Recommender Systems for Strategic Procurement in Value Networks

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ABSTRACT

The implementation of recommender systems in electronic procurement processes for service packages, consisting of product- and service components requires a consideration of strategic, tactical and operational procurement as well as information and communication technologies in value networks. Increasingly, the design of recommender systems for procurement processes in value networks is of scientific interest. The combination of different procurement processes for products and services driven by recommender systems however, includes problems. This paper shows the need for a process-oriented approach in procurement at several abstraction levels. A model for the design of the electronic procurement process in value networks to serve the identification of complex service packages and suppliers with recommender systems is described. Different process characteristics are investigated for the applicability of recommender systems in e-procurement. As an artifact this approach adjust a proposal for the recommender system-based procurement process in value networks.

Keywords

Recommender System, Value Network, Reference Modelling / Conceptual Modelling, Service Packages.

INTRODUCTION

The competitive environment forces many companies to operate in complex *value networks* and leads to a highly degree of vertical integration. In such value networks, virtual companies associations jointly satisfy complex consumer needs. Customers buy complex integrated *service packages*, which consist of individually composed tangible and intangible features. Each enterprise contributes its own specific product and service expertise (Gordijn, Petit and Wieringa 2006). Well known examples for networked enterprises are Cisco Systems and Dell, however, many other examples especially organizations that heavily depend on information systems (e.g. multinationals banks, insurance companies, governments, hospitals, travel agencies and web shops) can be found. By this nature, value networks are enabled by, and heavily rely on the use of information technology to coordinate process execution for production and service provisioning (Pijpers and Gordijn 2007). In this regard, a special criterion is the identification and selection of suppliers and complex service packages in value networks. In the early stage of the divergent product- and service procurement process caused by different product and service lifecycles, supplier selection requires great care and a methodical approach. It is important to obtain quality information, which gives a reliable picture. As a criterion, the evaluated performance of suppliers is used in the past (Bensch 2011a). This assumes that consumers continuously review and evaluate the supplied services. Of particular importance in strategic sourcing is the search and selection of suppliers in a value network. Recommendation systems can support process steps in procurement.

Recently, recommender systems in value networks have been considered from various viewpoints. Of importance are the formation of electronic value networks, digital information distribution, and the use of electronic marketplaces and powerful recommender systems for e-business. The work at hand strives to answer the question:

> How can recommender systems support the strategic procurement process in value networks for defined service packages?

The work at hand present the results of a design science research aiming at integration extant research on strategic sourcing. The discovered approaches are classified by process steps in e-procurement. Rest of this paper is structured as follows. Chapter 1 motivates the need for recommender systems in strategic procurement. In chapter 2 follows the description of the applied research design. In Chapter 3 follows the current state of research for procurement management in value networks with recommender systems. In Chapter 4, a comparative analysis of documented procurement processes is carried out. Based on this comparative analysis, a reference model for procurement processes in value networks supported by recommender systems is introduced. In Chapter 5 follows the design of an on the procurement in value networks optimized procurement process supported by recommender systems. The suitability of recommendation systems is verified by potentials for procurement process steps. Finally I present conclusions and suggestions for further research.

This paper basically follows the design science paradigm for design-oriented research (Fettke 2007; Peffers, Tuunanen, Rothenberger and Chatterjee 2007). The identification of existing procurement processes is the result of a systematically literature review-process. Based on existing reference models and processes for procurement management a new recommender systems supported process model based on extension and combination (Rosemann 1996), is developed. Based on the analysis of potentials by practice, the new process model has been validated and is briefly discussed.

RESEARCH METHODOLOGY

The work at hand follows the approach of design-oriented research, as a recognized method for information systems research (Boudreau, Gefen, and Straub 2001; Wilde and Hess 2007). In practice, the contribution is based on the seven research guidelines following Hevner et al. (Hevner, March, Park, and Ram 2004). The method is characterized as an iterative process with alternating phases of construction and evaluation ("build and evaluate") (Hevner et al. 2004). Peffers et al. described in accordance with existing approaches to design-oriented research, a structured process in order to a nominal model that includes six steps for implementing design-oriented research with four possible entry points. Also as a mental model the approach supports situational action steps, in the sense of a minimum common understanding of the presentation and evaluation of design-oriented research (Peffers et al. 2007). For the problem - the pursued objective is the nominal legitimated approach applied systematically and progressively according to these research guidelines. Figure 1 shows the recommended and applied approach. Due to the complexity of procurement processes challenged by recommender systems, a continuous process in accordance to Peffers et al. and Hevner et al. is promising. In the following the assumed methodology is described, based on seven design guidelines (G) in regard to Hevner et al., starting from the entry point (Design & Development Centered Initiation) in reference to Peffers et al. The nominal group highlighted in Figure 1 is therefore a projection of determinants, also the projection of elements of the entry point category “Design & Development Centered Initiation”.

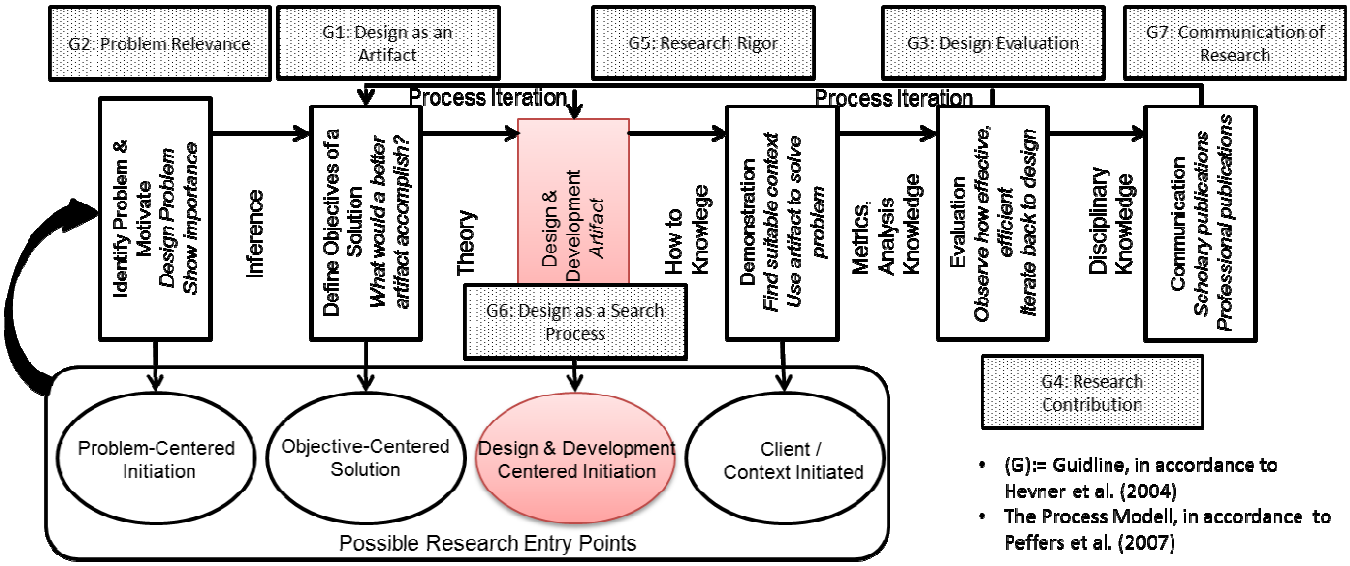

Figure 1. Applied Design Science Reserach Modell, follwing (Hevner et al. 2004; Peffers et al. 2007)

The development process is centered on the design and evaluation process. The focus is the design and evaluation of the strategic sourcing model to show potentials for recommender systems. This is developed gradually in several iterations in accordance with the Guideline "Design as a Search Process" (G6). For this purpose are recursive design alternatives tested against requirements and restrictions (requirements / constraints) (Peffers et al. 2007). As an entry point, the design-centered approach is chosen, that results from the existence of an artifact and its transfer to the Recommender Systems domain. The requirements of the research guidelines "Design as an Artifact" (G1) and "Problem Relevance" (G2) are described in Sections 1 and 2. As an artifact a procurement model with Recommender Systems is designed (G1). The support to identify of complex service packages and suppliers especially in context of structural change in information and communication industry (ICT) is significant (G2). The evaluation follows the procedure according to the methods of descriptive evaluation in regard to Hevner et al. (Hevner et al. 2004). The implementation concept is checked for plausibility in an argumentatively manner on methodological potentials (G3). The procurement model contributes to the expansion and structuring of the current state of knowledge, thus making it a "Research Contribution" (G4). The directive "Research Rigor" examines the application of proven approaches to supplier identification and purchasing in strategic procurement and IT sourcing (G5). To the directive,

"Communication of Research", further publications of the model and further discussions with domain experts from business and scientific groups are planned (G7).

E-PROCUREMENT IN VALUE NETWORKS

The search and identification of products and services in electronic catalogues, e-marketplaces and the Internet is time intensive and therefore causes high costs. Recommender systems support the product- and supplier identification, and assist in this respect in decision support (Gil and Garcia 2003). The transaction cost theory states that all action is connected with costs in a market. The basic premise of transaction cost theory has its origins in the contribution from Coase (Coase 1937). Its core is examined with the transaction cost theory; hereby exchange relationship between economic actors, with the aim of minimizing transaction costs is explained. Thereby incurred costs in the initiation-, negotiation-, execution-, control- and adaptation- phase in procurement. Standardization and the Internet diminish some transaction costs. New forms of information can reduce transaction costs by simply obtaining information. Based on the fundamentals of electronic procurement, opportunities are described.

Electronic Procurement and Recommender Systems in Value Networks

Recommender systems have been considered in research and practice over long time. Systematic literature reviews are conducted by Breese at al. (Breese, Heckerman and Kadie 1998) and Adomavicius & Tuzhilin (Adomavicius and Tuzhilin 2005). Recommeder systems are defined as an information filterung technology, that use methods to present information on items and service bundles that are likely to be of interest to the customer (Resnick and Varian 1997). There are different kinds of algorithms used. Much work has been done in both the industry and academia on developing new approaches to recommender systems. There are several methods (e.g. content-based recommendation, collaborative recommendation and hybrid approaches to merge) (Sahoo, Krishnan, Duncan, and Callan 2011). Retailers use increasingly information technologies to provide value-added services (Pathak, Garfinkel, Gopal, Venkatesan, and Yin 2010). However, despite of several advances, the current generation of recommender systems still requires further improvements to make recommender systems more applicable for the sourcing area. Industrial procurement therefore is an important part, especially as part of the supplier selection problem. Within the rapid advances in information technology (IT), auctions are being increasingly used for the procurement of goods and services (Adomavicius, Gupta and Sanyal 2008). With the flexibility offered by the Internet and the computational power of new technologies as cloud solutions, it is possible to design advanced options to use recommender systems also in sourcing cloud services. Many business software vendors and procurement departments support procurement services. In Practice, popular major online firms such as Amazon and Apple are firms which have an incentive to provide these systems because they can increase profits (Schafer, Konstan, and Riedi 1999).

A major task of supply chain management is to support the traditional procurement with information technology (Alt and Puschmann 2005). *E-Procurement* includes all web-based processes for the procurement of goods and services and thus represents a trade perspective (Baldi and Borgman 2001). To model and visualize the network in a structured way, the focal company e.g. OEM (Original Equipment Manufacturer) communicates a specific strategic demand for a service package to existing and potential suppliers. Figure 1 illustrates the evolution from the operative procurement to strategic value networks. The focus is therefore initially for operational control and optimization of material flow through all stages of the supply chain to the customer. The optimizations of demand forecasting and planning of all partners involve the supply chain with the aim to minimize inventories and lead times (Johnson and Whang 2002). It is therefore mainly the set of operational procurement tasks, which has been strongly an associate in a network connection.

Changing market conditions have dominated the global sourcing. The global sourcing includes the company´s overall planning, management and control of material information and money flows. Companies work with these requirements in networks (Bause and Kaczmarek 2001). Value networks represent companies and their social and technical resources within and between businesses (Pibernik 2001). In a value network, a service bundle is provided by the network. A network of suppliers spans over several tiers and communicate among each other using the Internet, based on information of suppliers. Information technology supports this approach. Procurement processes are key-components in value networks. The relevance of e-procurement (Riemer and Klein 2002) can be illustrated by the multiple relationships in value networks (Fettke 2007). A service package requires cooperation of enterprises in value networks (Knackstedt, Stein and J Becker 2009). In order to realize the exchange of data between suppliers and service providers in value networks, increasingly standardized data exchange formats are used. Besides the efficiency improvement and cost reduction, manufacturers and distributors use the chance to exchange faster and more electronic data (Walter, Blinn, Schlicker and Thomas 2010).

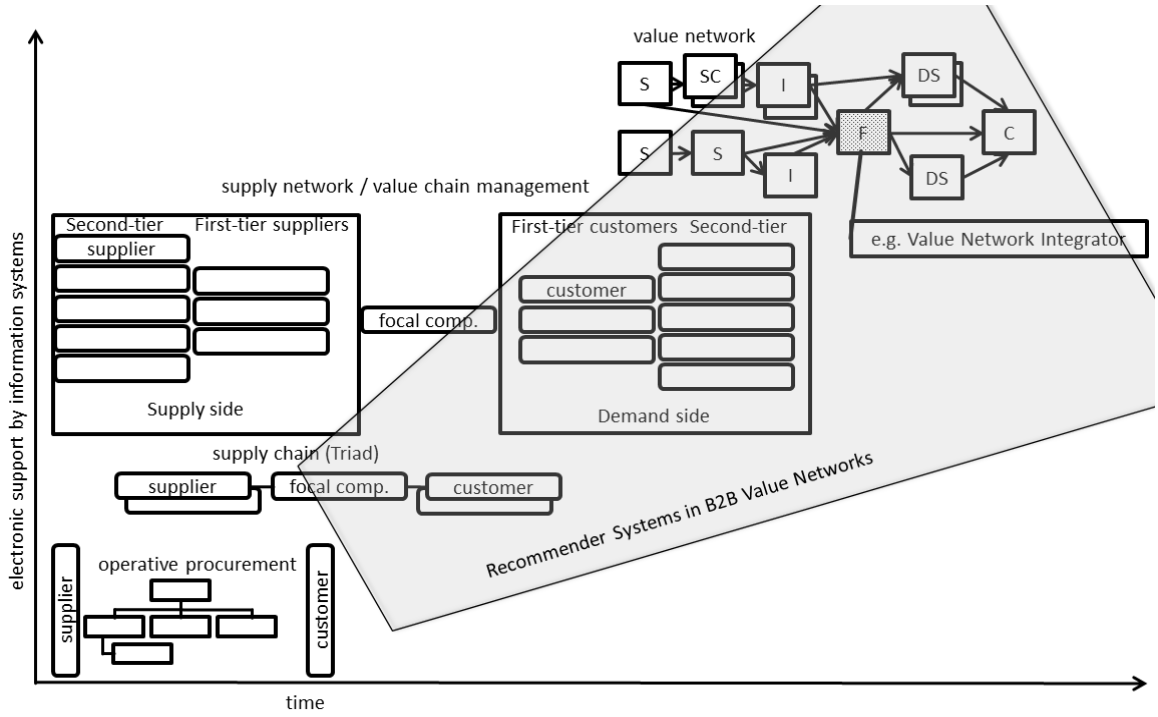

Figure 2. Recommender Systems in B2B Value Networks

A *value network* is a network of companies that work across multiple value chains. Each player contributes to value creation (Pibernik 2001). To obtain a value network, a specified customer order is provided by other network participants. Basis of information on network users finally, the value network can be formed. The value network for service packages as whole will bring together separate services to customer driven solutions. Packages of services, consisting of tangible and intangible services (product service package or value bundle) are scientifically researched in the field hybrid value creation (e.g. Becker, Beverungen and Knackstedt 2008a, 2008b; Bensch and Schrödl 2011; Beverungen, Kaiser, Knackstedt, Krings and Stein 2008). Based on the customer order (C) a focal company (F) is coordinating directly and indirectly (DS) the service delivery of network participants. Network participants are suppliers (S), intermediaries (I) and distributors (DS).

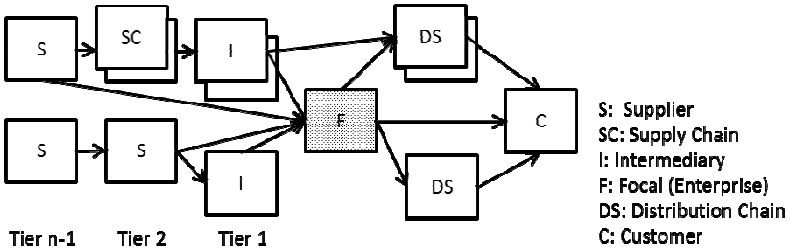

Figure 3. Value Network

The discussion of the constellation of value networks with recommender systems for service packages and supplier is still pending. The fields of application for recommender systems are diverse (Adomavicius and Tuzhilin 2005) . In value networks, recommender systems can support the procurement function in the context of a task (cf. (Klahold 2009)). From a given entity set, systems recommend a subset of items. Recommender systems are used to identify products and suppliers (Lee, Chun, Shim, and Lee 2006). An expanded view allows the recommendation of supply- and distribution chains. On the retail side, a variety of concepts are used in research and practice and are discussed for recommender systems. Potentials of the use of e-procurement with recommender systems are discussed by reduced costs and business processes acceleration, in order to improve the quality (Buchwalter, Brenner and Zarnekow 2002).

So, in the next sections, in the paper at hand is examined which sub-processes can be improved by recommender systems in sourcing complex service packages.

Model Dimensions in Procurement

For the description of the procurement process, procurement opportunities are divided into process steps. The process steps include the planning and preparation (sourcing), conducting the procurement and the control of the process (monitoring) (Eyholzer, Kuhlmann, and Münger 2002). The procurement objectives are differentiated according to strategical, tactical and operational components. Boundaries between the objectives overlap. The acquisition starts with the identification of needs (Eichler 2002; Eyholzer et al. 2002). Based on the requirement determination for goods and services, suppliers can be identified for requisition (Albani, Keiblinger, Turowski, and Winnewisser 2003). The phase is supported by corporate information systems. In strategic procurement are essentially the initiation and the agreement phase (Hartmann 1999; Held 2003). The tactical and operational procurement process includes steps for order processing. During the initiation phase, the identification of potential transaction partners is based on concrete specifications. The phase is supported by electronic marketplaces, product catalogues and suppliers using information and communication technology. In the agreement phase, conditions and quantities are agreed. The aim of the phase is a binding contract between the transaction partners. The implementation phase includes the operational procurement ("supply execution"). This includes the purchase steps order-entry, order monitoring, power decrease, audit and payment processing. Each particular process step is equally supported by business information systems (SAP 2010).

E-PROCUREMENT AND APPROACHES TO RECOMMENDER SYSTEMS

Procurement processes are discussed differently by products and services in the literature (Bensch 2011b; Bensch and Schrödl 2011). The analysis and comparison of these processes can determine the State-of-the-Art. The graphical coverage of the procurement process is an attempt to determine overlaps between process-steps to show, where opportunities for recommender systems are located. Differences between the procurement of tangible and intangible (hybrid) benefits are identified. Thus, an attempt is made to identify appropriate process steps for the adaptation of recommender systems in e-procurement. It can also be examined whether a recommender system is suitable for complex service packages with tangible and intangible elements to support the performance in procurement process.

Process steps were compared systematically. The derived process serves as a basis for discussion potentials of material and immaterial procurement processes supported by recommender systems. The overall process has been combined for tangible and intangible benefits in Figure 4.

The procurement process can be classified in a *strategic* and a *tactical* part, especially in the three sub-phases *initiation*, *agreement* and *transaction* (Hartmann 1999). Basically, the procurement process for services can also be applied in materiel procurement cases. In essence, the processes differ in the steps of the procurement specification and acceptance of service (Münger and Eggel 2007). The difference can be attributed to the experience and methodological support. The degree of standardization in engineering in terms of physical performance is more mature than for services (Becker, Beverungen, Knackstedt and Müller 2008). The systematic specification of services is difficult for companies (Backhaus, Frohs and Weddeling 2007). Within the other sub-processes, the alignment diverges low (Dietrich and Kirn 2007), as shown in Figure 4. On the one hand, the difference in the procurement process between products and services is characterized graphically; the importance for recommender systems is highlighted too on the other hand.

The definition of the requirements to identify suitable service packages and suppliers is already complex. The needs and the specification of goods and services do not arise in the departments of a company. The demand comes from the customer and cannot be standardized in a procurement document to be processed with information systems. A free-text description is possible. Product catalogues are part of an e-procurement solution and support gathering requirements. Product classifications such as UN / SPC (Standard Products and Services Classification) offer the advantage of global availability of materials and services. The use of service catalogues for service packages is not yet supported by enterprise information systems in a single step. The main difference and the complexity of the procurement management between the procurement processes are considered in strategic procurement. However, customers are supported in the choice of products, services and suppliers through recommender systems (Mcginty and Smyth 2006). Especially in the initial phase, the specification is complex. It is hard to find suppliers systematically in a value network. For the structured identification of suitable suppliers for the specified requirements, the focal company sends requests to the supply network. Suppliers respond to the questions. Existing and potential suppliers in Tier-1 go on in the same way (Albani et al. 2003). Figure 4 highlights the potentials of recommender systems support. The search effort can be reduced.

For example in an extensive literature analysis, phase and the procurement process descriptions based on the abstraction level of strategic, tactical and operational procurement (Hartmann 1999; Held 2003), to sub processes (Bogaschewsky 1999; Buchwalter et al. 2002; Eichler 2002; Hartmann 1999; Held 2003; ITIL 2012; Loos and Theling 2002; Münger and Eggel 2007) are graphically covered in Figure 4. In strategic sourcing, players are identified.

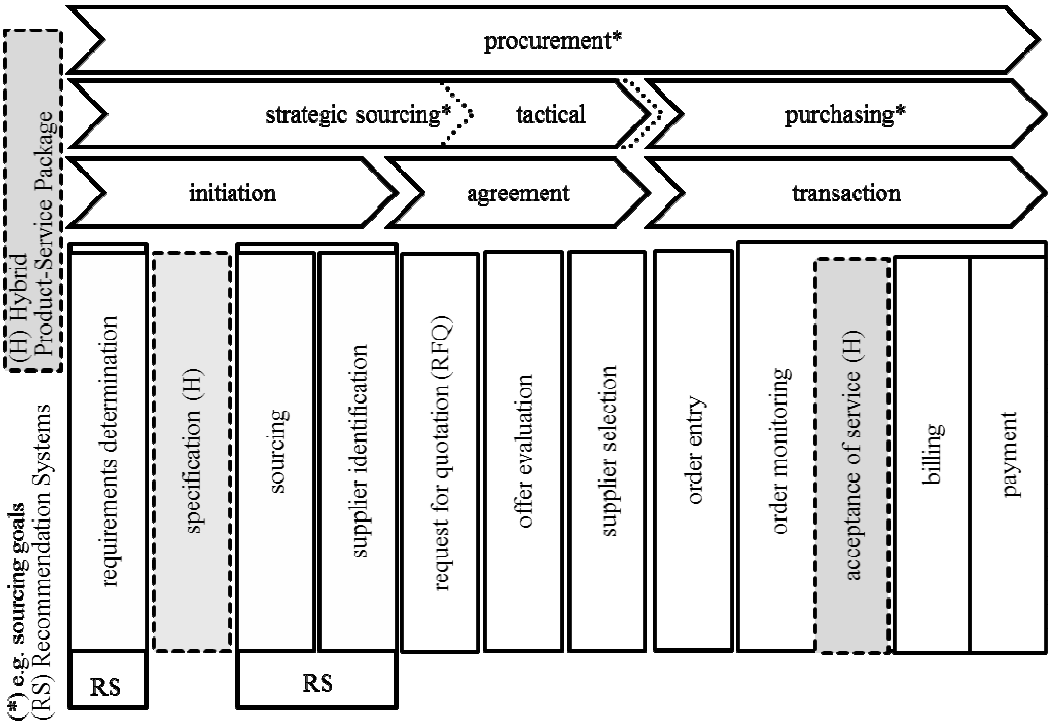

Figure 4. Overlaps between Process-Steps in Procurement

In particular in accordance to the initiation phase recommender systems promise potentials in the strategic procurement. In the phase requirements determination recommender systems assist appropriate services. For this purpose, similar requirements can be systematically found and recommend. Sourcing refers to a number of procurement practices. Sourcing is one of the primary functions in IT (Finlay and King 1999; Lacity and Willocks 2003). At this point, s*ourcing* is a procurement sub-process for locating a vendor for goods or services (Bensch and Schrödl 2011). Sourcing can be discribed as the provision of or purchase of an product or service provided by a supllier firm. In recent work, the number of vendors is given greater weight (Bensch 2012). So sourcing can be summarized as the entire set of processes ranging from initiating and preparing the decision to provide service bundles by a legally independent product-service provider (or some combination of the two) (Hirschheim, Dibbern and Heinzl 2008). Recommender sysems can analyze historical decisions and recommendations for improving the process. Similar to diversification strategies in sales (Fleder and Hosanagar 2007) is at this point a potential for recommender systems to support alternative suppliers and services.

The procurement process for tangible and intangible products is different, also in procurement systems. The combination of both processes increases the complexity, especially in value networks for recommender systems.

The main differences between product- and service procurement are the steps *specification* and *accept of service* (material storage vs. service acceptance). In addition, services cannot be stored (cf. (Dietrich and Kirn 2007)). However, this process step is operational and less complex. Electronic procurement focuses currently the integration of material and information flows. Positive effects of the integration of information on material and service flows are neglected. In addition to existing business information systems, tangible and intangible differences in various procurement processes are detected. For the procurement based on information systems, for the identification of service packages and suppliers, is modified in the following a procurement process supported by recommender systems. Design opportunities for process integration are identified.

RECOMMENDER SYSTEMS FOR STRATEGIC SOURCING

The traditional procurement process of products and services was, derived, analyzed and categorized from scientific literature. Critical process steps were identified in particular for strategic sourcing with recommender systems. Procurement processes have differences particular in the initiation and agreement phase. Hereinafter, the paper at hand derives a systematic design proposal for a customized procurement process for complex service bundles with recommender systems. The extended process accesses the differences in Figure 4.

Reference Model

Following a design proposal for the recommender system supported procurement in value networks is shown (Figure 5). Starting from the basic model of the value chain according Porter (Porter 1996), value-added activities contribute to the provision of services. Primary activities are activities that will be of direct value adding contribution. The procurement activity as a support activity provides a direct contribution to services. The value chain of a company is linked to the value chains of suppliers and buyers. Together they form the value network (cf. 2.2).

The procurement process begins with the individualized *requirements* elicitation. With increasing hybridization towards services, strong customer-supplier relationship for a given service package is required. Result of the requirement determination could be a specification that describes all the possible customer requirements (DIN 2009). The process is similar to the traditional procurement, however, affect the extent of the service package properties in the amount of the service level. Recommender system support requirements determination by generating recommendations. This is done by aggregation of consumer preferences. Recommender form from a specific type of information system filtering technique, which is attempt to recommend specification items, proposals which are likely to be of interest for the customer (C).

During the *specification* phase, product-service packages are described in a formalized manner. The related goal is a complete, consistent and unambiguous description of the external view of the performance. The specifications cover all customer requirements at the component level. The focal company specifies the identified requirements of the delivery network. Suppliers can be determined for service packages of the network. Components and sub-components are harmonized according to purpose. The Specification in value networks includes sub-phases, beginning by *decomposition*. Physical, hybrid and other intangible services were derived. The aim of the hybridization is to identify systematic features for an application domain. This is done by taking the rules for the configuration of selected services into account. Recommender systems support the decomposition of the demand in the form of a proposal for a component list.

The *product-service conception,* also design phase, corresponds to the composition of individual service components by purpose. Thus, to ensure that a service package is the choice of hybrid components custom designed along the needs assessment. Recommender systems suggest the manufacturer supply chains in order to procure sub-components. Specified components can be compensated in the intermediate step service package *composition*.

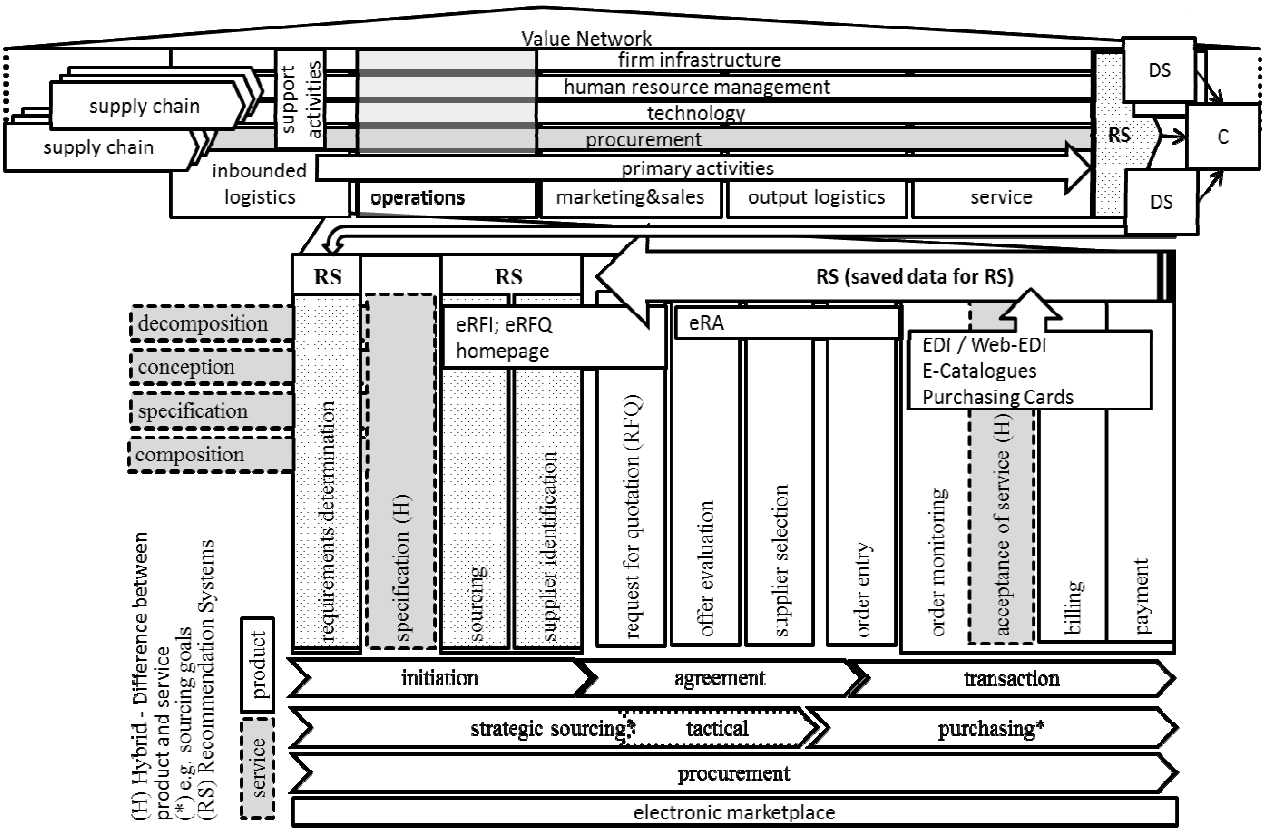

Figure 5. Recommender Systems for Strategic Sourcing

In the *sourcing and supplier identification* phase, the identification of strategic supply partners in a dynamic value network and the demand for selective services and complex service packages to existing and potential suppliers of Tier-1 is reported. According to the requirements repeated by Tier 1 suppliers communicate recursive into the value network. In reverse form, the requested information is returned, aggregated and confirmed into the value network. Therefore the value-network is totally formed.

Recommender systems recommend suppliers and value chains, to form the value network and support the process steps. Electronic procurement systems, marketplaces and catalogues provide the data basis for supplier identification. The operational procurement process complements the data for recommender systems. When building supplier profiles a distinction is made between explicit and implicit forms of data collection. The recommender system compares the collected data to similar and not similar data collected from other systems and calculates a list of recommended items.

The network formation is an iterative process. Potential suppliers and supply chains can be proposed by recommender systems to improve the network. This procurement phase will be more efficient. Requests can be made specifically to potential suppliers for specified components of a service package (RFI). Furthermore, the specification of a service package is identified and can be confirmed by recommended suppliers.

Thereby, in the agreement phase, recommender systems accelerate the selection of suppliers. The recommendation of comparable services and supplier reinforce market transparency. The individual product creation and recommender systems change the requirements for the value network (Becker, Beverungen et al. 2008b). In the operational procurement data is collected, which may contribute to the improvement of recommender systems.

The design of value networks can be called a main task for the control of the tension between flexibility for the customer and stability in the value network. The process of service delivery to the customer as well as the structural and organizational performance is therefore typically between product and services components for value networks to separate consideration. Recommendation techniques to generate recommendations by aggregating consumer preferences (called Collaborative-Social-filtering), generate suggestions based on the items the user has purchased in the past (Content based filtering) and knowledge based systems (hybrid systems, generate suggestions based on the items the user has purchased in the past) can support the process in the distribution chain (DS).

Details of supplier selection in supply networks and the implementation phase are not deepened. The electronic support of procurement is reflected in the conclusion of recommender systems, in chapter 5.2. The traditional process steps of the agreement and settlement phase are mainly applicable to service packages, as shown in Section 4. For reference, the following section verifies these design-oriented paradigms in a brief description of benefits by recommender systems.

Potentials of Recommender Systems in Strategic Sourcing

The purposes of the design proposal has been discussed with two local companies. A company sells IT services. The other company comes from the metal processing industry and offers system solutions. The design proposal has been compared with the established processes of these two companies. Potentials were determined with the representatives of both companies. The company representatives see considerable potential in the design proposal. The possibilities offered by electronic procurement support with recommender systems are diverse. Significant here are some alternate phases of the detail assigned to procurement in Figure 5 as a forward looking model.

For the systematic collection, processing and provision of service packages, components and suppliers can be derived on the basis of *requirements determination*. Recommendation systems attempts to recommend information items, service packages or components that are likely to be of interest to the customer. Here, various internet searches (e.g. in search directory services) are supported by recommendation systems, described in Figure 6.

On the basis of service packages, service components are derived and specified decomposed. Recommender systems identify on basis of component specifications complex service packages and potential suppliers. The electronic request for information (eRFI) and the electronic request for quotation (eRFQ) - enables suppliers to standardized information and submitting bids. In the agreement phase, the procurement process through electronic reverse auctions (eRA) is supported, in particular affects the pricing. In the next step, recommender systems can suggest potential suppliers or supply chains in considerations of those contracts.

The operative management can be improved by e.g. EDI or Web-EDI. Suppliers are preferred in the formation of value nets by recommender systems. In this process, performance assessment information is transferred to the recommender system. By the formation of value networks, useful strategies and activities can be developed and implemented with preferred suppliers. Parameters of the supplier evaluation are not deepened at this point. The suppliers for the service packages are carefully selected under consideration of the detailed process requirements in reference to acceptance of service.

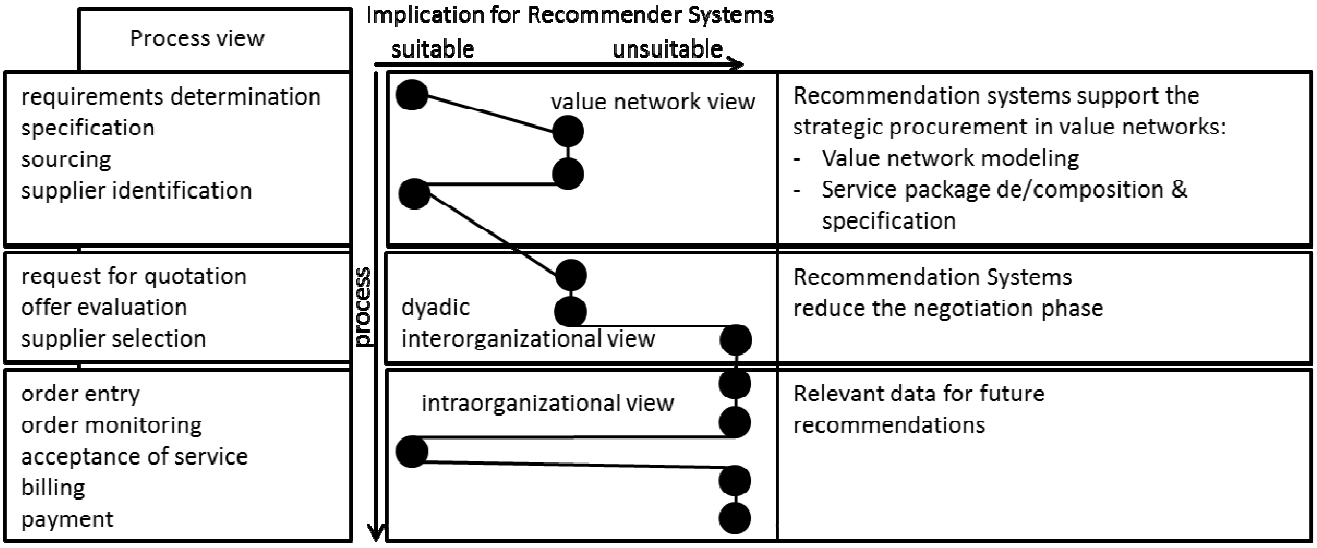

Figure 6. Potentials of Recommender Systems in Strategic Sourcing

SUMMARY

The aim of this paper is the process-driven support in strategic procurement by means of recommender systems. For this purpose, recommender systems in procurement management were analyzed and tested for compatibility with the requirements of the sourcing of service packages in value networks. Based on this analysis, a design-proposal for the procurement of service packages is modeled in addition to recommender systems. It proposes four strategic sourcing process steps, especially the specification step, as a design proposal for electronic procurement in value networks from a value network view. The integration of recommender systems for the procurement processes holds more than significant advantages for focal suppliers of service packages over traditional procurement. There are more than reduced transaction costs. The presented design proposal is a way out of those companies that challenges the systematic integration of services packages and suppliers but faces a lack in a systematic support for the finding of suppliers and service components as a subset of procurement strategy. The design proposal made possible by a strategic procurement approach to recommendation systems, the IT-driven design of recommended value networks for service packages.

The strategic approach to procurement has bundling effects in the design of service value networks. Offering companies are able to systematically identify service packages and suppliers per recommendation from different integrated offerings to achieve monetary and logistic advantages. In many scenarios, such proposals are the missing component to a seamless electronic procurement process. This approach offers companies a basis for process changes that support the procurement of service packages in recommended value networks. Processes are adjusted according to the company and market dynamics.

Current and future research will examine the extent on how procurement requirements are supported by business information systems. This research will give new insights to the developers of ICT systems for ERP and SCM on how to align theses business requirements to ICT functionality. It will examine how the procurement function can be expanded in procurement systems for recommendation systems for the design of electronic value networks. Further, it is of interest as proposed items are selected systematically.

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