INTERNET-BASED ELECTRONIC PROCUREMENT SOLUTIONS – OPPORTUNITIES FOR SUPPORT AND RE- ENGINEERING OF DIRECT MATERIALS PROCUREMENT

Robert Alard¹, Martin Gustafsson²

¹ *ETH Center for Enterprise Sciences (BWI), Domain of Logistics and Information Management, Swiss Federal Institute of Technology Zurich (ETH), Zürichbergstrasse 18, CH-8028 Zurich, Switzerland, robert.alard@ethz.ch*

² *E-Business Competence Centre, Swiss Life Insurance and Pension Company (Rentenanstalt / Swiss Life), General-Guisan-Quai 40, P.O Box 4338, CH-8022 Zurich, Switzerland martin.gustafsson@swisslife.ch*

In businesses today, an increasingly important role is played by the procurement, taking on strategic assignments involving co-ordinating the whole supply chain. To meet the numerous challenges faced by the procurement in this context, focused organisational measures and adequate usage of Information and Communication Technology is necessary. Internet-based electronic procurement solutions (e.g. electronic procurement, electronic marketplaces, etc.) have already proved to be important. These solutions offer a wide spectra of opportunities for support and re-engineering of procurement processes. Due to the highly innovational character few frameworks for planning, implementing and operating internet-based electronic procurement solutions exist today. This paper gives an overview over existing internet-based electronic procurement solutions and highlights an approach for the planning and deployment of internet-based electronic procurement solutions.

1. INTRODUCTION

During the last decades, industrial companies have increased focus on their core competencies and reduced the vertical range of manufacture. The supplier's share of the total value addition has therefore continuously increased. As an effect of the increasing procurement volumes and the resulting increase in supplier's influence on companies' competitiveness, the cost reduction potentials and performance opportunities have shifted towards the area of procurement. The procurement as functional and organisational area has therefore experienced a considerable up-swing in appreciation and attention. The relations to suppliers and their integration in the company's value-adding processes play an increasingly important role. Only procurement concepts which are mature in terms of organisational and informational aspects will enable a modern procurement to take an active part in an integrated supply chain management approach. An approach that will provide opportunities for

the producing company to create and hold sustainable competitive advantages. In the course of implementing Enterprise Resource Planning (ERP) systems, companies restructured business partner relations on the supplier side in part through Information and Communication Technology (ICT). The companies focused on improving data and information exchange with strategic partners of their business networks. During that time period, the concepts and software solutions known under the name of Supply Chain Management (SCM) were established. However, most SCM software solutions, together with the classic Electronic Data Interchange (EDI) solutions, proved to be insufficient for Small and Medium Enterprises (SME) due to the major organisational and financial efforts needed in the implementation (see Alard & Hieber, 2000; McIvor et al., 2000). Consequently, most information technology based concepts like EDI or SCM are until now implemented in large enterprises (see Buxmann, 1999). Another hurdle for acceptance is the limited variety of procurable objects supported by the majority of these software solutions. Following the breakthrough of the Internet as a high-performing and widely accepted network infrastructure, and the common use of standards (e.g. Hypertext Markup Language (HTML) or the more recently developed eXtensible Markup Language (XML)), many opportunities for usage of the modern information technologies (IT) have emerged. Most IT and organisational concepts in the Business-to-Business (B2B) area are still in development which makes the software market complex and, due to the recent developments in the "new economy", very dynamic. Consequently there are few industrial experiences made with the implementation of B2B concepts in the procurement. This is specifically true for internet-based electronic procurement solutions for direct materials. Therefore, many companies find it difficult to make strategic decisions in terms of implementation and operation of internet-based electronic procurement solutions, see figure 1.

Figure 1 – The Industrial User and the Dynamic Environment

2. INTERNET-BASED ELECTRONIC PROCUREMENT SOLUTIONS

Following Arnold's definition of procurement (see Arnold, 1997), internet-based electronic procurement can be understood as electronic support, based on Internet standards, of company and/or market activities that aim to procure objects that the company requires but does not produce itself. Internet-based electronic procurement provides support for strategic and operational procurement processes and is able to adapt to the trans-corporate context and design aspects of the supplier-side of the value chain. With the emerge of electronic business, internet-based electronic procurement solutions have increased in importance. Most software solutions for the internet-based electronic procurement focus on the procurement of indirect materials (1st generation internet-based electronic procurement solutions). Indirect materials are procured, not for resale or further processing, but for the use or consumption by the company itself. Examples of indirect material are Maintenance, Repair and Operating materials (MRO) or office supplies. In fact, the general perception of internet-based electronic procurement is often focused on this particular category of materials. The reason for the initial focus on indirect materials from software vendors is the lack of organisational structure of procurement processes for this group of goods (see Aberdeen Group, 1999; Dolmetsch, 1999; Segev et al., 2000). Furthermore, the procurement of indirect materials is more easily structured and therefore more suitable to automate. The direct materials were included by the software vendors in a second phase of the applications' development (2nd generation internet-based electronic procurement solutions) (see Commerce One, 2000). Direct materials are part of the core business and thus of great importance to the company. Examples of products that are required permanently for production include raw materials, single parts/standard parts and complex components, modules or specific semi-finished items, or highly configurable products. Today, numerous solutions to support the procurement of direct materials exist on the market and the ICT implementation opportunities are equally common. They span over support of strategic procurement processes to market research and operative procurement task such as order processing and invoicing. The assessment of internet-based electronic procurement solutions is often based on the differentiation between indirect and direct goods. This situation is unsatisfying and further differentiation of direct goods is needed for a successful implementation. In chapter 4 we show an enhanced analysis approach of procurement objects. This approach enables planning and deployment of internet-based electronic procurement solutions and points out the industry usage of such solutions.

3. TYPOLOGY OF INTERNET-BASED ELECTRONIC PROCUREMENT SOLUTIONS

Internet-based electronic procurement solutions can be grouped in four basic categories according to the institutional provider (see Zbornik, 1996) and initiator of the solution: sell-side solutions, buy-side solutions, neutral electronic marketplaces and direct company-to-company links. There are no strict boundaries between the

categories. In practice, there is a wide range of permutations and combinations of these fundamental categories. The four basic categories are presented below.

3.1 Sell-Side Solutions

The electronic procurement solutions in the sell-side category are provided and controlled by the supplier. In most cases, sell-side solutions offer products from one single supplier, as in Business-to-Consumer (B2C) relations (m:1 (buyer-supplier)-relation). Another form of sell-side solution is the accumulated product offering from many suppliers, e.g. a commonly used electronic distribution channel (m:n-relation). A particular form of sell-side solution is the rarely seen closed (private) electronic marketplace provided by suppliers (m:1-relation).

3.2 Buy-Side Solutions

The electronic procurement solutions in the buyer-side category are organised and controlled by buyers. The suppliers' product catalogue content is adjusted and integrated into the buying company's procurement solution. This is the classic and wide-spread form of electronic procurement (1:n-relation). This solution is typically associated with the notion of buy-side solutions. Many buyers can group to operate the procurement solution (e.g. subsidiaries group within a concern) (m:n-relation). Between buyer and supplier in the above mentioned buy-side solution, there are often intermediaries (e.g. a software vendor) who manage the catalogue etc. A particular form of buy-side solutions is the buyer-controlled electronic marketplaces. They are in practice often found in closed (private) form. These solutions are frequently used to commit strategic suppliers.

3.3 Neutral Electronic Marketplaces

In the case of neutral marketplaces, electronic procurement solutions are mainly provided and controlled by independent operators as value-adding services (m:n-relation). By restricting the number of users, neutral marketplaces can be transformed to closed (private) neutral marketplaces. Another approach is the procurement solutions controlled by several suppliers and/or buyers (m:n-relation) / consortium. Depending on market power and strength of the different players, this constellation may transform into one of the above mentioned solutions (buyer/supplier controlled marketplaces).

3.4 Direct Company-To-Company Links

Electronic procurement solutions that can be part of internal software systems (e.g. ERP) and are controlled by both suppliers and buyers belong to the category direct company-to-company links. Examples of such applications are (the non-internet-based) classic EDI-applications (based on standards like EDIFACT or ANSI X12 and a traditional EDI-architecture) and the internet-based forms of EDI such as Web-EDI and Internet-EDI as well as internet-based direct ERP-connections between buyer and supplier.

4. SUPPORTING THE PROCUREMENT THROUGH INTERNET-BASED ELECTRONIC PROCUREMENT SOLUTIONS

Internet-based electronic procurement solutions offer a wide variety of supporting functions in the procurement. However, not all strategic and operative procurement processes can be supported equally extensive. Figure 2 suggests strategic procurement processes that offer substantial potential for internet-based electronic procurement solutions.

	Type of solution		Examples
Procurement market research	Sell-Side Solutions		<ul style="list-style-type: none"> Product catalogue Product specification and configuration
	Buy-side Solutions	Classic buy-side solution	<ul style="list-style-type: none"> Supplier and product search in catalogue (restricted choice of products)
		Buyer controlled electronic marketplaces	<ul style="list-style-type: none"> Offer submissions (passive supplier search)
	Neutral Electronic Marketplaces		<ul style="list-style-type: none"> Product catalogue Supplier catalogue Register / Data bases Offer submissions (passive supplier search) Bulletin Board Services / News groups / Discussion services ("Chats") Search services / Information brokers
Supplier choice	Sell-Side Solutions		<ul style="list-style-type: none"> Product catalogue Product specification and configuration
	Buy-Side Solutions	Classic buy-side solutions	<ul style="list-style-type: none"> Supplier choice from catalogue (restricted number of suppliers)
		Buyer controlled electronic marketplaces	<ul style="list-style-type: none"> Offer submissions Auctions
	Neutral Electronic Marketplaces		<ul style="list-style-type: none"> Offer submissions Auctions
Contracting	Sell-Side Solutions		<ul style="list-style-type: none"> Auction Preparation of contracts
	Buy-Side Solutions	Buyercontrolled electronic marketplaces	<ul style="list-style-type: none"> Auction Preparation of contracts
	Neutral Electronic Marketplaces		<ul style="list-style-type: none"> Auction Contract preparations

Figure 2 – Aspects of Strategic Procurement and the Potentials for Support Through Internet-Based Electronic Procurement Solutions/Examples

Beside the support of strategic procurement processes, the operative procurement processes provide numerous opportunities for the support and /or restructuring through internet-based electronic procurement solutions. These appear mainly in the procurement process phases ordering, order tracking/controlling and invoicing. Other procurement solutions are found in classic IT-solutions e.g. logistics software (ERP), purchasing informations systems, workflow management and communication systems (see Monczka et al., 2002; Schönsleben, 2000; Schönsleben, 2001). To evaluate and guarantee an adequate usage of internet-based electronic procurement solutions, an extensive analysis of the initial procurement situation is necessary. The main task is to analyse the procurement items, sources and processes. There have been various efforts to structure the decision field to provide the buying company with an overview of the main aspects and features of procurement items and sources

and to ensure an appropriate basis for the strategic decision-making (see Hütte, 1996). In procurement theory and practice, the portfolio technique has proved to be a particularly promising method (see Syson, 1992; Wildemann, 2001). Combining the well-known materials-approach by Kraljic (see Kraljic, 1977) with ABC/XYZ analysis (see Schönsleben, 2000), a three-dimensional framework for analysis can be built (see Baumgarten & Bodelschwingh, 1996; Hamm, 1997) that captures significant parameters of the procurement situation and allows the strategic procurement units and procurement items to be categorised, as shown in figure 3. To each strategic procurement unit or procurement item, one of five “reference” procurement processes is assigned, depending on the position of the procurement items and strategic procurement units within the framework. Our research project in co-operation with partner companies in the machine and plant industry have identified the following five characteristic reference procurement processes: partnership processes, supply-dominated processes, buyer-dominated processes, market-oriented processes and usage-driven processes. These processes state different organisational demands and determine the feasibility of varying options of support through internet-based electronic procurement solutions.

Figure 3 – Analysis Framework for Structuring Procurement Items and Strategic Procurement Units and Characteristic Procurement Reference Processes

The support provided by internet-based electronic procurement solutions in the case of partnership processes is outlined below. The procurement objects and units that are positioned in the partnership category are characterised through a high market-related procurement risk. Frequently these objects and units are complex semi-finished products or integrated sub-systems. The objects are highly specified according to customer specifications and are of considerable importance for the buying company. By building relationships between buyer and supplier and thereby creating interdependencies, the market complexity of the procurement is reduced. One or two suppliers are typically designated per procurement object (single/dual sourcing) and long-term partnerships are developed in the direction of value added partnerships. In the case of strategic partnership procurement processes, most of the in figure 2 shown internet-based electronic procurement solutions are suitable for the support of

the strategic procurement processes, with exception of the classic buy-side solutions. These are not suitable for the support of partner strategic procurement process, due to their static structure with pre-configured catalogues (e.g. standard components) with no new suppliers entering the supplier pool. The operative partnership procurement process can also be supported in numerous ways by different internet-based electronic procurement solutions. In this context, the implementation of buyer-controlled electronic marketplaces or direct company-to-company links are suitable. A research project partner company was able to support "order placement" (placement of order, order confirming) and "invoicing" (controlling and acceptance) in partnership procurement processes through a buyer-controlled electronic marketplace and could thereby reach significant process and cost advantages. The binding of strategic suppliers was strengthened and the solution was continuously extended with more suppliers. Direct company-to-company links also offer a considerable potential for the support of operative partnership procurement processes. The direct company-to-company links require a substantial organisational and financial effort in the implementation. However, this can be justified through the substantial potential for optimisation (e.g. cost, process quality, delivery time/time to market, etc.) in the long-term character of the buyer-supplier relations in these procurement processes. In general the support potential through internet-based electronic procurement solutions must be evaluated by inter-disciplinary teams from procurement, IT, logistics, production and finance in the company-specific context and for procurement units, objects and sources. In this process, leading questions focus on company strategy consistency and technical and personnel consequences. In the context of the evaluation, "best-practice"-examples, reference projects or innovative case studies from other companies should be considered and particularly the connection to legacy IT (back-end systems) should be secured.

5. CONCLUSIONS

This paper introduced an enhanced framework for the structuring of internet-based electronic procurement solutions which, besides the normal three sub-groups (sell-side, buy-side and neutral marketplaces), defined a fourth group of applications. The institutional providers of these applications are buyers as well as suppliers and can be implemented through EDI-applications (e.g. Web-EDI, Internet-EDI) as well as direct inter-company ERP connections. Internet-based electronic procurement solutions offer a multitude of opportunities for the support of different phases in the procurement process. Depending on the type of procurement object / unit and the (following) procurement reference process, different organisational and IT-structure considerations are to be made to achieve a differentiated view on buyer-supplier-relations (see Bensaou, 1999). The procurement of standard components (indirect materials, standard items, commodities) e.g. in the usage-driven and market-oriented procurement reference processes are since some time supported through internet-based electronic procurement solutions whereas in the case of strategically important components, such as semi-finished products or highly configurable products, that are typically procured with partnership buyer-supplier-relations, internet-based electronic procurement solutions are mainly yet to be developed and implemented. The dynamic and fast growth of the internet-based electronic solutions produces challenges to the companies to formulate strategies with flexible and exten-

sive procurement focus. In the dynamic environment and immature market of internet-based electronic procurement solutions, companies find it difficult to make decisions as far as which solution to choose. The hurdles do not end with the availability of technologies, business models and standard (e.g. XML) but also include lack of user experience with such solutions. In the planning and implementation of internet-based electronic procurement solutions for support of inter-company co-operations the different aspects of technology, organisation and people need to be considered. In doing this, the organisational and personnel implications have priority and not, as is frequently the case, IT issues. More specific, these issues include material flow structure, information exchange, supplier development and co-operation management. The presented approach offers the procurement a well-founded and powerful tool for the planning and implementation of internet-based electronic procurement solutions by structuring procurement objects and object groups and based on this structure evaluate and suggest the deployment of internet-based electronic procurement solutions.

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