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Towards a Research Agenda for SCM systems

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ABSTRACT

In recent years Supply Chain Management (SCM) in general and SCM information systems in particular have raised growing interest among researchers from several knowledge areas, such as Information Systems, Artificial Intelligence, Simulation, Telecommunications, Economics and Business Management, among others. Based upon a recent survey that we have undertaken, and which updates a prior one, in this paper we provide a focused analysis of previous research in SCM systems, before providing a tentative list of potential research issues that we consider worth studying. To our knowledge, there is no published research agenda on SCM systems, which contrasts with the mentioned research interest in the area and with the big amounts of projects and money that companies around the world are dedicating to SCM projects. For a better understanding, we have classified the emerging research topics along the lines of a proposed life-cycle framework.

Keywords

SCM systems, life-cycle, research agenda, Supply Chain Management.

INTRODUCTION

Supply chain management (SCM) is not a new topic in business management research and practice. For several decades, organizations have studied how to deliver products and services in shorter times, right quantities and with the best prices. With business globalization, and a fierce and growing competence, SCM has become a new paradigm in order to improve logistic and production processes, increase business competitiveness, and to try to get a bigger and better share of the market while at the same time deliver greater value to customers.

During the 90’s, with the significant growth of business information systems and technologies, paradigmatically represented by the expansion of ERP packages implemented in companies many manufacturing organizations saw the opportunity to evolve from a traditional vertical integration model deployed within the limits of the organization to a more horizontal SCM-based model that, being more flexible and outwards-oriented, could allow for a multiplicity of alliances with different business partners up and down the supply chain. Thus, with the more open and holistic perspective of SCM, CEOs attempt to restructure all their logistic and production processes, from planning to delivery. Furthermore, with SCM they pretend to accomplish the most important requirement in order to be competitive, that is to coordinate with effectiveness the whole chain of activities along what it is now called the “extended-enterprise”.

The role that information systems and technologies play in the development of SCM systems is undeniably crucial, since they have the responsibility of executing all transactions and at the same time working as decision support systems for the whole supply chain. The so-called SCM information systems (or SCM systems, for short) thus becomes a business and research topic that is taking a growing relevance not only among researchers from several areas, but also between big software companies. In this paper, we make an attempt of bringing together open research issues that, after having surveyed recent academic research on the area, we consider to be the most important in future SCM research development. In addition, we organize our proposed SCM open research issues into a proposed life-cycle framework that we will explain.

PREVIOUS RESEARCH ON SCM SYSTEMS

The presented research agenda is based upon a recent survey on academic research on SCM systems that we have undertaken which updates and extends a previous one (Gunasekaran and Ngai 2004), of a more general management nature. In our
survey we have evaluated and organized the literature of SCM IS/T published in journals and proceedings from 1990 to 2005 (Figure 1). With such a literature review background, we have noticed that, despite the growing research interest in SCM, there are still areas that require further research attention, study and maturity.

Figure 1. Research related to SCM systems

SCM PROPOSED FRAMEWORK AND RESEARCH ISSUES

As state Davenport (2004) and Power (2005) the SCM systems end up being an aggregate which result from the composition and combination of several software components, most of the time, purchased from specialized vendors. This new tendency, the called component-based information systems paradigm, created new challenges to IS researchers, such as study, create, adapt and apply new methods and models for the procurement and implementation of this software components. In this context, we consider as initial point the definition of life-cycle model that provides a deep understanding of theses component-based systems. We expect that using a life-cycle approach as a model, the researchers would be provided with a holistic standpoint of the SCM research issues.

In the proposed life-cycled model (Figure 2), we suggest procurement and implementation as main phases in the analysis of SCM systems research issues. In addition, for each phase, we introduce three stages: analysis, selection and contract management for procurement; and alignment, deployment and use for implementation. Besides, taking into account that SCM is a multi-organizational nature initiative, we present the intra-/inter- organizational dimension that can be used to locate a specify issue according to a particular domain. Thus is possible locate a research issue at a single company or a local unit within a corporation; at inter-organizational level, involving the whole group of companies; or even in both.

Next, we present a description of all stages and we introduce and justify the open research issues in each of the described stages

Procurement

The procurement phase represents the start of a SCM project. It is when a group of commercial partners convene to work collectively as a society with the aim of creating one or several value chains. The activities of this phase comprise activities that allow to define the requirements for the future SCM systems, such as integration levels, information that will be shared, information systems that are involved or required, and if these systems are to be purchased as a package system or should be reused from the ones of the participating companies. Next we describe in more detail the three stages of the SCM procurement phase.
Figure 2 SCM life-cycle proposed framework

Analysis

This stage is where the SCM global model is first studied, negotiated and settled. The current business practices have to be evaluated and usually redesigned towards a new group-wide business model. Following this, SCM analysis also includes the elicitation of the requirements of the SCM system that will support the SCM initiative.

Research opportunities

In the analysis phase are the open research issues related to the motivations that drive a group of organizations to form a supply chain, while it is still unclear why differences exist in patterns of adopting SCM strategies (Craighead and Laforge 2002). Another issue is to determine which industries are essentially better candidates to benefit from SCM strategies (Lockamy III and McCormark 2004). The issues of trust, power and relationship have to be further considered in both the SCM analysis and use stages (Chistiannse and Kumar 2002).

The analysis phase could also be benefited from the use of SCOR (Supply Chain Operations Reference-model). This is particularly true for the case of business process modeling, where it is possible to realize gap analyses by comparing “as-is” business models with the desired “should-be” models in the context of SCOR (Huan et al 2004). From such a comparison, the requirements of a future SCM system may be derived and justified. Despite that SCOR was developed as a communication tool between practitioners, we could envision other applications resulting from research made with SCOR, such as: procurement of SCM custom off-the-shelf software (COTS) and improving training in SCM, among others (Stephens 2001).

Selection

From the definition of the SCM business model and systems requirements, a global systems architecture must be decided, including those SCM systems components that must be purchased and those that must be developed or reused in-house.

Research opportunities

In order to guarantee that a satisfactory selection of SCM components it would be good to have procurement methods that help companies to select the adequate components, with the appropriate evaluation criteria, documents and phases (Sarkis and Srinivas 2004). In fact, while it is possible to build a complete SCM system based on a single SCM tool, it is common that companies combine SCM components from different vendors and integrate them into an SCM system. There are various ways to integrate an SCM system, such as through web portals, Electronic Document Interchange (EDI) and Enterprise Application Integration (EAI) tools. It is at selection time that these options must be evaluated and finally selected, and this topic has not been researched yet (Mclaren et al 2002). Besides functional and non-functional criteria for evaluating and
selecting SCM components, this stage also includes the appropriate tasks for analysis costs, benefits and risks; neither these analyses have been studied enough for the specific case of SCM systems.

**Contract management**

In this stage it is where the various types of contracts with the SCM providers (one or more component vendors, implementation consulting vendor, etc.) must be discussed, written and managed.

**Research opportunities**

Contract issues in SCM, as in other type of enterprise systems, have not been studied enough. While contract practices used in other types of systems and computing services can be adapted to SCM, we believe that the specificities of SCM demand for further specialized research in this topic. It is important to note that many problems that later on may arise during SCM implementation and use have their roots in poorly managed contract issues. Good practices in this topic could surely help in establishing a higher level of trust, commitment and partnership attitude.

**Implementation**

The second phase of our proposed life-cycle, in charge of adjusts and integrate all the components selected, covers the alignment, deployment and usage of SCM systems, from the analyses, decisions and contractual agreements undertaken in the previous phase. In this phase we identify the follow stages:

**Alignment**

This stage consists in the conciliation of the discrepancies between the SCM global model resulting from the analysis stage and the functional and technological characteristics of the SCM components purchased at the selection stage.

**Research opportunities**

Since SCM systems end up connecting and coordinating several organizations, usually companies from around the world, this implies that they must be aligned not only to the respective business strategies but also to different legal and cultural situations of the involved companies. This calls for additional research on these topics (Yen and Shue 2002).

The alignment of the organizational processes with the introduction of a SCM system will usually imply a big change in many of the logistic and production processes of the involved companies, moving the focus from a the local business viewpoint towards a more global inter-organizational process perspective. Change management in SCM systems is another important issue that requires the attention of the research community, since the particularities of SCM projects have not been dealt with before in the extensive research on general change management. Also, collecting and analyzing the best practices in SCM alignment in order to determinate critical success factors in SCM alignment would be an important contribution to SCM.

**Deployment**

This stage consists in more technical aspects of the implementation of the SCM system. Thus, it is when the project integrates the systems resulting from the adaptation of the selected SCM components with the legacy information systems that the involved companies have decided to keep.

**Research opportunities**

Among other approaches, it seems that the use of EAI tools may prove useful in order to integrate applications to connect SCM systems (Themistocleous and Irani 2001). Comparing the various approaches and more specifically studying SCM projects that have used EAI technology can bring light to this stage.

The information that is shared over the chain is often classified as confidential, and the misuse of this information could destroy the partnership and trust and could open opportunities of fraud in chain operations. Security related to SCM systems is a topic not studied enough.

Due to the close relationship between ERP and SCM systems, both of a transactional nature, special attention should be pay to the deployment of SCM systems on top of one or several previously implemented ERP systems.
Use

This final stage starts when the system is fully operational and it involves a whole community of users, of different roles and types, from whom it would be interesting to try measure their satisfaction levels with regard to the performance of the SCM system at intra/inter-organizational levels, and to determine tangible benefits, and thus the return of investment (ROI).

Research opportunities

When the SCM is functional it is important to develop mechanisms that help to evaluate the outcomes of the implemented SCM system (Stefanou 1999) and to measure the benefits, especially at the intra-organizational level, through cost-benefit metrics and analyses (Patnayakuni 2002). The use of SCOR metrics together with software evaluation tools would be a good option to address this topic.

CONCLUSIONS AND FURTHER RESEARCH

Our intention with this paper is to provide a tentative list of research issues related to SCM systems in order to identify those areas that require initial or additional attention from researchers. Along this direction, we have proposed a life-cycle framework than can be useful to analyze SCM systems from an evolutionary component and inter-organizational viewpoint.

We believe that SCM systems are still an emergent research area in its early development. Although it is not our intention present an exhaustive description of the all the possible research issues in this area, we present this paper as an attempt to settle the bases to organize and classify research issues around SCM systems. Hopefully, with the further development in the area, each phase and stage presented here would present new research opportunities. Also in further research it would be interesting integrate the objectives of SCM systems as third dimension in the SCM IS analysis, this insertion can provide to researches with new research questions principally about information sharing above the chain and the configuration of the supply chains (Samaddar et al 2006).

We expect that this paper can be used by research groups starting to study SCM projects as a useful tool to enter the field and to organize their captured knowledge, and by the practitioners and consultants as another analysis viewpoint on the SCM systems movement.

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