibility to logistic and manufacturing processes, offering to the firms the possibility to have a real control upon the supply chain even in situations when certain activities are entirely achieved outside the firm.

3. Use of Internet and ERP systems in supply chain management

The main purpose of this paper is to identify the weaknesses and strengths of using Internet and ERP systems in supply chain management, exploiting in this sense the results of a study conducted by the authors, between 2010-2012, in 67 firms belonging to industrial production field (producers, suppliers, distributors) and to logistic services providers’ field. The study was conducted on the basis of a complex logistic audit questioner and of 7 interviews with renowned professionals in the field of logistics, 3 managers and 4 specialists belonging to very performing companies in this field. We have to mention that we used a conducted sample, consisting of firms that have interests and achievements in logistics. A separate part of the questioner was dedicated to the problems rising in the development and enhancement of informational systems and logistic processes management, on the
basis of information technologies and e-business, e-logistics, e-SCM successful applications.

Our study conducted in the Romanian industrial milieu shows that, in order to enhance the logistic performances (limited stocks, quick and accurate delivery, low costs, high quality service, client service, etc.), many industrial firms (44.77%) are not prepared to integrate new digital technologies.

The large variability of request determines producers and distributors to use Internet, which is considered the most important Business to Business technology, and to create an informational line in the supply chain. This informational line enables rapid communication, rapid spread of ideas and concepts and facilitates innovation. The explosive growth of Internet makes the specialists affirm that there is no limit for the quantity of stocked and transmitted information over Internet, thus, a full collaboration of the logistic network being possible. (Ghiani, G., Laporte, G., Musmanno, R, 2004).

Firms can be successful on the Internet economy, by means of participation to the electronic business network, but it has been noticed that, in the case of many firms (35.82%), especially small and medium size, logistic management web sites are designed by non-experienced staff. The result is that the electronic business network implemented by these firms are lacking of consistency. Well-designed sites, created by logistic specialists, have a very important role in purchasing goods and services, offering the capacity to build up “one to one” networks, by means of assuring long-term relations that may accelerate electronic acquiring process. They also help to reinforce the favored client status assigned to some companies that buy great quantities of products. The study also shows that partner firms from the supply chain are preoccupied more with cost reduction (56.71%) than with accessing new successful applications in e-business, e-logistics and e-SCM field (20.89%).

Web offers the possibility to transmit information via e-mail, with a certain degree of message standardization. Economist Intelligence Unit and Meritas Consulting conducted a study which proves that 82 % of the senior managers from firms belonging to Fortune 500, that are in charge with supply chain, consider that Internet will crucially influence the supply chain performances. This proves that managing informational fluxes and logistic processes within the supply chain have taken a step to the digital era. (Donath, B, 2002 p. 758). A new trend has been observed in Business to Business commerce, buy means of firms integration in virtual logistics. There is an even larger number of electronic markets, an even larger number of Internet based supply chains that are meant to create communicational levels and dynamic interaction among participants. Access to virtual logistic networks can be realized using Wireless technologies (mobile phones, laptops, desktop units).

Another challenge for many Romanian firms belonging to industrial milieu and other fields consists of updating the technologies in use and older software, for a better exploiting of the opportunities offered by a modern Web based network. The study reveals that 32.83% of the enquired firms from the Romanian industry have encountered these problems. The cause for this resides in the fact that companies comprised in this segment don’t have a coherent IT strategy, compatible with logistic management requirements and don’t have very well trained staff. It is to be said that 71.64% of these firms have less than 250 employees, being small and medium sized companies. Taking into consideration that many Web sites allow the access of a large variety of information for free, this being not only an opportunity for Romanian
companies, but also a necessity, firms must adapt themselves to software standards compatible with the requirements of an effective and efficient supply chain. As for the use of ERP systems, the study reveals that only 62.68% of Romanian industrial enterprises comprised in the sample use ERP systems, integrating production, logistics, stocks, transportation, orders and accounting. Many of the ERP systems applications are used for planning in advance, for system designing and delivery automation. For the most part of the enquired enterprises, ERP represents a back-office activity that does not directly involve clients. That is why front-office systems need to be implemented, to create interaction with clients and with e-Business, e-Commerce and SRM (Supplier Relationship Management). ERP system advantages refer to online visualization in real time of firms’ activities and permanent monitoring of the most important business parameters, at the level of each enterprise and overall, for the entire supply chain. All these actions allow to easily identify the most important problems and opportunities, to ground decisions in real time and to efficiently control business in real time.

Except for the large size enquired enterprises, which represent 26.86% from the total amount of the enquired firms, the small and medium size enterprises managers declared that the acquisition of an ERP system is not a priority to them. There are manager who have purchased accounting-financial applications, improved them with some modules (human resources and material resources management), considering therefore that they own ERP systems, not taking into consideration the fact that these systems must comprise business management modules that assure the management of all organizational processes, such as accounting-financial processes, sales, delivery, acquisitions, logistic management, production management, human resources management, etc. The firms that don’t implement ERP solutions lack in real time information, resorting only to accounting solutions, which causes difficulties in activity flux, time loss, human resources loss and lack of control over information. Therefore, there is no pertinent topic for firms and competitive supply chains without appropriate and competitive ERP.

Many production companies and distributors from the Romanian market lack well prepared staff, at the managerial level as well as at other levels comprising specialists in charge with executive functions, which leads them to opt for sophisticate ERP solutions, inappropriate to the type of business, or to the acquisition of cheap solutions that don’t bring about profit. Because investments in ERP competitive systems are great, the enterprises that declare to have heavily invested for purchasing this kind of systems are to be found in the segment of large production and distribution companies.

The great providers for these systems, such as SAP and Oracle, which are well represented in Romania, help the companies to develop a system of integrated information management, that integrates not only organizational internal components, but clients and suppliers also, aiming to share data and information that will bring about important effects for the quality of decision in supply chain management. This ability of the system to get integrated represents a huge advantage for them, and even if they are at a high price, they offer to the users the possibility to reduce costs by means of efficiency and standardization of systems and procedures.

Despite the fact that there are many companies that have implemented ERP system, we can say that they focus especially on designing business processes, in order to
assure coherence between them and the effective integration among different parts of the company. Internal integration is one important aspect within supply chain management, but an approach to SCM cannot be done efficiently and effectively without external integration with suppliers and clients. In order to accomplish this, enterprises have to make efforts to structure their key processes, to collaborate with their clients and suppliers and to integrate their internal systems with the purpose to support business operations. (Rushton, A., Oxley, J., Croucher, P, 2004)

Specialists in the field have ascertained that there is a misunderstanding in ERP systems implementation, not only Romania, which started this process later, but also in countries that have notably achievements in this domain, such as USA. In this light, R.V. Delaney, executive vice-president at la Cass Information System (St. Louis), severely criticizes ERP systems, pointing out the fact that, in 40 years of logistic experience, there hasn't been ever so much confusion like it was when ERP systems were implemented. Even if ERP system implementation hasn't developed too much in the last 10 years, these sophisticated systems are not the only ones to be blamed, top managers engaging their part of responsibility. Many planning systems have been replaced by ERP systems, this change being undertaken without deeply knowing the business, so as it can offer an alternative support for planning to the logistics professionals. Despite this, Delaney admits that ERP systems providers have minimized obstacles regarding interface, by means of documentation and standardization, with the purpose to make these systems accessible to the supply chains. A significant obstruction in ERP systems is time of implementation (6-8 months) and the elapse of time in which they will display a positive impact over national productivity. (Donath, 2002: p.794)

4. Conclusion
The analysis of the logistic systems based on Internet and ERP urges us to affirm that a very important role for the success of these systems is represented by the degree of top management awareness and involvement. Top management is in charge with solving specific problems of these systems and with resorting to internal professionals and to consultancy, in the case of the small and medium firms that don't have at their disposal highly qualified staff in the field.

Of course, one could easily suggest implementation of technology, but it is more difficult to change organizational culture, in order to share these ideas both with external clients and with internal clients (the employees).

As there isn't such a thing like a culture of e-SCM in Romanian industrial enterprises, except for the top companies that represent 18.87% of the total amount of companies, one possible solution might be setting up a logistic council within the company, made up of logistic professionals and other professionals from the company, that should discuss with the managers about the impact of the new technologies, in order to understand the advantages and the extra value they bring about. If necessary, asking for outside firm consultancy is recommended, with the purpose of getting the managers and other employees aware of the advantages that result from the implementation of these solutions. Purchasing solutions based on information technologies within supply chain management will be a success if partners are informed about the last innovations in the field of IT tools and technologies, if human resources possess team work abilities and competences, if managers holistically understand the business culture. Regarding the acquisition of
ERP systems, the experience of the successful enterprises recommends solutions developed in Romania, that are adapted to the Romanian laws, with beneficial effects in implementation, that take less time and that are more effective. Of course, it is mandatory for the success of implementation that the software provider should have the know-how in this field and should assure professional support services. Implementation of quality management system can assure proper ERP systems and Internet working, for highly qualitative services offered to clients. Assuring a service to clients at their level of demands and expectations asks not only for the assurance of the provided services quality and for long and medium term retention of loyal customers, but also for the ability to use the most appropriate e-business programs, the most effective systems and applications, e-logistics and e-SCM, with the aim to offer competitive advantage and higher profitability.

E-SCM is based on the certainty that competitiveness is unconceivable without logistic services development, without achieving comparable levels of effectiveness, efficiency and quality. For this, stress should be put on these aspects: product availability improvement, based on an efficient stock management and on market requests; coordination of production, distribution, stock levels and deliveries between the main loops (members or organizations) of the supply chain management, supported by integrated informational systems that provide sales in real time; programming and proceeding along information; setting up of alliances and strategic partnerships with clients, suppliers, stock administrators, with those in charge with the development of information technology and successful e-business and e-logistics applications; direct involvement of the client in defining the product and in specifying the requests regarding operation quality standards that make up physical fluxes of materials and products.

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