Towards a definition of SCM systems through SCOR

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Abstract
In recent years Supply Chain Management (SCM) in general and in management information systems in particular, have gained interest among researchers. However, derived from a recent analysis of the area and from many definitions used in literature, we think that there is not a clear understanding of what should be considered as a SCM system. In the same way, the minimal functional requirements for a system to be considered as an SCM information system are not yet clear. This contrasts with the existence of SCOR, a much publicised model used as standard in the SCM domain. Although SCOR does not include a definition for an SCM information system and, in fact, it leaves the system implementation at will of the companies, we think that it can be used to provide a better definition. Thus, in the present work we intent to offer a tentative definition of SCM systems based on SCOR.

Keywords: SCM systems, SCOR, Supply Chain Management definition

1. INTRODUCTION

In current business environments it is common practice that organizations use new coordination and alignment models in order to improve their individual and group logistic and production processes, increase overall business competitiveness, and to try to get a bigger and better share of the market while at the same time try to deliver greater value to customers.

Today, one of the models most used results from a Supply Chain Management perspective, in which organizations create a society of autonomic entities in order to work together with the coordination and alignment of their logistics and production value chains and the associated information systems (Chandra et al 2001). There are many industries (textile, automotive, pharmaceutical, etc.) that have tried for years the integration and standardization provided by this kind of information systems, due to the complexity of their productive processes, the amount of involved customers, the required variety of raw materials and the dissemination around the world of their business partners.

Given the mentioned complexity and diversity, rather than aiming at the bespoke development of proprietary solutions, those companies deploying SCM systems prefer to built them around packaged COTS (commercial-off-the-shelf) software tools. In fact, SCM systems can be seen as part of a more general group of Enterprise Systems (ES), which also includes systems and tools for Enterprise Resource Planning (ERP), for Customer Relationship Management (CRM), for Business Intelligence (BI) and for Enterprise Application Integration (EAI). All of them working together may provide companies with a powerful technological infrastructure in order to automate, integrate and manage intra- and inter-organizational processes and ameliorate the relationships between partners, suppliers and customers in the whole supply chain.

In recent years the interest for ES and specifically for SCM systems has grown considerably not only in the enterprise, but also in academic research, as revealed by the growing number of publications in the area (Gunasekaran and Ngai 2004) and the space offered for this area in conferences around the world. As a representation of theses efforts we can mention the creation of a council that gathering the best practices of their members has presented the Supply-Chain Operation Reference-model (SCOR), a publicized reference framework that has allowed a better understanding of SCM processes and that can be used to define and capture all of the chain processes and measure their performance. In fact, most of the SCM tools have been designed in line with the SCOR, as a way to promote the standardization in inter-organizational logistics and production processes.

Despite the recent advances in SCM systems tools and research, we have not found any work, neither from the survey of Gunasekaran and Ngai (2004) nor from our own wider literature review, that includes a precise definition of what we must understand as a SCM information system and which includes the basic functional elements that an information system must have in order for it to be considered a SCM system.

Thus, the purpose of this paper is to define those minimal SCM information systems elements through the analysis of the basic SCOR processes, respectively named *plan*, *source*, *make, deliver and return*,. In the next section we will review and describe the SCOR model and its basic processes; in section 3 we present the functionality that each one of the elements a SCM system should require to manage a supply chain; and finally in section 4 we give our concluding remarks and ideas for further work.

2. DESCRIPTION OF THE SCOR PROCESSES

The SCOR reference model was created in 1997 by a coalition of a significant number of organizations and practitioners in logistics from many industries, which founded the Supply Chain Council to analyse the SCM phenomenon from a global and inter-organizational viewpoint. Their goal was to provide a conceptual tool to increase effectiveness in supply chains operations and a common communication language for business partners in their trading relationships. The fist step was the task of defining the SCM term and the processes used to connect customers, suppliers and partners into an inter-organizational environment (Stephens 2001).

The SCOR model takes traditional management processes and applies them within an inter-organizational environment in order to describe all the interactions occurring in a logistic or production value chain, from the generation of an order request to the return of excess and damaged products (Lockamy III and Mcormack 2004).

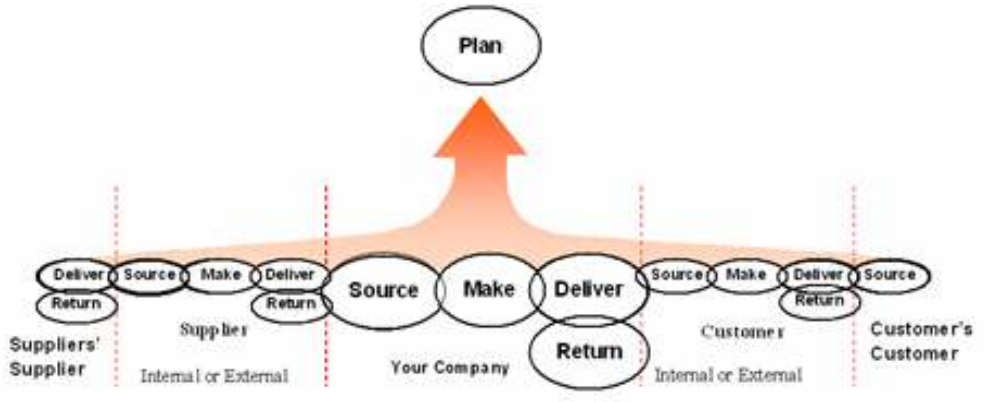

Figure 1. Management processes of SCOR model (from SCOR 2005)

The Supply Chain Council defines five different management processes in order to manage global logistic and production processes (Figure. 1):

- *Plan*. - This process is in charge of planning for the balance between supply and demand requirements in order to optimize the logistic and production resources with regard to requirements. It also includes the spreading of the plans to all chain members to coordinate and update the other processes.
- *Source*- This process is in charge of evaluating and selecting providers according to the established criteria and authorizes future payments to them. In the same way, it contains the programming of the periodic delivery of raw material in order to keep optimal stock levels.
- *Make.* – This process is used to schedule the logistic and production activities, including design and product tests, as well as packing and production rules.
- *Deliver.* - In this process the means and transport routes are selected, the warehouses are managed as well as the required activities for merchandising, installing and following customer satisfaction. .
- *Return.* - This process contains the management activities regarding the return of exceeding or defective raw material, verification of its status, return schedule or repair.

All of these management processes are defined and decomposed into three levels of detail as shown in Figure 2. At level one (plan, source, make, deliver and return), supply chain performance can be directly tied to the business objectives of the organisation. In levels two and three process elements are used to describe more and more detailed activities to provide greater insight into the operation of the supply chain. There is a level four where companies implement specific SCM practices in order to adapt to changing business conditions but this level is out of the scope of SCOR. (SCOR 2005).

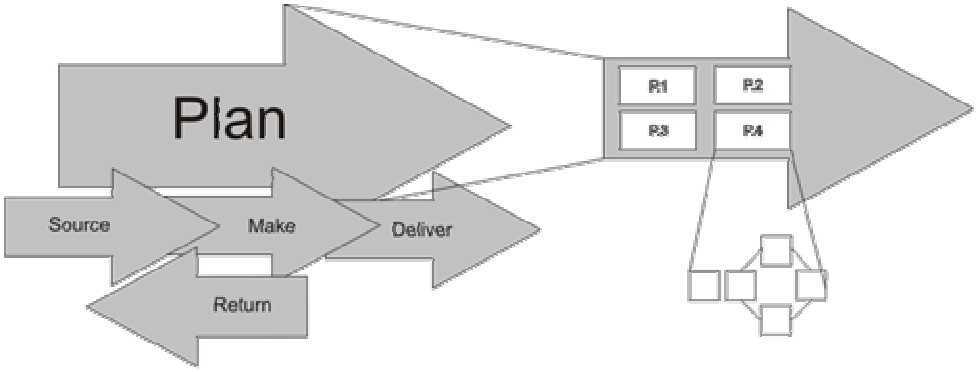

Figure 2 . Decomposition of processes in the SCOR model (from SCOR 2005).

3. SCM SYSTEM COMPONENTS BASED ON SCOR PROCESSES

In order to work under a complete SCM scheme it is necessary the integration and collaboration of many systems, as well as information sharing between partners, providers and customers. In other words, a SCM system is made of many software components, some of them being legacy systems but most of them being new components based on implemented COTS software, all of them requiring inter- and intra-organizational integration (Themistocleous and Irani 2001).

Given the importance of SCOR as a reference model, and the various COTS products for building SCM systems, we have decided to use both sources as a way to propose a tentative definition for SCM systems. Thus, we try to present a tentative approach of SCM information system based on the SCOR model and related literature, as well as on the functional criteria drawn from all current SCM packages offered by the main software vendors (SAP, ORACLE, Manugistics and I2).

After the analysis of the SCOR model, the deep exploration of the most publicised SCM packages and a literature review about the domain, we make an attempt to define the minimal functional requirements of a SCM information system. Along this line, next we define, for each one of the SCOR processes, the required functionality for an inter-organizational SCM system.

P. Plan

P.1 Global production planning system- This initial element of the planning process is a system in charge of the alignment of the local production plan with the global plan, allowing communication among all members of the logistic chain and helping to synchronize those production plans from suppliers down to customers.

P.2 Demand planning system- Collecting information from the functional areas (marketing, finance, production, etc.) of the member companies of the chain, this system allows for the anticipated calculation of the orders that must be taken care of, according to their priority. Additionally, a calculation of raw material needs can be made for all the members. The information system should also have some mathematical methods to calculate orders, such as models for linear and intermittent demand, mobile average, among others.

S.Source

S. 1 Supplier management system- This component is used to select the supplier that fits the best according to the order; in the most automated case, the system connects to the net and chooses the supplier by means of parameters previously specified and procurement business rules.

S.2 Warehouse management system- This system controls the handling of material and products within the chain, and whether to send or receive supplies. It also helps to allocate products in order to optimize the supply flow in the various storages as well as helping to plan and carry out the inventory periodically. A tendency today for these components is that of main software vendors providing compatibility with RFID technology.

M. Make

M.1 Collaborative production system- This system allows for the controlling of all the activities related to product elaboration, manual labour and machine-working time. It also serves to configure the whole chain in order to work on an established production environment such as make-to-order, make-to-stock, configure-to-order, etc., depending on the requirements.

M.2 Simulation tools- They are required to project scenarios in which, by inserting information from other systems, it can give better production plans and reduce costs.

D. Deliver

D.1 Order management system- This element controls the order process, allowing order capture from different sources of information (XML, common applications, web portals, EDI) and checks the order against the stock at the same time.

D.2 Transport management system- This component is used to manage the physical movement of the orders, allowing for the selection of the most suitable transport, the optimization of delivery routes, the calculation of transport costs and the way to share transport resources and costs with business partners, whenever possible.

Return

R.1 Return control system- This component works in coordination with the transport management system and the stock management system, allowing for the return of exceeding or defective products to providers through chain elements, managing the proper delivery means.

All the mentioned components work in a coordinated environment in order to support the basic functionalities required for automating supply chains. Often the vendors offer other functionalities such as predefined KPI (key performance indicators), promotion planning or markdown optimization, but despite of being a good analytical support to SCM initiatives, they are not yet considered as basic functionalities.

Throughout our analysis to determinate the minimal components of the SCM systems, we have found that most of the time each package vendor uses their own particular nomenclature to name their software components. In the detailed examination of the information of their brochures and websites we have found that some of them accomplish all the components defined previously in this work. In Table 1 we present all the defined components (coded as above S.1, S.2… R.1) and we use to compare the functionalities and determine which are full supported (●), partial supported (◒) or non supported (○).

	Vendor Solution				
Components	SSA Global	Oracle	SAP SCM	I2	Manugistics
P.1	●	●	◒	●	●
P.2	●	●	●	●	●
S.1	●	●	●	●	●
S.2	●	●	●	◒	◒
M.1	○	●	●	◒	●
M.2	●	●	●	●	●
D.1	◒	●	●	●	●
D.2	◒	●	●	●	●
R.1	◒	◒	●	◒	◒

Table 1. SCM basic components supported by main providers

4. CONCLUSIONS AND FURTHER WORK

In this work we have presented an initial and tentative definition for SCM systems. To achieve this, we have based our proposal upon the SCOR reference model, which is used by many organizations to introduce the SCM philosophy among their partners, providers and customers. For the same purpose, we have made a review of those basic functionalities contained within the diverse SCM solutions offered by companies such as SAP, ORACLE, I2 and Manugistics.

Having the current knowledge of the SCM system domain, we can now more clearly define it as *a group of information systems that, working together in an inter-organizational environment, supports business partners to carry out their operations and decision making in those logistic and production processes relative to planning, sourcing, making, delivering and returning of products.*

As possible further work, with additional elaboration, we consider this work to be a basis for a company to select, according to functionality, the required software packages that conform to their aimed SCM systems. A next step is to carry out a quality model of such a software offer according to ISO/IEC 91926-1 and a methodology such as the one presented by Franch et al. (2002). These colleagues specify six steps to create a quality model for evaluating COTS packages, being the first step the recognition of the appropriate domain, such as the one presented in the previous sections for the case of SCM systems.

Also, as possible future work, we may think of using and extending our proposed definition and SCOR in order to provide adequate guidelines for studying, understanding, planning, monitoring and controlling SCM systems implementation projects.

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