

Association for Information Systems AIS Electronic Library (AISeL)

ECIS 2012 Proceedings

European Conference on Information Systems
(ECIS)

5-15-2012

PURCHASING CLOUD-BASED PRODUCT-SERVICE BUNDLES IN VALUE NETWORKS - THE ROLE OF MANAGEABLE WORKLOADS

Holger Schrödl

Otto-von-Guericke-University Magdeburg

Follow this and additional works at: <http://aisel.aisnet.org/ecis2012>

Recommended Citation

Schrödl, Holger, "PURCHASING CLOUD-BASED PRODUCT-SERVICE BUNDLES IN VALUE NETWORKS - THE ROLE OF MANAGEABLE WORKLOADS" (2012). *ECIS 2012 Proceedings*. 204.

<http://aisel.aisnet.org/ecis2012/204>

This material is brought to you by the European Conference on Information Systems (ECIS) at AIS Electronic Library (AISeL). It has been accepted for inclusion in ECIS 2012 Proceedings by an authorized administrator of AIS Electronic Library (AISeL). For more information, please contact elibrary@aisnet.org.

PURCHASING CLOUD-BASED PRODUCT-SERVICE BUNDLES IN VALUE NETWORKS - THE ROLE OF MANAGEABLE WORKLOADS

Bensch, Stefan, University of Augsburg, Universitaetsstrasse 16, 86159 Augsburg, Germany, Stefan.bensch@wiwi.uni-augsburg.de

Schrödl, Holger, Otto-von-Guericke University Magdeburg, Universitaetsplatz 2, 39106 Magdeburg, Germany, holger.schroedl@ovgu.de

Abstract

The implementation of electronic procurement processes for product-service systems, consisting of material and service components requires a consideration of strategic, tactical and operational issues in procurement processes and information technologies. Increasingly, in certain industries, these product-service systems consist more and more of cloud-based components like online storage or web applications. In the past, the alignment of business processes with a focus on traditional procurement processes for products or services has been well established. But with the rise of product-service systems as core offering from companies, the design of hybrid procurement processes in value networks has to be developed. The merging of different procurement processes for products and services, however, has severe problems and does not reflect the specific requirements in the procurement of product-service systems, especially with cloud-based components. This article highlights the need for a process-oriented view in procurement at multiple levels of abstraction and describes a model for the design of electronic procurement process in value networks for cloud-based product-service systems requirements. Different process characteristics are examined for applicability to hybrid value performance and allow an adjustment proposal for the hybrid procurement process. The proposed procurement model is validated in a typical case-study in the IT industry.

Keywords: product-service systems, value bundles, procurement, cloud computing

1 Motivation

Global market scenarios lead to the fact that offers are easily comparable. This applies in the range of offers of production enterprise as well as from service enterprise. In such comparable offer situations, a price leadership is often the key to win shares of the market. A strategically significant possibility to differentiate towards the competitor in comparable markets is the offering of integrated product-service-systems, so-called value bundles (Burr 2002). Value bundles are an integrated combination of physical products and immaterial services with a focus on solving a specific customer problem (Hirschheim, Klein & Lyytinen 1995). In practise, value bundles are extensions of the offerings of a company with components which do not belong to the core competences of the company. Therefore, companies who are offering value bundles use different suppliers in a well-organized form like supply networks to establish these integrated offerings. Value networks exist of several suppliers independent of each other from which one of these suppliers is designated as focal suppliers. The focal supplier is the supplier who creates the offer of the customers and organizes all aspects of the value bundle in the value network. Looking at value bundles in the Information Technology (IT) sector, one can see that some of the components of these value bundles are offerings in the cloud computing area. Offerings like online backup service or cloud databases are combined to complex customers' solutions to enhance the value of the solution to the customer. Following this, we see more and more value bundles with cloud-based components as service components in the bundle. Current research results show that the management of value bundles leads established commercial processes to new challenges in information systems. The research in the range of the hybrid added value concentrates upon models and methods of the construction of such solutions. From a procurement perspective, we see first results in a reference model for the strategic procurement process of value bundles in supply networks (Schrödl, Gugel & Turowski 2011). The discussion about more specific aspects of value bundles in value networks is still incomplete. The central research question for the present article is: How is a supply management process modelled for the procurement of product-service bundles especially with cloud-based components in value networks. The article is structured as follows: in the second chapter the current research state is displayed to the subjects supply networks, strategic procurement, value bundles and the modelling of strategic supply networks. In chapter 3 existing models are evaluated. Based on the results of this evaluation a reference model which describes a development of strategic value network for value bundles is introduced in chapter 4. Further, in chapter 4 the reference model is applied in a typical use case. Chapter 5 gives a summary and indicates future research need.

2 Research background

2.1 Service package and value bundle configuration

For a long time, procurement was considered exclusively as an in intra-company executive organ which had to fulfill production-political and distribution-political decisions (Arnold & Essig 2000; Kaufmann 2002). Today, however, the high strategic importance of the procurement function is widely recognized in practice and science (Holbach 2002; Kaufmann 2002; Krampf 2000). The strategic procurement as a part of the entire procurement function has as a major task the analysis and goal-oriented creation respectively influencing of sourcing-relevant factors (Roland 1993; Large 2006). These factors can be classified in three areas: market, suppliers, and the company itself (Roland 1993). In current literature, a multitude of contributions for the strategic sourcing of products or services can be found. But as the economic importance of pure products and services tends to decrease because of lacking differentiation, combinations of physical products and services being offered as bundles become more and more important in the industry. These combinations are called value bundles and are a combination of physical products, services as well as immaterial values as for example guarantees. These combinations are specially tailored to solve an individual customer problem (Hirschheim, Klein & Lyytinen 1995). Value bundles can be segmented in standardized

physical products, standardized services as well as customized product and customized services (see figure 1, left). Integration is a key component of value bundles and means not only the bundling of products and services to a combined solution, but also the process integration on customer and supplier side (Janiesch et al. 2006). The degree of integration between services in kind and services is variable (Fettke & Loos 2007) and has an impact on the services. (see figure 1, right).

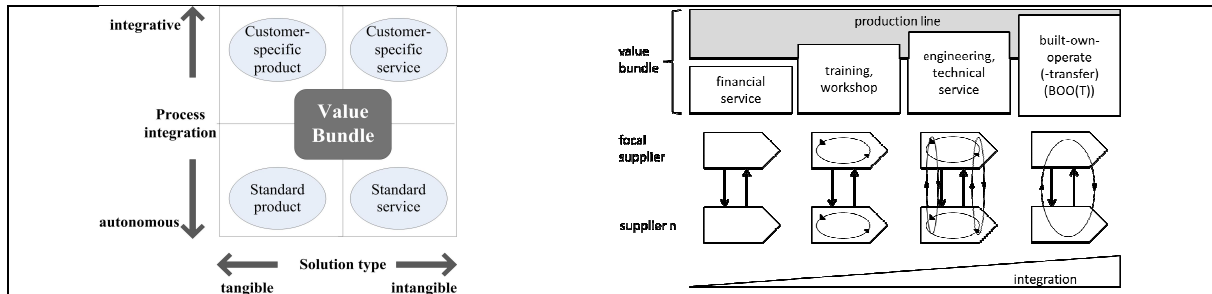


Figure 1. Types of value bundles and bundle integration in a product line

A key design feature of hybrid value-added process is the formation of network structures. Reiss and Präuer (Reiss & Präuer 2001) showed in an empirical study, that the cooperative organizational forms, such as strategic value-added partnerships, networks and cross-company project-orientated cooperation are the most suitable organization forms to offer value bundles.

2.2 E-Procurement in value networks

A major task of supply chain management is to support the traditional procurement with information technology (Puschmann & Alt 2005). E-Procurement includes all web-based processes for the procurement of goods and services and thus represents a trade perspective (Baldi & Borgman 2001). Changing market conditions have dominated the global sourcing. The global purchase includes the company's overall planning, management and control of material information and money flows. Companies work with these requirements in networks (Bause & Kaczmarek 2001). Value networks represent companies and their social and technical resources within and between businesses (Pibernik 2001). 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. The relevance of e-procurement (Riemer & Klein 2002) can be illustrated by the multiple relationships in value networks (Fettke & Loos 2007). A service package requires cooperation of enterprises in value networks (Knackstedt, Stein & Becker 2009). Besides the efficiency improvement and cost reduction, manufacturers and distributors use the chance to exchange faster and more electronic data (Walter et al. 2010). Also the cloud computing market can be explained economically as a value network (Böhm et al. 2009). Customers purchase services (Barros & Dumas 2006), platforms (Böhm et al. 2009) and infrastructure individually or in aggregate form (Tapscott, Ticoll & Lowy 2000) from the service provider or aggregator. Cloud resources (e.g. power, storage and bandwidth) can be bundled as services, which are offered to cloud users (Pueschel & Neumann 2009). These and other scenarios have in common that the supply network is of strategic importance for the participating companies. Solutions, consisting of products and services are scientifically researched in the field hybrid value creation (Becker, Beverungen & Knackstedt 2008b; Bensch, Schrödl & Turowski 2011; Becker, Beverungen & Knackstedt 2008a). The discussion of the constellation of value networks with cloud computing for service packages and supplier is still pending. Recently, the use of e-procurement in value networks has highlighted various fields (Zweck, Korte & Rijkers-Defrasne 2008).

2.3 Research Design

This paper basically follows the design science paradigm for design-oriented research (Fettke & Loos 2007; Peffers et al. 2008). Design science is a research method to solve organisational problems by

creating and evaluating IT artefacts (Hevner et al. 2004). These IT artefacts are defined as constructs, models, methods, or instantiations (March & Smith 1995). To ensure a rigor conduction of the research, a clear research methodology is necessary. March & Smith consider build and evaluate as the main research activities in design science (March & Smith 1995). Build activities should demonstrate, that a certain artifact can be constructed. Evaluate activities should develop criteria to measure the behaviour of the artifact and assess the performance of the artifact against these criteria. Taking this as nucleus for a design science research methodology, several extensions of this methodology have been proposed to enhance the applicability of the research method. For the present research, we have adopted the design science research methodology from Vaishnavi & Kuechler with five process steps (Kuechler & Vaishnavi 2008). The first process step, awareness of the problem, has been addressed in the introduction. The problem relevance leads to the central research question: How to model a procurement process aligned to the specific requirement of cloud-based IT solutions? In the second process step, we suggest the combination and extension of existing procurement processes as a means to develop a new procurement process aligned to cloud-based IT solutions (Rosemann 1996). In research step 3, development, we construct a new procurement process by identifying existing procurement process through a systematic literature review. Based on these results and the specific requirements of cloud-based IT-solutions, a model for the procurement process is proposed. For the evaluation of the proposed risk management method, we follow the guidelines for design science research according to Hevner et. al (Hevner et al. 2004), where five classes of methods for design artefact evaluation are provided. In this research, we validate the new process in a typical industry use case. In the conclusion, we reflect the process and discuss refinements for further application.

3 E-Procurement and Cloud Computing

3.1 Requirements surveying and requirements analysis for cloud bundles

In a structured literature analysis, we have collected published requirements analysis by cloud computing. We examine articles in the literature rankings VHB-Jourqual2-listing („Association of University Professors of Business Administration e.V.”) (Schrader & Hennig-Thurau 2009), the official AIS-Ranking (AIS 2010) and the WKWI-listing (Speaker of the Scientific Commission of computer science) (2008). Phrases such as "aaS", "requirements" and "cloud computing", has been searched in the singular and plural, in German and English language. Next, journals and conferences have been investigated by topic. The data collection process begins with an electronic search of academic databases and the Internet. After that, we have identified high quality journals and conference accurate records of the date of each search. Foundational fields in Computer Science, Management Science and Organization Science and IS research were identified.

3.2 E-Procurement process model for cloud-based value bundles

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 & Münger 2002). The procurement objectives are differentiated according to strategic and tactical and operational components. Boundaries between the objectives overlap. The acquisition starts with the identification of needs (Eichler 2003; Eyholzer, Kuhlmann & Münger 2002). Based on the requirement determination for goods and services, suppliers could be identified for requisition (Albani et al. 2003). The phase is supported by corporate information systems. In the strategic procurement the initiation and the agreement phase are essentially (Bogaschewsky 1999; Held 2002). The tactical and operational procurement process includes steps, which have to do with order processing. The identification of potential transaction partners is based on concrete specifications, required in the initiation phase. 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. The individual process steps are equally supported by business information systems (SAP AG 2001). For comparison of procurement processes, process steps were compared systematically. Phases and the procurement process descriptions based on the abstraction level of strategic and tactical and operational procurement (Bogaschewsky 1999; Held 2002), to sub processes (Bogaschewsky 1999; Buchwalter, Brenner & Zarnekow 2002; Eichler 2003; Bogaschewsky 1999; Held 2002; van Bon & van der Veen 2010; Loos & Theling 2002; Münger & Eggel 2007) are graphically covered in Figure 3. The procurement process can be classified in a strategic and a tactical part, especially in the three sub-phases initiation, agreement and transaction (Bogaschewsky 1999). The graphical coverage of the procurement process is an attempt to determine overlaps between process-steps. Differences between the procurement of tangible, intangible and cloud-based assets are identified. Basically, the procurement process for services is applicable. In essence, the processes differ in the steps of the procurement specification and acceptance of service (Münger & 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 2008b). The systematic specification of services is difficult for companies (Backhaus, Frohs & Weddeling 2007). For example, a service, such as receiving training services in the SCOR model is not mapped (Knackstedt, Stein & Becker 2009). Typically for cloud solutions acceptance of service a payment step is ability to pay for use of computing resources on a short-term basis as needed and release themes needed (e.g. processors by the hour and storage by the day). Thereby rewarding conservation by letting machines and storage go when they are no longer useful (Armbrust et al. 2010). Within the other sub-processes, the alignment diverges low (Dietrich), as shown in Figure 3.

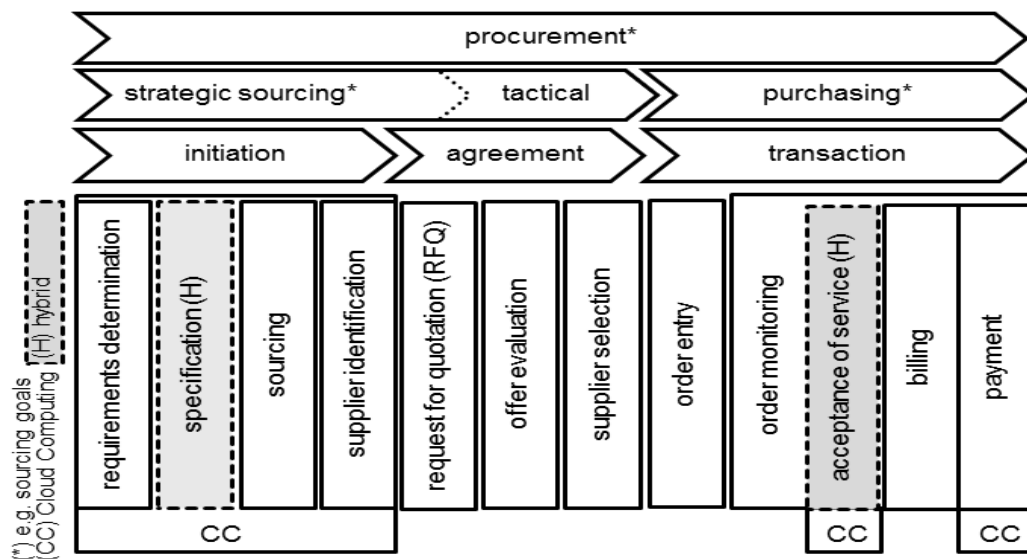


Figure 3. Overlaps between process-steps in procurement

3.3 Cloud computing as collection of three "X-as-a-Service" models

In many industries, cloud computing practice has attracted much attention (Wang et al. 2010). However, there is no commonly accepted definition for cloud computing (Vaquero et al. 2008). Recent articles accumulate for these purposes systematically scientific publications, expert opinions and pragmatic descriptions of practice and attempt a comprehensive definition. (e.g. Leimeister et al.; Böhm et al. 2009; Vaquero et al. 2008). The procedure turns out basic concepts and general objectives. The definitions are often in agreement that the term cloud computing addresses an infrastructure-, platform- and application layer. Youseff et al. (Youseff, Butrico & da Silva 2008) developed an ontology with the additional layer: kernel software and firmware/hardware to sort access to over-

laying layers of virtualization technologies and hardware. Infrastructure as a Service (IaaS) is characteristic of the flexible and adaptive use of IT resources. One example is the use of virtual servers or remote storage from the cloud. The cloud software infrastructure layer provides resources to other higher-level layers (Leimeister et al.). An additional level of abstraction is Platform as a Service (PaaS). Instead of a virtual infrastructure, software platforms will be provided. Thereby integrated runtime and development environments are provided as a service. A known representative is the Google App Engine (Google Inc. 2011). At the application level services are offered (SaaS). Users can access the hosted cloud services. SaaS will be defined as a method for deployment of software applications available in the Internet. In the narrow sense of the term "Service" functionality can also be accessed via a "web service" interface. Thus the integration of external services into own applications is possible (Becker, Beverungen & Knackstedt 2008b).

3.4 Infrastructure requirements in procurement of cloud based solutions

For the comparison of requirements in procurement of cloud based solutions, the articles were compared systematically. The overall requirements of cloud-based solutions benefit has been combined in Table 1, defined as a manageable set of 'workloads'. Based on the derived requirements, applications can be grouped and managed in strategic procurement and, moreover, helps companies to select appropriate service providers. The infrastructure layer creates a pool of storage and computing resources by partitioning. The most common form for providing computational resources to cloud users is dubbed Infrastructure as a Service. Virtualization is the enabler for this cloud component. Amazon's Elastic Compute Cloud (Amazon Inc.) is a popular example of a commercial system in this cloud category (Youseff, Butrico & da Silva 2008). The services offered in the cloud layer are commonly differentiated into computational resources, latency, network, storage and security, as manageable set of workloads. Cloud computing is a model for enabling convenient, on demand network access to a shared pool of configurable computing resources'. The cloud model promotes compute intensive business analytics. A growing share of computing resources allows for example the analysis of complex supply chains. Cloud computing can also perform desktop applications. Capable software packages with seamless extension in the cloud perform expensive computing requirements. Efforts from the grid community to enable lower latencies to resources via multi-level scheduling, to allow applications with many short running tasks are addressed by cloud computing. Cloud computing allow latency sensitive applications to operate natively on the cloud (Foster et al. 2008). One of the major challenges for cloud computing as the clouds is the growth in scale and numbers of users. However, each vendor specifies their own limits and mechanisms for computing CPU utilization (Venkataraman, Shah & Zhang). The categorization of requirements to manageable specifications can be challenging. Network throughput is the average rate to successful data transfer through a network connection. Network bandwidth is the capacity for a given system to transfer data over a connection. For a client perspective throughput is more important, although providers base their billing on bandwidth. The required storage resources may be procured on demand from cloud computing services e.g. from the operating systems (WebOS service provider) (Messerschmidt & Lilienthal). Analogous to the use of computing resources offered from the cloud data storage, data storage-as-a-Service (DaaS) can switch users flexible by demand. Data-Storage-as-a-Service (DaaS) allows users to be accessed ubiquitously on remote discs. As with other storage systems must be taken into account differences in the requirements. Criteria in the selection of storage are high availability, reliability, performance, replication and data consistency. These requirements are manifested in SLAs with service providers that can be manageable grouped (Leimeister et al.). Security is an important topic to purchase cloud computing solutions (Zhang, Cheng & Boutaba 2010). Service providers shall provide the opportunity to specify security settings remotely e.g. for a virtual private cloud. So, the focal supplier must rely on the infrastructure provider to achieve full data security. The infrastructure provider in this context achieves confidentiality, for secure data access and transfer, and auditability to verify the security settings (Li et al. 2009; Santos, Gummadi & Rodrigues 2009).

Workload	IaaS	Manageable set of 'workloads'
Compute	✓	
Latency	Δ	
Network	✓	
Storage	✗	
Security	Δ	
<p>Articles: e.g. (Weinhardt et al. 2009); (Armbrust et al. 2010); (Farahmand, Atallah & Konsynski 2008); (Becker, Beverungen & Knackstedt 2008a); (Foster et al. 2008); (Leimeister et al.); (Li et al. 2009); (Santos, Gummadi & Rodrigues 2009); (Messerschmidt & Lilienthal); (Wang et al. 2010); (Hedwig, Malkowski & Neumann 2010); (Pueschel & Neumann 2009); (Saya, Pee & Kankanhalli 2010); (Gable & Rai 2009); (Vaquero et al. 2008); (Venkataraman, Shah & Zhang); (Youseff, Butrico & da Silva 2008); (Zhang, Cheng & Boutaba 2010)</p>		

✓: workload met, Δ: workload delta, ✗: workload not met

Table 1. Conception of the cloud service bundles as a manageable set of workloads

4 Cloud computing in strategic sourcing

4.1 Reference Model

The procurement process begins with the individualized requirements elicitation. With increasing hybridization, strong customer-supplier relationship for a given service package of services is required. Result of the needs assessment could be a specification that describes all the possible customer requirements (DIN 2009). The process is similar to the traditional procurement; however, it affects the extent of the hybrid properties in the amount of the service level. Cloud-services can support the requirements determination by generating recommendations through aggregation of customer preferences (PSCaaS). During the specification phase, product-service bundles 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 specialized for the delivery network the identified requirements. Suppliers can be determined for product-service bundles of the network. Components and sub-components are harmonized according to purpose. Specification includes 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 taking into account the rules for the configuration of selected services. A product configuration as a service (PSCaaS) can support the decomposition of the demand in the form of a proposal for a component list by infrastructure requirements for applications. The product-service conception, also design phase, corresponds one the one hand to the composition of individual service components by purpose. Thus, to ensure that a hybrid product-service bundle is the choice of hybrid components custom designed along the needs assessment. Within the design phase, goods and services are brought into relationship. It is necessary to consider material and service components of differentiated. When creating services the customer is to involve more than for products (Schuh et al. 2008). On the other hand, in the product-service conception, the cloud components are structured according to their application infrastructure requirements. This ensures that the cloud components are advertised in the appropriate configuration to the supply network. Not every cloud service has the same requirements in their application infrastructure. Therefore, the different requirements have to be taken into account.

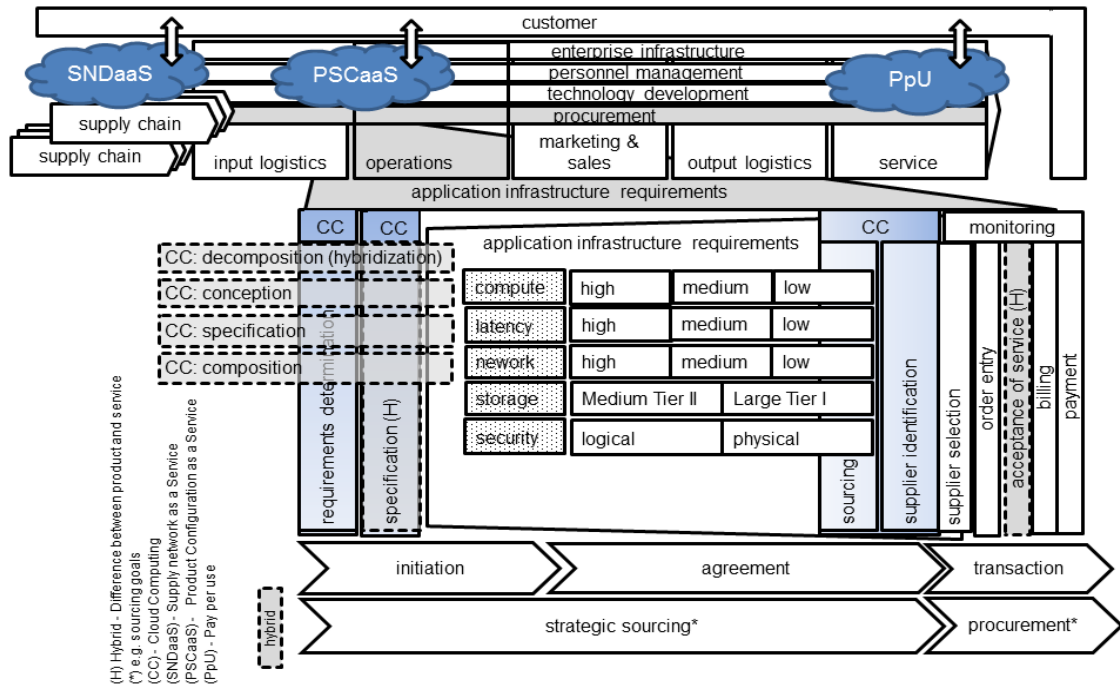


Figure 4. Cloud Computing in strategic sourcing

Specified components can be compensated in the intermediate step product-service composition. In the sourcing and supplier identification phase, identification of strategic supply partners in a dynamic value network, the demand for services to existing and potential suppliers of Tier-1 is reported. According to the report's requirements due to Tier 1 supplier in turn needs to suppliers. In reverse form, the requested information is returned back, aggregated and confirmed into the value network. Therefore the value-network is formed complete. SNDaaS systems (Supply Network Design as a Service) can support the process steps. SNDaaS can recommend suppliers and value chains to form the value network. The network formation is an iterative process. Potential suppliers and supply chains can be proposed to improve the network of SNDaaS. In the agreement phase and sub-processes, cloud computing accelerate the selection of suppliers. The recommendation of comparable services from other providers creates market transparency. Thus, the value network as a whole bears the establishment of the hybrid service packages. The individual product service bundles and cloud computing change the requirements for the value network. The design of value networks can be called as 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 property and services components for value networks to separate consideration. The traditional process steps of the agreement and settlement phase are mainly applicable to the service bundles, as shown in Section 2. On the basis of the identified bundles of services are offered opportunities for a rule base. Configurable reference models contain a rule base is described in, can be represented as follows from an initial model models (Becker, Beverungen & Knackstedt 2008a). Repeated customer requests can therefore be identified by the customer based on the package of services in the course as a subset of the original starting model based on rules configured by the customer (Becker & Delfmann 2007). From the customer's specific application context can be derived configurable models with cloud computing (PSCaaS).

4.2 Reference use case

To demonstrate the plausibility of the proposed model, a use case is described. The use case is a real case from a company providing ICT solutions and is typical for procurement problems with complex product-service bundles including cloud-solutions in value networks. Elements of the case have been discussed with experts from the providing company in the areas product management, marketing, IT

operations and senior management. All discussions have been reflected to the proposed procurement model. The considered application is the offer for a provider of information technology. This package is an enterprise IT workplace, which can be used as a standard workstation for common office activities. The scope of this IT workplace includes hardware (PC, keyboard, mouse), various software packages and internet connection. Further, a customer relationship management system (CRM) with connection to a digital marketplace for the purchase-management for office supplies is integrated. To ensure proper backup, an online-backup solution is integrated. In addition, the offer includes the workplace installation and the training of the employee as a service. Finally, there is a service level agreement (SLA). This allows the user by problems either to call a hotline or an on-site service. This product-service offer is agreed with the customer and sold.

Needs type	Solution Component
own production	PC, Keyboard, Mouse
Procurement needs	Software Packages, Internet Conn., CRM-System, Online-backup solution, Market Place Conn., Workstation Inst., Staff training, Advanced training, Software licenses, SLA

Table 2. Defining procurement need

First, the focal supplier has to identify its procurement need. Therefore the customer solution is divided into "own production" and "procurement needs" (see table 2). During the hybridization phase of the procurement, components were decomposed into individual components and sub-components. Here, a classification according to tangible, intangible, hybrid and cloud components made (see table 3). Based on the focal supplier decision, clear division for certain components is not always possible.

Classification	Solution Component
Tangible Components	Software Packages
Intangible components	Connection to market place, Software licenses
Hybrid components	Internet connection, Workplace installation, Staff training, Advanced training, SLA
Cloud components	CRM-System, Online-backup solution

Table 3. Hybridization phase

In the phase of the conception of the hybrid components, the product and service components can be distinguished (see table 4). The different components are grouped together to purpose groups to achieve positive effects in the procurement of components belonging to the same purpose group.

Component	Product	Service	Purpose
Internet connection	+	+	Online-Service
Workplace installation	-	+	Local-Service
Staff training	-	+	Local-Service
Advanced training	+	+	Local-Service
Service-Level-Agreement (SLA)	-	+	Service-Level

Table 4. Conception of the hybrid components

In the phase of the conception of the cloud components, the cloud components are grouped into the application infrastructure requirements (see table 5). By grouping together components with the same application infrastructure requirements, positive effects in the procurement may be achieved.

Component	Application infrastructure requirements				
	Compute	Latency	Network	Storage	Security
CRM system	Low	Medium	Medium	Medium Tier2	Logical
Online-Backup	Low	Low	High	Large Tier1	Physical

Table 5. Conception of the cloud components

In the phase of specification, the procurement requirement formalized and announced. The tangible and intangible components can be specified classical. The hybrid components and the cloud components are to be specified only in context and interaction with the client. This is documented in the specification. All components and specifications are advertised in the value network. In the phase of the bundling of services, the deals are based on the tenders of the components takes place in the value network, tested, completed and bundled. This collection is combined with the components of the manufacturer's own products and is packaged as the product-service bundle that is offered to the customer. The bundling of services now depends on the heterogeneity of the suppliers.

5 Conclusion

Aim of this paper is to develop a procurement process for product-service bundles in procurement management. For this purpose, cloud solutions as an existing product-service bundle in supply chain management was analysed and tested for compatibility with the requirements of the sourcing of product-service bundles in value networks. Based on this analysis, a design-proposal for the procurement of cloud solutions is modelled in addition to the infrastructure layer. It proposes five strategic sourcing process steps as a design proposal for procurement value bundles in value networks. The suitability of the new process was demonstrated in a use case. The integration of logistic aspects for the procurement processes of product-service bundles holds significant advantages for focal suppliers of hybrid value bundles over traditional procurement. There are more than reduced transaction costs. The presented design proposal is a way out for those companies that challenges the integration of product and service components in cloud solutions but faces a lack of procurement strategy for value bundles to source hybrid value bundles from their value network. The strategic approach to procurement has bundling effects in the design of cloud components. Offering companies are able to systematically identify cloud compositions from different integrated offerings to achieve monetary and logistic advantages. In many scenarios, such proposals are the missing component to a seamless procurement process. This approach offers companies a basis for process changes that support the procurement of cloud bundles in value networks. Processes are adjusted according to the company and market dynamics. Current and future research will examine the extent 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 these business requirements to ICT functionality. It will examine how the procurement-function in existing business information systems to cloud solutions in value networks. It is exploring how existing ERP systems must be designed to implement the procurement-process for cloud solutions in value networks.

References

- 2008, 'WI-Orientierungslisten. WIRTSCHAFTSINFORMATIK, vol. 50, no. 2, pp. 155–163.
AIS 2010, MIS Journal Rankings [05 December 2011].
- Albani, A., Keiblinger, A., Turowski, K. & Winnewisser, C. 2003, 'Komponentenmodell für die Strategische Lieferkettenentwicklung'. *Wirtschaftsinformatik* 2003, pp. 61–80.
- Amazon Inc., Amazon Elastic Compute Cloud (Amazon EC2). [06 December 2011].
- Armbrust, M., Fox, A., Griffith, R., Joseph, A.D., Katz, R., Konwinski, A., Lee, G., Patterson, D., Rabkin, A., Stoica, I. & Zaharia, M. 2010, 'A view of cloud computing', *Com. ACM* 53, pp. 50-58
- Arnold, H.U. & Essig, M. 2000, 'Sourcing-Konzepte als Grundelemente der Beschaffungsstrategie', *Wirtschaftswissenschaftliches Studium*, vol. 29, no. 3, pp. 122–128.
- Backhaus, K., Frohs, M. & Weddeling, M. 2007, *Produktbegleitende Dienstleistungen zwischen Anspruch und Wirklichkeit*.
- Baldi, S. & Borgman, H.P. 2001, 'Betreiberstrukturen von Elektronischen B2B-Marktplätzen - Eine Fallstudie in der Automobilindustrie', *WIRTSCHAFTSINFORMATIK*, pp. 543–554.
- Barros, A.P. & Dumas, M. 2006, 'The Rise of Web Service Ecosystems', *IT Prof.*, 8(5), pp. 31–37.

- Bause, F. & Kaczmarek, M. 2001, 'Modellierung und Analyse von Supply Chains', WIRTSCHAFTSINFORMATIK, pp. 569–578.
- Becker, J. & Delfmann, P. (eds.) 2007, Reference Modeling. Efficient Information Systems Design Through Reuse of Information Models, Physica-Verlag, Heidelberg.
- Becker, J., Beverungen, D. & Knackstedt, R. 2008a, 'Reference Models and Modeling Languages for Product-Service Systems'. HICSS-41, pp. 105-114.
- Becker, J., Beverungen, D. & Knackstedt, R. 2008b, 'Wertschöpfungsnetzwerke von Produzenten und Dienstleistern als Option zur Organisation der Erstellung hybrider Leistungsbündel' in Wertschöpfungsnetzwerke, Physica, pp. 3-31.
- Bensch, S., Schrödl, H. & Turowski, K. 2011, 'Beschaffungsmanagement für hybride Leistungsbündel in Wertschöpfungsnetzwerken'. WI, Zürich, pp. 231–240.
- Beverungen, D., Kaiser, U., Knackstedt, R., Krings, R. & Stein, A. 2008, 'Konfigurative Prozessmodellierung der hybriden Leistungserstellung in Unternehmensnetzwerken des Maschinen- und Anlagenbaus', Multikonferenz Wirtschaftsinformatik.
- Bogaschewsky, R. 1999, 'Electronic Procurement - Neue Wege in der Beschaffung' in Elektronischer Einkauf. Dt. Betriebswirte-Verl, Gernsbach, pp. 13–40.
- Böhm, M., Leimeister, S., Riedl, C. & Krcmar, H. 2009, 'Cloud Computing: Outsourcing 2.0 oder ein neues Geschäftsmodell zur Bereitstellung von IT-Ressourcen?', IMuC 24(2), pp. 6-14.
- Buchwalter, J., Brenner, W. & Zarnekow, R. 2002, 'Referenzprozesse für elektronische Ausschreibungen aus Sicht des industriellen Einkaufs', WIRTSCHAFTSINFORMATIK, no. 04.
- Burr, W. 2002, Service-Engineering bei technischen Dienstleistungen. Habilitation, DUV, Wiesbaden.
- Dietrich, A.J., Informationssysteme für Mass Customization. Institutionenökonomische Analyse und Architekturentwicklung, DUV, Wiesbaden.
- DIN 2009, Project management - Part 1: Fundamentals, Beuth, DIN 69901-1:2009-01.
- Eichler, B. 2003, Beschaffungsmarketing und -logistik. Verl. Neue Wirtschaftsbriefe, Herne.
- Eyholzer, K., Kuhlmann, W. & Münger, T. 2002, 'Wirtschaftlichkeitsaspekte eines partnerschaftlichen Lieferantenmanagements. HMD, vol. 39, no. 228, pp. 66–76.
- Farahmand, F., Atallah, M. & Konsynski, B. 2008, 'Incentives and Perceptions of Information Security Risks'. ICIS 2008.
- Fettke, P. & Loos, P. (eds.) 2007, Reference modeling for business systems analysis, Idea Group Pub., Hershey, PA.
- Foster, I., Zhao, Y., Raicu, I. & Lu, S. 2008, 'Cloud Computing and Grid Computing 360-Degree Compared'. 2008 Grid Computing Environments Workshop. (GCE) ; Austin, Texas, pp. 1–10.
- Gable, G. & Rai, A. 2009, 'Reconceptualising the Information System as a Service'. ECIS, Verona.
- Google Inc. 2011, Google App Engine - Google Code. [06 December 2011].
- Hedwig, M., Malkowski, S. & Neumann, D. 2010, 'Towards Autonomic Cost-Aware Allocation of Cloud Resources'. ICIS2010.
- Held, T. 2002, Integration virtueller Marktplätze in die Beschaffung, DUV, Wiesbaden.
- Hevner, A.R., March, S.T., Park, J. & Ram, S. 2004, 'Design Science in Information Systems Research', MIS Quarterly, vol. 28, no. 1, pp. 75–105.
- Hirschheim, R., Klein, H.K. & Lyytinen, K. 1995, Information systems development and data modeling: Conceptual and philosophical foundations, Cambridge Univ. Press, Cambridge.
- Holbach, D. 2002, Beschaffungsmarktforschung in der digitalen vernetzten Welt. DVS, Frankfurt/M.
- Janiesch, C., Pfeiffer, D., Seidel, S. & Becker, J. 2006, 'Evolutionary Method Engineering: Towards a Method for the Analysis and Conception of Management Information Systems'. AMCIS 2006.
- Kaufmann, L. 2002, 'Purchasing and Supply Management: A Conceptual Framework' in Handbuch industrielles Beschaffungsmanagement. Hahn, Wiesbaden, pp. 3–33.
- Knackstedt, R., Stein, A. & Becker, J. 2009, 'Modellierung integrierter Produktion und Dienstleistung mit dem SCOR-Modell'. Wirtschaftsinformatik 2009, pp. 119–128.
- Krampf, P. 2000, Strategisches Beschaffungsmanagement in industriellen Grossunternehmen. EUL.
- Kuechler, B. & Vaishnavi, V. 2008, 'On theory development in design science research: anatomy of a research project', EJIS vol. 17, no. 5, pp. 489–504.
- Large, R. 2006, Strategisches Beschaffungsmanagement, Gabler, Wiesbaden.

- Leimeister, S., Böhm, M., Riedl, C. & Krömer, H., 'The Business Perspective of Cloud Computing: Actors, Roles and Value Networks'. ECIS 2010.
- Li, B., Li, J., Huai, J., Wo, T., Li, Q. & Zhong, L. 2009, 'EnaCloud: An Energy-Saving Application Live Placement Approach for Cloud Computing Environments'. IEEE ICC, pp. 17–24.
- Loos, P. & Theling, T. 2002, 'Integrationsmöglichkeiten von E-Procurement-Systemen in inner- und überbetrieblichen Systemen'. E-Business, Cuvillier, Göttingen, pp. 73–84.
- March, S.T. & Smith, G.F. 1995, 'Design and natural science research on information technology', *Decision Support Systems*, vol. 15, no. 4, pp. 251–266.
- Messerschmidt, C.M. & Lilienthal, M., 'Acceptance of a Web OS as a Commercial Consumer Service Bundle'. ECIS 2010.
- Münger, T. & Eggel, S. 2007, 'Elektr. Beschaffung von Dienstleistung', *Supply Mgmt*, pp. 16–17.
- Peppers, K.E., Tuunanen, T., Rothenberger, M.A. & Chatterjee, S. 2008, 'A Design Science Research Methodology for Information Systems Research', *JMIS*, vol. 24, no. 3, pp. 45–77.
- Pibernik, R. 2001, 'Flexibilitätsplanung in Wertschöpfungsnetzwerken', *ZfB*, no. 8, pp. 893–913.
- Pueschel, T. & Neumann, D. 2009, 'Management of Cloud Infrastructures: Policy-Based Revenue Optimization'. ICIS 2009.
- Puschmann, T. & Alt, R. 2005, 'Successful Use of e-Procurement in Supply Chains', *Supply Chain Management - An International Journal* 2(10), pp. 122–133.
- Reiss, M. & Präuer, A. 2001, 'Solutions Providing: Was ist Vision-was Wirklichkeit?', *Absatzwirtschaft* 5(44), pp. 48–53.
- Riemer, K. & Klein, S. 2002, 'Supplier Relationship Management Supplier Relationships im Rahmen des Partner Relationship Managements', *HMD* 39(228), pp. 5–22.
- Roland, F. 1993, *Beschaffungsstrategien*. Dissertation, Göttingen.
- Rosemann, M. 1996, *Komplexitätsmanagement in Prozessmodellen*. Gabler.
- Santos, N., Gummadi, K.P. & Rodrigues, R. 2009, 'Towards Trusted Cloud Computing'. Hotcloud 2009. Workshop on Hot Topics in Cloud Computing, ed USENIX Annual Technical Conference.
- SAP AG 2001, *Dienstleistung (MM-SRV)*. [05 December 2011].
- Saya, S., Pee, L.G. & Kankanhalli, A. 2010, 'The Impact of Institutional Influences on Perceived Technological Characteristics and Real Options in Cloud Computing Adoption'. ICIS2010.
- Schrader, U. & Hennig-Thurau, T. 2009, 'VHB-JOURQUAL2', *BuR*, vol. 2, no. 2.
- Schrödl, H., Gugel, P. & Turowski, K. 2011, 'Towards a Reference Model for the Identification of Strategic Supply Chains for Value Bundles'. HICSS-44, IEEE, Piscataway, NJ, pp. 1–10.
- Schuh, G., Lenders, M., Bartoschek, M. & Bender, D. 2008, 'Preisfindungsprozess für Leistungssysteme im Maschinen- und Anlagenbau', *Controlling*, 8/9, pp. 481–487.
- Tapscott, D., Ticoll, D. & Lowy, A. 2000, *Digital capital. Harnessing the power of business webs*, Harvard Business School Press, Boston.
- van Bon, J. & van der Veen, A. 2010, *Foundations of ITIL V3*, Van Haren, Zaltbommel.
- Vaquero, L.M., Rodero-Merino, L., Caceres, J. & Lindner, M. 2008, 'A break in the clouds: towards a cloud definition', *SIGCOMM Comput. Commun. Rev*, vol. 39, pp. 50–55.
- Venkataraman, V., Shah, A. & Zhang, Y., 'Network-based Measurements on Cloud Computing Services', pp. 1–10.
- Walter, P., Blinn, N., Schlicker, M. & Thomas, O. 2010, 'IT-gestützte Wertschöpfung zur Integration von Produktion und Dienstleistung' in *Wertschöpfung*, Springer Berlin, pp. 299–313.
- Wang, L., Laszewski, G., Younge, A., He, X., Kunze, M., Tao, J. & Fu, C. 2010, 'Cloud Computing: a Perspective Study', *New Generation Computing* 28(2), pp. 137–146.
- Weinhardt, C., Anandasivam, A., Blau, B., Borissov, N., Meinel, T., Michalk, W. & Stöber, J. 2009, 'Cloud-Computing - Eine Abgrenzung, Geschäftsmodelle und Forschungsgebiete', *WIRTSCHAFTSINFORMATIK*, 51(5), pp. 453–462.
- Youseff, L., Butrico, M. & da Silva, D. 2008, 'Towards a Unified Ontology of Cloud Computing', GCE08, Austin, Texas, USA, 16 November 2008, IEEE Service Center, Piscataway, NJ, pp. 1–10.
- Zhang, Q., Cheng, L. & Boutaba, R. 2010, 'Cloud computing: state-of-the-art and research challenges', *Journal of Internet Services and Applications* 1(1), pp. 7–18.
- Zweck, A., Korte, S. & Rijkers-Defrasne, S. 2008, *Hybride Wertschöpfung*. Düsseldorf.