

A PLANNING FRAMEWORK FOR THE DEPLOYMENT OF INNOVATIVE INFORMATION AND COMMUNICATION TECHNOLOGIES IN PROCUREMENT

Robert Alard¹, Martin Gustafsson², and Jörg Nienhaus¹

¹ *ETH-Center for Enterprise Sciences (BWT), Swiss Federal Institute of Technology Zurich (ETH), Zurichbergstrasse 18, 8028 Zurich, Switzerland*

² *Unisys (Schweiz) AG, Commercial Services, Zurcherstrasse 59, 8800 Thalwil, Switzerland*

Abstract: The management of buyer-supplier relations is a major topic for many enterprises today. Modern Information and Communication Technologies (ICT) offer interesting perspectives on opportunities and implementation approaches. Today, logistics and procurement departments of numerous enterprises are evaluating the possibilities and opportunities of new ICT solutions and especially of internet-based electronic procurement solutions for the optimisation and re-engineering of their buyer-supplier relationships. Due to the highly innovative character of the new ICT solutions and the scarcely available operational examples in the industry, only little guidance exists to support responsible managers during the evaluation, planning and designing of internet-based electronic procurement solutions. This paper describes a framework for the strategic evaluation and planning of the deployment of internet-based procurement solutions for direct materials. The presented approach supports enterprises in the analysis of procurement objects and procurement structuring, in the definition and management of buyer-supplier-relationships, in the requirements analysis of ICT solutions as well as the assessment of the potential to support procurement with innovative ICT and internet-based electronic procurement solutions.

Key words: Planning Framework, Procurement, Supplier Relationship Management, Internet-based Electronic Procurement

1. INTRODUCTION

One of the most significant trends influencing the strategic procurement today is the increased usage of Information- and Communication Technologies (ICT). Since some time now ICT have had a major impact on the design of business processes. The software applications focused initially on internal business processes. With Electronic Data Interchange (EDI), Supply Chain Management (SCM)-applications and electronic business (e-business) solutions the focus shifted to trans-company approaches. For Small and Medium-sized Enterprises (SME) e-business applications provide good access opportunities to SCM concepts [1]. Internet-based electronic procurement solutions have claimed an especially important role in the e-business and SCM environment [2, 3].

Following Arnold's definition of procurement [4], 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. 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.

2. A PROCUREMENT PLANNING FRAMEWORK

There is a lack of research in the field of internet-based electronic procurement of direct materials and limited experience when it comes to usage of such applications [5, 6, 7]. Therefore, enterprises are challenged when taking strategic decisions on implementation and usage of internet-based procurement solutions. The planning framework presented below structures procurement objects and groups and thereby provides support in planning and evaluation of procurement solutions.

In the literature there are plenty of suggestions for the support of strategic decisions. In the procurement theory and practice the portfolio approach has proved useful [7, 8, 9].

In preparation for the implementation of internet-based electronic procurement solutions in the industry, important questions must be answered in terms of procurement objects and sources in the Value Chain. An instrument for analysis and structuring of procurement objects and groups is the analysis framework described below, figure 1 [10, 11]. It is used in the evaluation and planning of electronic procurement solutions aiming to create a differentiated view on buyer-supplier solutions.

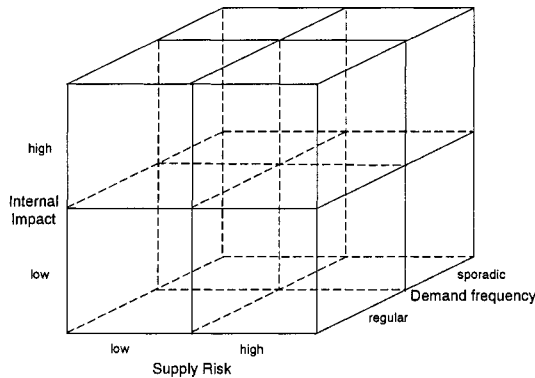


Figure 1. Analysis Framework for the procurement

The dimension Internal Impact is a crucial parameter in shaping the procurement relationships and processes and is quantified according to ABC-analysis with purchasing volume per procurement object/group and qualitatively assessed through expert-groups. Qualitative and quantitative criteria in the assessment of the internal impact are e.g. price of procurement object, costs of the purchase of the procurement object in a defined time period (volume), impact on quality, functionality and image of the end product or possible penalties caused by the procurement object.

The Supply Risk can be interpreted as the technical and logistical complexity and the resulting insecurity of the procurement market. Should the procurement object be easily reachable on the market, it is labeled with low supply risk. Criteria used to assess the supply risk are e.g. number of potential suppliers, level and sophistication of supplier-buyer-cooperation necessary, level of standardization, technical complexity, competition situation of suppliers and the existence of substitution products.

The demand frequency shows the demand structure of the procurement object from the internal standpoint. The objective of this dimension is to assess the ability to make exact prognoses of demand. The XYZ-analysis is useful in the assessment of this dimension. For objects with a continuous demand a prognosis level of 90-95% each week is expected [11, 14].

Even though objective and quantifiable criteria are used in single dimensions of the analysis framework it should be noted that the overall assessment is strongly dependent of enterprise specific and partly subjective criteria. This should not be considered something negative [8]. The presented planning framework (see figure 1) provides a grouping of the procurement objects/groups and assigns them to their respective procurement reference relationships (PRR) (characteristic buyer-supplier-relationships). These should be understood as procurement design guidelines which aim to

support optimised concepts. The design possibilities are vast and include organisational as well as information technical aspects [13, 15].

The positioning of procurement objects and procurement groups in the analysis framework as well as the design of procurement reference relationships should be managed in the context of commodity management, i.e. in cross-organisational teams with representation from logistics, production, research and development, construction, quality and strategic as well as operational procurement. Figure 2 presents five characteristic procurement reference relationships which have been identified in the machine and plant industry.

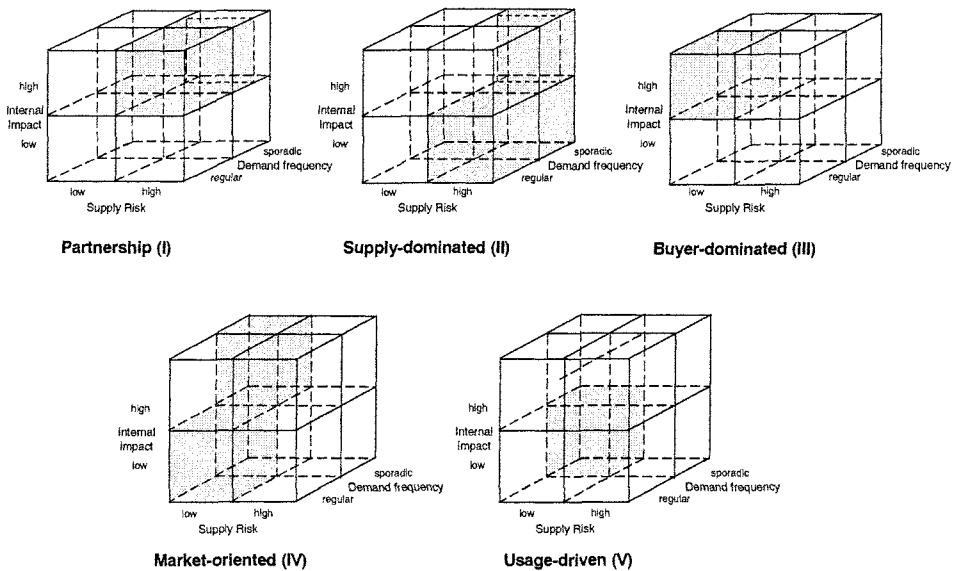


Figure 2. Analysis framework for structuring procurement items and strategic procurement units and characteristic procurement reference relationships

The identified procurement reference relationships are: Partnership (I), Supply-dominated (II), Buyer-dominated (III), Market-oriented (IV) and Usage-driven (V). In most enterprises only a sub-set of the procurement reference relationships are relevant [12, 16]. The design of procurement reference relationships is influenced by market strength of suppliers and buyers and should be assessed with respect to the cooperation willingness and ability of the suppliers within the enterprise-specific context of the enterprise.

3. SUPPORT AND DESIGN POTENTIAL THROUGH ELECTRONIC PROCUREMENT SOLUTIONS

Even considered the wide spectrum of support potential offered by internet-based electronic procurement solutions, not all strategic and operative procurement processes can be supported. In strategic procurement for example the potential is focused on the phases of procurement market research, supplier choice and contracting.

Table 1 presents procurement process phases and the corresponding support potential with examples. The internet-based electronic procurement solutions are structured according to their institutional ownership of the software solution [2]: Sell-side solutions, Buy-side solutions, neutral electronic marketplaces and buyer-supplier direct connections.

Table 1. Procurement process phases in the strategic procurement and support potential by internet-based electronic procurement solutions / Examples

	Type of solution		Examples	PRR
Procurement market research	Sell-Side Solutions		<ul style="list-style-type: none"> ▪ Product catalogue ▪ Product specification and configuration 	I-V
	Buy-side Solutions	Classic buy-side solution	<ul style="list-style-type: none"> ▪ Supplier and product search in catalogue (restricted choice of products) 	IV, V
		Buyer-controlled Electronic Marketplaces	<ul style="list-style-type: none"> ▪ Offer submissions (passive supplier search) / Call for tenders 	I-III (IV-V)
Neutral Electronic Marketplaces		<ul style="list-style-type: none"> ▪ Product catalogue ▪ Supplier catalogue ▪ Register / Data bases ▪ Offer submissions (passive supplier search) / Call for tenders ▪ Bulletin Board Services / News groups / Discussion services ▪ Search services / Information brokers 	I-V	
Supplier choice	Sell-Side Solutions		<ul style="list-style-type: none"> ▪ Product catalogue ▪ Product specification and configuration 	I-V
	Buy-Side Solutions	Classic buy-side solutions	<ul style="list-style-type: none"> ▪ Supplier choice from catalogue (restricted number of suppliers) 	IV, V
		Buyer-controlled Electronic Marketplaces	<ul style="list-style-type: none"> ▪ Offer submissions / Call for tenders ▪ Auctions 	I, III, IV, V, (II)
Neutral Electronic Marketplaces		<ul style="list-style-type: none"> ▪ Offer submissions / Call for tenders ▪ Auctions 	I, III, IV, V, (II)	
Contracting	Sell-Side Solutions		<ul style="list-style-type: none"> ▪ Auctions ▪ Contract preparations 	-
	Buy-Side Solutions	Buyer-controlled Electronic Marketplaces	<ul style="list-style-type: none"> ▪ Auctions ▪ Contract preparations 	I, III, IV, V, (II)
	Neutral Electronic Marketplaces		<ul style="list-style-type: none"> ▪ Auctions ▪ Contract preparations 	I, III, IV, V, (II)

(): limited suitability

The preference of the internet-based electronic procurement solution is to be decided by cross-organisational teams in enterprise-specific context. Below internet-based electronic procurement solutions are discussed in terms of support potential in strategic procurement and their respective fit in specific PRRs (see figure 2).

In the market research phase there are several opportunities for procurement support through sell-side (e.g. product catalogues, company information, product specifications and configuration) and neutral electronic marketplaces. (e.g. Global Sources, Thomas Register) [17, 18, 19]. Classic buy-side solutions provide search opportunities for procurement objects and procurement sources in tailored catalogues [20]. The demand owner within the enterprise is supported in the market research. However, since there is a limited access to the tailored procurement catalogues, and the content is centrally regulated, there will only be a limited possibility for researching new suppliers. Hence, the predefined supplier pool will not be extended. Classic buy-side solutions are well suited for general support of procurement in usage-driven procurement reference relationships [18, 20] as well as for specified procurement objects in market-oriented procurement reference relationships [6, 18] as defined in the planning framework. An opportunity for passive supplier search is provided by call for tenders / offer submissions of the demand on buyer-controlled electronic marketplaces or procurement web site of the buying enterprise [21]. This type of procurement market research can be used by all types of procurement reference relationships. However, when it comes to strongly standardised procurement objects (e.g. attached to market-oriented or usage-driven PRR), a more active market research is recommended.

In the supplier choice phase, the procurement is supported by sell-side and buy-side solutions in addition to neutral electronic marketplaces. Whereas sell-side solutions and classic buy-side solutions provide information through product and supplier catalogues, call for tenders and auctions are placed on buyer-controlled and neutral electronic marketplaces. These solutions are generally well suited for all types of procurement reference relationships. However, for supplier-dominated procurement reference relationships, market position of suppliers could limit the motivation to respond to call for tenders and auctions [18]. Therefore the deployment of such solutions seems only interesting if among suppliers there are so-called "price breakers" willing to compete on the basis of price. The decision must be based on the specific characteristics of the situation; generally it has to be assumed that the involvement of a "price breaker" especially in conservative markets will be challenging. The contracting phase is directly attached to and defined by the auction. Further on the possibility of contractual pre-

parations like general terms and conditions or shipping and handling instructions are relevant.

4. CONCLUSION

Until now the deployment of ICT to support direct materials' procurement (e.g. classic EDI) was mainly performed at large enterprises and networks stable over a long time due to high initial investments in terms of organisation and technology. With internet-based electronic procurement solutions a wide variety of opportunities emerge which also SMEs can benefit from. The economic impact and industrial importance of internet-based procurement solutions is therefore expected to continue its growth.

Our research indicates that enterprises currently are seriously challenged by planning, design and deployment of internet-based electronic procurement solutions. Design concepts for integration of internet-technologies in the procurement are therefore crucial. With this background, an analysis- and design framework for the procurement of direct materials was developed and the support potential through internet-based electronic procurement solutions showed. The analysis framework is used for procurement objects and procurement groups analysis. In our research, based on proven procurement strategies in the machine and plant industry five characteristic procurement reference relationships were identified. The presented procurement reference relationships serve as test of support potential in the procurement as well as development of ideal concepts. Underlined by examples from the strategic procurement we show in which procurement process phase innovative ICT and internet-based electronic procurement solutions provide support. We also show in which procurement reference relationships this type of support appears in terms of a differentiated view on ICT. For the procurement the planning framework provides a navigation help in the integration of organisation and information technology and enables the strategic evaluation of the deployment of internet-based procurement solutions.

REFERENCES

1. Pfohl, H.-C. (2000). Supply Chain Management: Konzept, Trends, Strategien. In: Pfohl, H.-C. (Hrsg.): Supply Chain Management: Logistik plus? Logistikkette – Marketingkette – Finanzkette. Fachtagung der Deutschen Gesellschaft für Logistik e.V.; 15; Unternehmensführung und Logistik; Bd. 18. Berlin: Erich Schmidt; pp. 1-42.

2. Alard, R. (2002). Internetbasiertes Beschaffungsmanagement direkter Güter- Konzept zur Gestaltung der Beschaffung durch Nutzung internetbasierter Technologien. Dissertation ETH Zürich.
3. Alard, R.; Hieber, R. (2000). Lösungen für unternehmensübergreifende Kooperationen - Supply Chain Management und Business-to-Business Commerce. PPS Management 5 (2000) 2, pp. 10-14.
4. Arnold, U. (1997). Beschaffungsmanagement. Stuttgart: Schäffer-Poeschel.
5. de Boer, L., Harink, J., Heijboer, G. (2001). A Model for Assessing the Impact of Electronic Procurement Forms. Proceedings of the 10th International Annual IPSERA Conference, Jönköping.
6. Neef, D. (2001). e-Procurement - From Strategy to Implementation. Upper Saddle River: Financial Times Prentice-Hall.
7. Nellore, R. (2001). Managing buyer-supplier relations: the winning edge through specification management. London, New York: Routledge, Taylor & Francis Group.
8. Gelderman, K., van Weele, A. (2001). Advancements in the Use of a Purchasing Portfolio Approach: A Case Study. Proceedings of the 10th International Annual IPSERA Conference, Jönköping.
9. Syson, R. (1992). Improving Purchase Performance. London: Pitman Publishing.
10. Baumgarten, H.; Bodelschwing, K. von (1996). Kostenreduzierung durch gestraffte Abläufe. Beschaffung aktuell 43 (1996) 2, pp. 35-38.
11. Hamm, V. (1997). Informationstechnikbasierte Referenzprozesse: prozeßorientierte Gestaltung des industriellen Einkaufs. Wiesbaden: dt. Univ.-Verl.; Wiesbaden: Gabler.
12. Gustafsson, M. (2001). Entwicklung eines Konzepts zum Materialgruppenmanagement im Bereich des Customer Service bei ALSTOM (Schweiz) AG. Diplomarbeit; Linköping Institute of Technology / ETH Center for Enterprise Sciences (BWI), Domain of Logistics and Information Management.
13. Wildemann, H. (1999). Das Konzept der Einkaufspotentialanalyse - Bausteine und Umsetzungsstrategien. In: Hahn, D.; Kaufmann, L. (Hrsg.): Handbuch industrielles Beschaffungsmanagement: internationale Konzepte - innovative Instrumente - aktuelle Praxisbeispiele. Wiesbaden: Gabler; pp. 435-452.
14. Schönsleben, P. (2000). Integrales Logistikmanagement - Planung und Steuerung von umfassenden Geschäftsprozessen. Berlin u.a.: Springer.
15. Fieten, R. (1994). Integrierte Materialwirtschaft. Beschaffung aktuell - Konradin Verlag: Leinfelden-Echterdingen.
16. Hunziker, D. (2001). Entwicklung eines Konzeptes zur Geschäftsprozess- und Organisationsgestaltung bei der Einführung von Electronic Procurement. Nachdiplomarbeit; ETH Center for Enterprise Sciences (BWI), Domain of Logistics and Information Management.
17. Harink, J.H. (1999). Excelling with e-procurement. Samson: Alphen aan den Rijn.
18. van Weele, A. (2002). Purchasing and Supply Chain Management: Analysis, Planning and Practice. London: Business Press, Thomson Learning.
19. Weber, S. (2001). Information Technology in Supplier Networks: A Theoretical Approach to Decisions about Information Technology and Supplier Relationship. Heidelberg; New York: Physica-Verlag.
20. Dolmetsch, R. (1999). Desktop Purchasing - IP-Netzwerkapplikationen in der Beschaffung. Dissertation Universität St. Gallen. Bamberg: Difo-Druck.
21. van Weele, A., Rozemeijer, F. (1999). Getting Organised for Purchasing and Supply Management in the Information Age. In: Hahn, D.; Kaufmann, L. (Hrsg.): Handbuch industrielles Beschaffungsmanagement: internationale Konzepte - innovative Instrumente - aktuelle Praxisbeispiele. Wiesbaden: Gabler, 1999, pp. 625-637.