

ICT– guaranteed success? Implementing ICT-systems in a supply chain of SMEs (A case study)

Eirik Borgen^a, Heidi C. Dreyer^b, Inger Anne Sætermo^c

^{a,b,c}*Department of Economics and Logistics, SINTEF Industrial Management,
Trondheim, Norway*

Abstract

From the literature, we have seen different stories of successful implementations of Information Communication Technology (ICT) systems along the complete supply chain – Cisco and Dell to name a few. Especially in the Internet field, consultants and authors point out the importance to implement integrated information communication systems to be competitive in the market, and how easy this is; the technology is already there, ready to be implemented. But is it so, is it so easy to just implement the set of technological magic boxes and then be at the competitive edge of business? This paper contains the story of an attempt to implement an integrated information communication, a system that handle orders along a supply chain containing a number of small and medium sized enterprises.

Keywords: Supply chain, SME, Internet, Implementation, Organisation, Wholesaler

1. INTRODUCTION

We recently finished the project “Integrated logistics systems”, funded by the Norwegian Research Council. The project focused on the interaction and co-operation between companies in the supply chain, and aimed at finding methods for effective and rational flow of goods, services and information. The goals of our project was:

- to develop an integrated logistics management model for a supply chain
- to implement the management model in a case supply chain

Hence, the project focused among other things on how ICT may be used to improve and make effective communication in the whole *supply chain*. That is ICT as an *enabler* in the effective interaction between autonomous companies. We were concerned with the *flow* of information, services and products in the supply chain.

Objectives

What we will discuss in this paper is our experience and reflections from seeking to implement an integrated communication system for the case study. As mentioned, software tools naturally plays a vital role when it comes to designing a logistics management system and this perspective is what we want to stress in this paper. The major research questions we discuss in this paper are:

- How should tasks be organised in the supply chain?
- What are the consequences of the suggested task management?
- What are the benefits for our supply chain?
- How should it be implemented?
- Any immediate effect?

Research methodology

The research is based on literature and empirical studies. Data are defined, collected and analysed in an interactive process between the companies involved and the researchers. This process was guided by empirical and theoretical discussions, as well as thorough evaluations by the researchers.

The following figure illustrates the interactive research process:

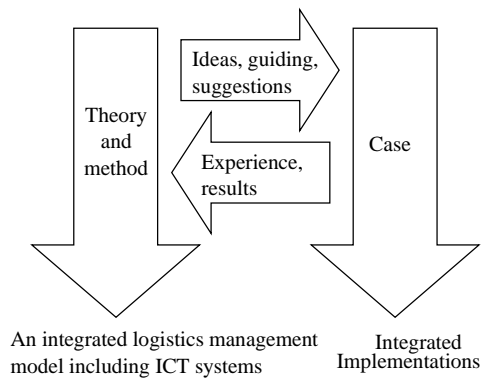


Figure 1: The research methodology

2. DEFINITIONS

A *supply chain* is the flow of goods and information from the ultimate source to the ultimate consumer (Smith 1999). The supply chain consists of a number of companies, which fulfil different roles in the process of making a product or service available to the market. Furthermore, managing the supply chain can be seen as a collective strategy between the involved enterprises to link inter-organisational or overlapping business operations enhance marked opportunities (Bowersox, et.al. 1999). By an integrated logistics management model we mean a regulated/structured way to manage and control the flow of goods and information through the supply chain. This in order to achieve an effective and rational logistical system (Berg, et.al. 2000). The regulated flow of goods and information is primarily based on principles from modern production literature (Browne, et.al. 1988, Andersen, et.al. 1998). This implies both a collaborative strategy between the supply chain members and holistic and synchronised processes.

An integrated supply chain with close relations between the selected trade partners can be a competitive advantage not only for individual enterprises but also for the whole channel of supply (Christopher 1992, Ross 1999). However, the competitive strength depends among other factors on efficient supply chain processes and on enterprises being able to develop effective forms of co-operation. That is, between all enterprises - manufacturers, suppliers, distributors and other partners. Operations, collaborative planning and strategies require shared commitment, trained and well-informed people, integrated processes and technology (Sewell 1999). These elements ensure the smooth flow of business operations between the enterprises (Schengili 1998).

Concerning technology the integrated logistics management model/system requires a high level of integrated information that flows along the supply/demand continuum. Obviously, the

infrastructure including computer systems for the exchange of information and communication are of critical importance for the interaction and flow between companies in a supply chain.

3. DESCRIPTION OF THE CASE

We have studied a supply chain of suppliers to builders and contractors. The companies in our case consists of one supplier, one wholesaler, several retailers and a freight forwarder. (end customer excluded). Some of the important factors for our case are:

- manual work and use of phone/fax.
- low knowledge and experience of ICT among the wholesaler and retailers.
- high knowledge and expertise on equipment to builders and contractors, but not much recruitment and impulses from other industries.

The supplier produces a wide range of products. The wholesaler builds up the assortment of products from several suppliers to a homogeneous supply. The retailer is responsible for providing product assortment, availability, price and image within an geographical market, while the freight forwarder is responsible for the physical movement between the companies in the supply chain. According to classical theory of distribution this is the ordinary way to organise and structure a distribution channel (Stern and El-Ansary 1992).

4. HOW SHOULD TASKS BE MANAGED IN THE SUPPLY CHAIN?

Together with the companies in this case study, we spent time and effort on mapping and agreeing on today's logistic performance. A common understanding and acceptance are an important basis and reference for further work. Not surprisingly we discovered that there existed a lot of duplications between the companies, such as activities connected to order processing, transport and warehousing. In order to design an efficient flow of information and products, we found it necessary to allocate the tasks to different processes in the supply chain and to bring into focus the main processes. The following two main logistic processes were identified:

- the order process
- the distribution process

We examined the processes thoroughly in order to propose and agree upon a new design. That is, to decide which company shall perform what tasks in the future, and decide how to manage the process flow regarding information and products. This is all about competitiveness, competency and skills. According to Porter which company is able to perform the respective tasks in the most efficient way (1985). Thus, core competency, skills and specialisation are keywords when allocating tasks in the supply chain (Borgen, et.al 1999).

The core of our suggested solution is that we want to minimise the inventory level and optimise the throughput in the supply chain. This means that the wholesaler's role has to change from being a traditional inventory wholesaler to being an information wholesaler. According to the theory of distribution the wholesaler's advantages are to accumulate and distribute a wide assortment to several retailers (Stern and El-Ansary, 1992). This can be done through an effective information system combined with inventories spread between the suppliers and retailers. Smith claims that this new approach has only now become available due to the Internet and its ability to send high speed encrypted information/data (1999).

Today the wholesaler manages a central inventory and the retailers order both direct from suppliers and the wholesaler. Following our suggested solution, this central inventory will be removed and the products will be transported directly from the supplier(s) to the retailers. The freight forwarder is responsible for the transportation. The "information" wholesaler places orders for *all suppliers* on behalf of all the retailers.

In the following we will describe the current scenario and outline the suggested process, including the "information" wholesaler in more detail.

The order process

The order flows are based on market demand and pull-principles. The companies wanted a demand-driven process in order to get the true demand-pull through the supply chain, this in order to reduce the inventory level. The figure below shows the order process today.

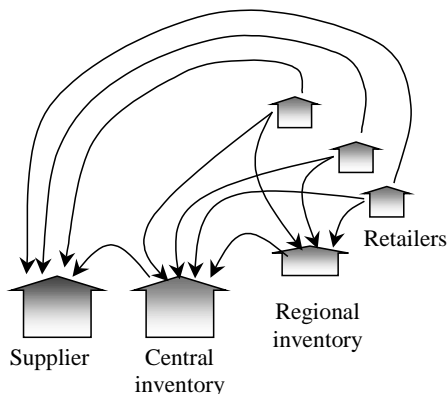


Figure 2: Today's order process

The arrows in the figure denote the order flow. As can be seen, the ordering routines in our supply chain are characterised by a complex flow of orders. The retailers send their orders to both the wholesaler and directly to the supplier depending on the product and their relationship with the supplier/wholesaler. This results in many contact-points and a flow of orders that is difficult to follow. It

requires systems for order handling both at the wholesaler and at the supplier.

A lot of overlapping tasks was identified. Information was only reused to a limited extent. The ways the orders are handled are very time-consuming: A lot of manual work is connected to the order processing, and the orders are usually made by phone (or fax). This requires conversation time for both the retailer and the receiver of the order. The next figure shows our suggestions for a new order flow process:

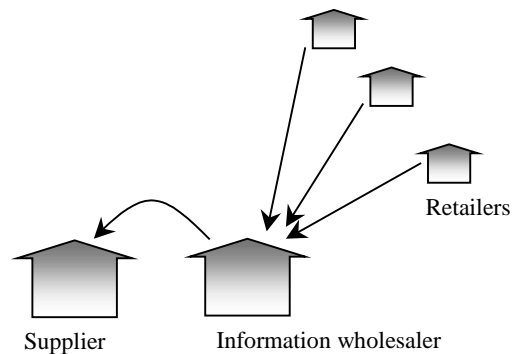


Figure 3: The suggested order process

In the integrated logistics management model we have suggested a simplification of the order flow in such a way that all the retailers will send all their orders to the wholesaler. The wholesaler will thereafter forward the orders to the correct suppliers. In this way, there will be no direct contact between the retailer and the supplier, and the parallel order flow from the retailers to the suppliers will be removed. This can be achieved with manual order processing, but if it is to be efficient, it is required that all the orders are made electronic.

Work on supply chain communication has been underway for some time. Electronic Data Interchange (EDI) has been in use for many years already. The emergence of the Internet, with its low-cost, near universal reach, and easy-to-use browser interface offers exciting opportunities (Porter 1998).

We have suggested an internet-based ordering system for our case study mainly due to the low-cost and user friendliness of the solution. We also regard such solutions as being very flexible. With Internet, two-way communication is possible in an efficient manner. Hence non-conformance reports can be sent by the same channels as the orders. The wholesaler will forward the orders to the supplier via the Internet by email or standardised messages.

Our suggestion implies that the wholesaler establishes a central Internet hub (portal/web-hotel) where all of the interconnecting information is stored. The web site must provide the necessary facilities and services for the retailers to operate

efficiently. New partners are added to the system by connecting them directly to this hub.

The web sites are designed in such a manner that they are user-friendly, and they do not require major investments or training for the retailers. The main investment will have to be facilitated by the wholesaler. It is possible for the retailers to send both orders with files from docked hand-held computer terminals, and orders typed in directly or via digital product lists. The wholesaler can then forward the orders to the suppliers via Internet.

Among the important requirements in our case are the following:

- The proposed system must be integrated with the existing ICT systems in the companies.
- The proposed system must be able to provide an up-to-date overview and status of the orders and the expected time of delivery. It must be possible to cancel an order, and to make a product inquiry without actually placing an order.
- Confirmation of delivery or time remaining before delivery (e.g. UPS, DHL, tracking packages by the hour).
- The users need access to a list of available products, inclusive of delivery time.

Some additional requirements are more specific depending on whether the system handles orders from the retailer to the wholesaler, or the forwarded orders from the wholesaler to the supplier:

- In general, the retailers are not very advanced users of ICT-systems and they have limited resources for investments. Hence, low costs for the retailer and a user-friendly interface are important factors.

According to the integrated logistics management model/system, the wholesaler receives orders from all the retailers and forwards them to the correct suppliers, all processing using a standardised electronic system between the players in the supply chain. Moreover, the system will be able to handle non-conformance reports.

5. WHAT ARE THE CONSEQUENCES OF THE SUGGESTED TASK MANAGEMENT?

According to Smith (1999) the advantages of having an "information" wholesaler, looking from the information side, is a more rational, non-duplicating and precise flow of data and information. The supplier obtains information on multiple customers in one transmission. Similarly, the customer sends information on multiple suppliers to the information wholesaler, and the information wholesaler sends information on multiple customers to the supplier, all happening in one transaction, although it is executed in two steps within the value chain.

We agree with Smith's statements. In addition, we would like to add the following on the information wholesaler's role in the supply chain, and the effects on the employees present working situation due to the reallocated tasks:

The direct physical communication between the retailers and the suppliers will be greatly reduced when the ICT-based ordering system is operative. The retailers can then only order from the wholesaler. That increases the retailer's dependency of the wholesaler. The supplier will no longer receive orders directly from the retailers, and their chances of influencing the retailers are reduced. Hence, the suppliers also become more dependent on the wholesaler.

Collecting and storing a wide variety of transactional information and product data in the supply chain's "data warehouse", creates a unique knowledge database. This information provides a competitive advantage for the supply chain's participants information which the wholesaler is responsible for effectuating/distributing. However, this requires openness and trust between the wholesaler and the other companies within the value chain for sharing information. As the title indicates, the information wholesaler will be the information owner/provider, and will have electronically access to the complete order information. The wholesaler can use his knowledge base for negotiation purposes, this will of course stress the trust between the companies in the integrated supply chain. Skorstad (1999) claims that the ability to share information is a more important factor than the ICT-system and technology, in order to create a successful supply chain.

The creation of an information wholesaler could instigate tension and stress between internal processes and departments, since the employees fear organisational re-engineering and rationalisation. Several employees, especially at the sales and ordering departments, have to change their working methods and focus. This challenge should be met with introductory lessons, education and training of employees. The other companies in the supply chain will reduce and streamline their activities to match the new mode of operation.

6. WHAT ARE THE BENEFITS FOR OUR SUPPLY CHAIN?

Increased efficiency

We expect the ICT-based ordering system to give the companies of the supply chain a common platform/"meeting place" that internal efficiencies and increases the total efficiency of the supply chain. By implementing the principles from the integrated logistics management model, accompanied with the ICT-based ordering system, we expect faster order-processing time, reduction of internal stock, better handling of deviations, removal of both manual and duplicate work and higher quality of product assortment information. All these

improvements are expected to increase the overall profit for the companies and in turn result in better prices and services to the end-customers.

A study from A.T. Kearney and European Logistics Association shows that companies can save over 50 percent of total purchasing transaction cost by moving from paper-based to Internet-enabled systems (1999). This indicates that ICT makes it possible to effectively transfer information between companies along an integrated supply chain. Together with the participating companies in our case study, we have calculated that the whole supply chain can save approximately 80% of today's order cost when redefining the tasks in a more efficient manner and handling the order processing electronically.

The adoption of ICT will save a significant amount of transaction time and labour cost. Hence, the companies can concentrate their time and effort on desired core activities, customer service (customer satisfaction) brand marketing or further specialisation.

Improved service quality

In this case, it is assumed that by using electronic order processing and by reusing information to a greater extent, this will reduce the transactional errors by 50%. (The companies assume that 10% of the orders today contain errors.)

Key Performance Indicators

When using electronic information handling systems, it is easy to establish and maintain systems for monitoring performance indicators as costs, reduction in delivery time and reliability. These indicators make it easier to control, correct and follow up with corrective actions. In this project, there is suggested a scheme for how to monitor key performance indicators.

7. HOW SHOULD IT BE IMPLEMENTED?

The project work was organised in two groups. The main bulk of work was carried out in a working group consisting of researchers and representatives from the participating companies. The results from this work were approved by a steering committee consisting of senior research officers from SINTEF and managers from the participating companies. The idea was that if the representatives in these two groups agreed on the suggested solution, we could then perform an introductory sale to the companies with the support of the group representatives.

The solution was presented and finalised in November 1999. The working group and the steering committee accepted it. Actions to both promote and to implement the solution were subsequently developed. The solution is found in three documents: The basic document is a functional description of the b2b Internet solution, including technical specifications as well as guidelines on how the system shall work and how

the organisations shall interact with the system. The second report is a document that contains pros and cons for the selected solution. The document shall serve to explain the logic and advantages behind the new system to the participants in the value chain. It addresses especially the retailers, because they will be strongly affected by the proposed system/solution. The last document is a detailed implementation plan that specifies actions to ensure compliance and full implementation of the solution.

8. WHY NO IMMEDIATE SUCCESS?

The implementation phase was supposed to start in January 2000. However, by June this year little progress was observed, and the companies have decided to postpone the implementation. The wholesaler has started to implement handheld terminals, and indicates that this may be a gentle transition to the solution.

Apart from this, the wholesaler claim they are waiting for partners' initiative regarding e-commerce solutions before doing anything on their own. (The partners are the co-operative body of the retailers and a sister company handling other types of goods). These partners consider implementing e-commerce to facilitate solutions for private consumers and retailers. Their perception and focus is that an Internet solution should firstly put focusing on a C2B-solution rather than a B2B-solution. They are presently at the initial stage of this process.

Based on successful implementation stories of e-commerce (e.g Cisco and Dell) and the fact that the management has given their commitment to the suggested solution, this absence of progress came as a surprise to us. The technology is ready, and implementation plans are made. Why this postponement?

Some of the literature is concerned with similar or related approaches considering implementations of information systems. Marcus, Newman, Orlikowski, Kling and Iacono among others try to explain implementation fallacies and problems based on observations. They seek to identify generic organisational behaviour to explain what happens. Marcus (1983) builds on Kling's work (1982) and refers to the resistance employees in a company may have to implement computer systems and the reasons for this. He introduces three theories about resistance against implementation of new computer systems in organisations. Such resistance may be understood from some of the following considerations; 1) personal relations or internal relations within a group, 2) inherent characteristics about the quality of the system, and 3) opposite interests between employees and the system. Marcus tends to indicate that the latter theory is the best explanation in order to understand and foresee resistant in an organisation against implementation of information systems. The three following patterns of recognition, according to Marcus, is based on this theory: a) Systems which change the balance of

power within an organisation meets resistance from those who lose power and get acceptance from those who gain power. b) Systems, which centralise control of information flow, are counteracted in organisations that have a decentralised control structure. c) Systems with a functional design which are in disharmony with the social framework in which it shall function, results in resistance from the users. Marcus (1983), Kling & Iacono (1984), Newman (1989) and Orlikowski (1992) do all refer to such examples, all which can be classified according to the previously mentioned patterns.

Kling and Iacono try in their paper to understand the actions undertaken during implementation of a computer information system in an organisation. They explain this behaviour using four different models: technological evolution, economic rationality, organisational drift and organisational politics. In their research, they observed that the first three explanation models were not suited to understand what was going on in their case. As they found no signs that supported those three explanation models, even if people from the organisation claimed that the foundation was economical rationality. The model that identified what happened in their case, was the "organisational politics" model. Different groups in the company used different methods or strategies to promote their own opinion of the system, mobilising support to gag the opposition – in their way to promote their own interests. Kling and Iacono conclude that when different groups in an organisation have different views at the direction taken by the implementation, they will try to realise their own view(s) through dominance, sabotage or compromises.

In search of an answer to the given question from this chapter's heading, we may find some explanation models from the above-mentioned literature that help us to understand what is going on. Such knowledge will definitely be an advantage to carry forward into new projects where we, as action researchers, will be better prepared to guide companies through similar processes.

In view of this and our case experience, it must be mentioned that there is a drawback related to such research work, because this kind of issues was not originally put on the agenda of the project. We may therefore only be able to *indicate* possible causes based on the following observations from our work:

Project organisation

Due to the fact that the wholesaler's role in the supply chain is vital when it comes to information handling, we felt that the IT department of the wholesaler should have been represented in the project team. This option was raised early in the project, but not followed-up because the people of the IT department was fully involved with customising and de-bugging the newly implemented ERP-system. Another argument for not involving

people from the IT department from start, were the logistic management approach of the project, and information technology was only a minor part of the overall project activity. During the project evolution, we observed that the IT department was not kept informed of the results from the project – and vice versa. We did not get detailed information about other ongoing e-commerce projects in the company until the latter stage of our project. Related ideas of e-commerce had been adopted by the IT-department, but with more focus on C2B-solutions. This lack of information/communication between our project and the IT department, gave no incentives to the IT people to commit themselves to the progress of our project. They were busy with other tasks, which attracted their attention to the sacrifice of our project. By acting in this way they downgrade or did not implement the management's request about implementation and justified this with shortage of resources. This can be understood as organisational politics or organisational drifting.

Priority and decision

The companies have already other ongoing projects that demand resources. The people responsible for these projects fear that by implementing the proposed solution, that would result in less resources (man-hours) available for their ongoing projects. We did not manage to convince all the contact persons involved in our project that the solution from this project should be given priority over other ongoing and not started projects. It is all about priority, and even the contact persons lack to put priority to the suggested solution due to their own prioritised ideas, undermined this issue. In addition, the newly implemented ERP system by the wholesaler required a lot more time and resources than foreseen. It is also a fact that the connected ICT solution will require some investment by the wholesaler. Hence, the decision-makers at the wholesaler are reluctant to start implementing new ICT solutions, and are acting risk-averse when it comes to this project. The following statement from one of the wholesaler's decision-makers supports this impression; "We can not use that retailer as a pilot because at the moment he earns good money." It seems that the companies refuse to plan and take responsibility because it is impossible to know what the technological development will offer tomorrow and the premises for today's plans may be invalid.

Competence and skill

In our case, the supplier and the freight forwarder have high skills in use of ICT. The wholesaler, with the exception of the IT department, do not have similar competency with ICT systems, or any experience with systems like the one we suggest. It is stated that retailers are generally not very competent in using ICT solutions. This statement is used as an argument against the suggested implementation and as an argument for only implementing handheld terminals. Our impression is that this competence varies a lot, some of the retailers do not even have a computer while others

run ERP systems themselves. In addition, in the suggested ICT solution a user-friendly interface towards the retailers is emphasised, and it is one of the main reasons for the suggested solution. To us, it seems that the argumentation to implement only handheld terminals, to some degree can be regarded or understood as organisational politics. Our impression is that at least some of the retailers are very interested in more advanced forms of ICT solutions.

Culture and motivation

There seems to be some lack of motivation in parts of the wholesaler's organisation. Other things that improve efficiency and lower prices concern the wholesaler. They seem more concerned about extending the range of products, traditional inventories, long opening hour etc., rather than involving themselves in new technology and new ways of operating. Some want to implement ICT tools mainly because they have a feeling that "everybody else will". They are not clear on why they want the ICT tools and for what reasons. They do not see the potential and do not want any change. The wholesaler is able to compete and survive with the organisation and the processes they have today. They do not feel the competition and price pressure, as they believe today's organisation can meet such challenges. The management may see a more intense competition coming, but some employees, we have been told, seem to be more concerned with domestic affairs and bureaucracy. This way of thinking could be seen as a sort of organisational drifting without too much focus on the main objective of the wholesaler, which is to make money and secure market position. It could also indicate that the wholesaler's strategy is not widely communicated and understood in the organisation.

Equality in the supply chain

We have recommended a balanced supply chain, hence none of the companies are dominating and has the power to force any of the other companies to perform major changes. There may be a challenge not to have a "locomotive" in the value chain, an entity that push and drive the complete process. The core of the supply chain – is that the companies appreciate each other as equal partners. This makes it impossible for any of the participating companies to make decisions in the supply chain unless this is done in agreement with the other companies.

In the spring of 1999, during a conversation between a member of the research team and one of the managers from the Norwegian department of Cisco, the manager asserted the following as one of the reasons for Cisco's success with their Internet solution implementation. "Because they were big compared with their customers, and because their position in the market was very strong, they could demand that their customers used the implemented Internet solution. If not, they were no longer a customer."

Taking that into consideration, the equality among the partners in the supply chain may be one of the reasons for the lack of implementation progress. Such equality may lead to organisational politics among the partners – something we observed early in the project when the definition of the roles of the companies in the supply chain was put on the agenda.

9. CONCLUSION

Our argumentation to implement the suggested ICT solution is based on "economical rationality". Even though the wholesaler's management team claim that they agree in the solution and that they see the solution in an economical and rationalistic perspective, they do not put much pressure on the organisation and associated companies to get it implemented. This aversion may be based on three causes:

1. The management are not convinced about the solution.
2. They do not believe in the economical rationale behind.
3. There are other "hidden" explanations/agendas.

Of course, we can not eliminate the first two courses, even if the management claim that they are convinced about and can see the economical potential of the solution. Assuming that reasons 1 and 2 are not applicable, could the obvious reasons underpinning cause 3 be issues such as: organisational politics, organisational drifting or subparts from the above two explanation models.

We have a supply chain that has just started to see the value of close co-operation and managing the logistics as partners. As we see it, this is a step in the right direction towards rational and effective logistics and supply chain management. Even though our suggested solution are not implemented fully, we have pointed out some possible ways to improve the flow in the supply chain, and the companies in our case have decided to sign a partnering contract. Solving the integrated demand and supply planning is a complex endeavour, but finding the solution is becoming a competitive need (Sewell 1999).

When it comes to computer systems, we have looked at some existing systems, and Internet solutions already exist that can handle the requirements by the retailers. A system for receiving and processing orders for the wholesaler needs to be developed and customised.

We think that the supply chain we have studied has a lot of potential to gain from using ICT systems in a more effective and integrated way. Our suggestion will significantly change the role and function of the wholesaler in the supply chain, but the organisational indications are that the wholesaler is not ready to take this step fully.

In the end, people, not computer systems solve business problems. When Porter (1998) claims; “by making it easier for people to communicate and collaborate, we can move significantly closer to harvesting the benefits of supply chain management”, we will add that this is only a part of the answer. In addition, there exist personal, cultural and organisational behaviour aspects, which need to be understood and addressed in a proper way.

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