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# Managing the Cloud Procurement Process – Findings from a Case Study

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***Abstract*—**Cloud computing (CC) has already gained overall appreciation in research and practice. Whereas the willingness to integrate cloud services in various IT environments is still unbroken, the previous CC procurement processes run mostly in an unorganized and non-standardized way. In practice, a sufficiently specific, yet applicable business process for the important acquisition phase is often lacking. And research does not appropriately remedy this deficiency yet. Therefore, this paper introduces a field-tested approach for CC procurement. Based on an extensive literature review and augmented by expert interviews, we designed a model that is validated and further refined through an in-depth real-life case study. For the detailed process description, we apply the event-driven process chain notation (EPC). The gained valuable insights into the case study may help CC research to shift to a more socio-technical area. For practice, next to giving useful organizational instructions we will provide extended checklists and lessons learned.

***Keywords*—**Cloud Procurement Process, IT-Organization, Event-driven Process Chain, In-depth Case Study.

## I. Introduction

CLOUD computing (CC), as a kind of IT-outsourcing, has a huge potential for supporting and befitting IT-processes in many aspects such as scalability, virtualization, flexibility, agility, and cost advantages [1]–[4]. Despite the reasonable security concerns [5], [6], the CC market shows remarkable growth, and service providers consistently expand their CC service range [7]. Thus, CC issues obtain legitimately increasing reputation in scientific research.

There is, however, a general consensus that the CC paradigm [8] is involving various disciplines concurrently [3], [9]. But the great majority of scientific publications focuses especially the technical aspects of cloud services, tackling other aspects such as organizational business processes more or less superficially [3], [10]. Given this fact, it is indispensable for scientific research to investigate CC more in an inter-disciplinary context [11].

Looking at the CC lifecycle (from the user perspective), the COBIT 5.0 reference model [12] defines four management domains that are relevant for CC as well: 1) *align, plan and organize*; 2) *build, acquire and implement*; 3) *deliver, service and support* 4) *monitor, evaluate and assess*. In terms of *align* and *plan*, there are already valuable research contributions especially with regards to perceptions of risks and chances of cloud services for various business fields and geographical areas, e.g. [9], [13]–[16]. Further, research is enriched by papers that focus specific implementation processes in the second management domain as well as processes in later lifecycle steps, e.g. [17]–[21]. Interestingly, though, to date just a few, if any, research investigations put emphasis in between, next to the planning phase and prior to the implementation phase, namely the organizational and procurement phases.

The usually simple and detached implementation of cloud services tempt to think of CC as a consumable for supporting especially non-core operations easily that can be bought and pushed away as needed. Consequently, in practice the cloud organization and procurement processes did not get enough attention and therefore, run mostly in an unorganized and non-standardized way, particularly in decentralized organizations. However, corporate standards for procurement and selection of IT assets were necessary ever since [22], [23]. With the expanding CC usage, this topic gets more importance and CC literature did not catch up this topic accordingly up to now.

One might think that enterprise architecture frameworks such as COBIT 5.0 [12] or ITIL V3 [24] cover the relevant topics. But these concepts mainly focus general intra-enterprise environments and do not effectively address the complexities linked with integrating internally and externally sourced cloud services and related processes like the CC procurement activities [25]. Hence, researchers argue that the traditional IT governance frameworks establish a governance foundation that is not materially altered by the CC paradigm and therefore, these frameworks should be enlarged by more detailed approaches, e.g. [25]–[27].

The paper at hand postulates the need of a standardized cloud service procurement process, by concentrating on organizational aspects of cloud service sourcing. Due to the complex interactions between various participants during the procurement process of cloud services, there is a compelling need for a standardized procedure. Especially, we focus internal interactions and the degree of centralization within organizations. Based on a theoretical model and evaluated by an in-depth case study, we intend to support to better understand and manage the complex cloud provider selection and subsequently, the cloud service procurement activities.

Further, we will present the first interdisciplinary view on CC procurement processes by combining aspects from the research fields of information systems, organization and procurement.

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The paper proceeds by reviewing the need for a standardized cloud service procurement process in the next section. In the third section, we will present the underlying research approach. Next, we will extend the existing body of knowledge by presenting an analytical model in section four. In the fifth section, we will give a short overview of the case company and we will describe the model application. In section six, the company´s procurement approach will be discussed in detail. The paper closes with a discussion in section seven and concluding remarks in section eight.

## II. Literature Review

At least since the pioneering article by Prahalad and Hamel, named "The core competence of the corporation", companies have been outsourcing many of the activities that have not been classified as their core business [28]. The crux is determined by the institutional decision whether it is efficient to produce certain products and services in-house or purchase them. Herein, procurement is defined as the process of choosing suppliers and contracting forms for acquiring a demanded asset [29].

With the spreading trend of outsourcing IT-services, literature offered a variety of explanations and frameworks for the procurement of external operation (e.g. with regards to checklists: [30]; with regards to contracts: [31]; with regards to transaction cost theory: [32]; with regards to sunk costs: [33]; with regards to IT outsourcing success: [34]). No doubt, CC emerged from the IT outsourcing trend and researchers in this topic will find several points of contact with the IT-outsourcing literature. (Practitioners and academics alike discuss the question of whether CC is part of the outsourcing evolution or if it brings about a revolution [35]). But specific features of CC make it hard to transfer IT-outsourcing knowledge on actual CC issues.

The National Institute of Standards and Technology (NIST) defines CC as "a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction" [36]. But CC does not represent a new technology. Rather, it stands for a new paradigm for IT processes [8] by consistently linking individual, existing technologies [9]. The majority of the research literature distinguishes between three service models [36]: "Infrastructure as a Service (IaaS)", "Platform as a Service (PaaS)", and "Software as a Service (SaaS)".

However, with CC there is a shift from traditional provisioning model in IT outsourcing where IT resources are physically located at the client's or vendor's site (single tenant architecture) to an asset free IT provisioning model where highly scalable hardware, software and data resources are available over a network [2]. Contrary to traditional IT-outsourcing models, the cloud service end user is able to obtain complete services from encapsulated functions at any location and at any time directly from the provider via the web [11], essentially bypassing the internal IT-departments. Furthermore, compared with IT-outsourcing, the internal IT-departments lose further significance for IT-operations and procurement tasks as well as responsibilities move insidiously from the IT-departments to the process owners. This denotes a subliminal kind of responsibility distribution in the width since tasks are shifted from central IT-departments to diverse areas in the operations. Hence, already existing literature that combines the streams of IT outsourcing and procurement (e.g. [30]) is not applicable for CC procurement because roles and processes different than with IT-Outsourcing. Further, due to the simple implementation possibility on the one side and the high risk of security and coordination breaches on the other side, for the CC procurement process, the involvement of internal IT-departments and their expertise is compelling needed. But CC makes traditional and functionally focused IT-procurement processes unsuitable [3]. More process-oriented involvement of specific stakeholders is needed. The question is about the correct degree of involvement, depending on the organizational structure and the company size.

Moreover, the pay-as-you-go model enables the user usually to enter into contracts with shorter terms in comparison with traditional IT-outsourcing [37], leading to switching CC providers more often. Thus, with the insidious spreading of responsibilities as well as with the possible shorter contract cycles, the need for a standardized procurement process gets highly important with CC usage.

Kraljic proposed one of the most dominating procurement articles [38] which gains still high reputation in theory and practice [39]. In his matrix, the axes are determined by "market complexity" and "importance of purchasing". In aspects of CC, indubitable, the market complexity is quite high, whereas the importance for the overall company is rather low due to using external CC providers is mostly done for non-core operations (the authors assume that companies use cloud services only for core processes in a more matured cloud environment after having experienced good results with non-core operations). Consequently, in case of CC usage, the matrix classifies it as a "bottleneck" item with a high supply risk that needs to be contained with an adequate sourcing management strategy.

## III. Research Approach

The research approach combines analytical as well as empirical research (c.f. Fig. 1) and is adapted from methodologies of Fettke and Loss [40] and Schlagheck [41]. ***Phase one*** involved the challenges of issue identification, which we stated in the introduction section. In ***phase two***, the model was derived from on a systematic literature review [42]. Herein, three major databases were selected (SpringerLink, Elsevier, AISNET) for searching combination of terms like "Cloud Computing", "IT-Outsourcing", "IT System", "Selection", "Evaluation", "Procurement", "Acquisition", and "Organization". ***Phase three*** included an empirical study for validating the gained results of the prior phases. Herein, we conducted thirteen semi-structured expert interviews. Experts with specific CC-knowledge were identified in business networks such as xing.com and were then interviewed via

phone. The interviews lasted between 30-45 minutes and took place in December 2013. The validated model was afterwards applied and further detailed in the ***fourth phase***. Especially the detailed real-life application, which we will show by means of an event-driven process chain (EPC), grants deep practical insights. We believe that the diversity of companies and complexities is too great to expect a "one way fits all" approach. Therefore, the aim of this paper is to discuss these issues in a more limited but deeper context, through an in-depth case study [43]. The paper at hand focuses the results of this fourth phase before summarizing the results in the ***last phase***.

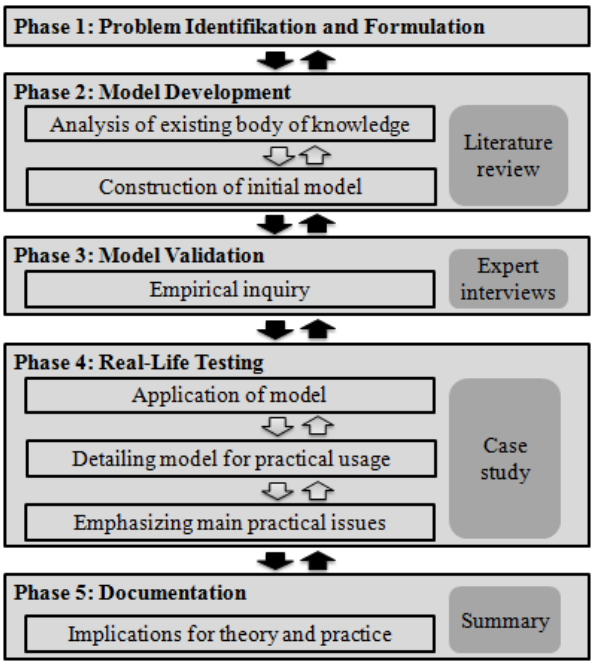


Fig. 1 Procedure to model development

Considering the expert interviews in ***phase three***, we were especially interested in 1) the relevance of the underlying topic, 2) whether generally accepted frameworks (e.g. COBIT and ITIL) provide needed support, 3) how practice is managing CC procurement issues, and 4) the usefulness of our approach. Summarizing the IT-experts´ statements, we got great support for our theoretical approach as there is an evident risk of security and architectural breaches when excluding internal IT departments at CC procurement activities. Most of the using companies have not defined a clear organizational CC procurement process so far as they tend to underestimate these risks. And the widely known general frameworks miss to address the associated risks accordingly that related to unorganized CC procurement activities. For most of the interviewees, the concepts of COBIT and ITIL seem to be too abstract in terms CC procurement issues.

With regards to in-depth case study in ***phase four***, the limited amount of existing scientific knowledge in the underlying topic justifies the use of such a study as a methodological procedure for investigating the process of CC procurement in detail. In general, single case research has some limitations with regard to replicability of findings, because it does not support theoretical sampling [44], [45]. Nevertheless, the conditions of a rare and unique case legitimize the use of that kind of study research on the ground of its revelatory nature [45]. Herein, case study research is applicable for solving real-life organizational issues [46], [47]. However, Yin concedes that case study research should have some propositions and a defined unit of analysis. The case study aims to evaluate and refine the developed model. The underlying unit of analysis is limited to the study of the case company, intending to supply inductive reasoning. Walsham stated "that interviews are the primary data source, since it is through this method that the researcher can best access the interpretations" [48] of the participants. Therefore, two sources served for evidence within that case, direct observations and expert interviews [45].

The underlying case company was chosen for three reasons. First, it is a traditional and successful automotive supplier, with a high reputation for information systems. Second, the company is well-known for using CC technologies to benefit its operating systems. Third, the company´s IT-management determined that a source-driven approach is needed to ensure a standardized CC evaluation, thus constituting a fruitful case to study the CC procurement processes. Direct observations were executed, since the first author of the paper was a member of a cloud project team, leading to eight all day long sessions that took a period of six months until July 2014. The goal of the project was to examine how to structure the CC procurement process and the related responsibilities. The gained insights constitute major parts of the underlying paper. In order to check the validity, semi-structured interviews were conducted with the other nine team members after having conceived a first draft of the paper, each circa 45 minutes. The interviews were recorded and transcribed. There from, we refined our model processes. Finally, for ensuring the overall validity, the paper was checked by the project manager.

## IV. Model Development

Procurement theory thinks of procurement as having a cross-boundary function that can make an impact through two major linkages: internal interactions and external involvement [30], [49]. The CC procurement process is determined by the interaction between internal IT-experts, internal process owners, and external parties such as cloud provider, cloud carrier, or cloud broker [36]. Our paper focuses the internal interactions. One of the archetypical discussions with regards to the distribution of procurement activities in the procurement domain science, as well as how to organize procurement processes, is the hierarchy issue [29], [39]: At a central structure, a powerful central department evaluates and purchases on behalf of the sub-entities. In contrary, at a decentralized structure, a central department makes the policies and does corporate acquisitions. But the sub-entities purchase on their own behalf. In case of mixed centralization

and decentralization structures, it is, by procurement domain literature, articulated as “hybrid” structure; such as strategic activities are dealt with centrally, whereas operational execution is done decentralized [50].

Further, Monczka, Trent, and Petersen [51] stated that, in general, procurement processes should be adapted to external conditions. These conditions are reflected by organizational development and behavior, leading among others to the degree of internationalization of a company [52]. The analysis of the overall company is needed, since the process owner of the CC service may come from any area of the company. The internationalization degree of the company has major influence on managing and organizing the CC procurement process. Therefore we separate between three internationalization types: “glocal player” (e.g. international production and international product distribution), “global player” (e.g. local production and international distribution), and “local player” (e.g. local production and local distribution).

Hence, with regards to CC procurement involvement, we examine two levels in the below standing matrix in Fig. 2, namely the ***hierarchical degree*** and the ***internationalization degree*** of a specific CC procurement process.

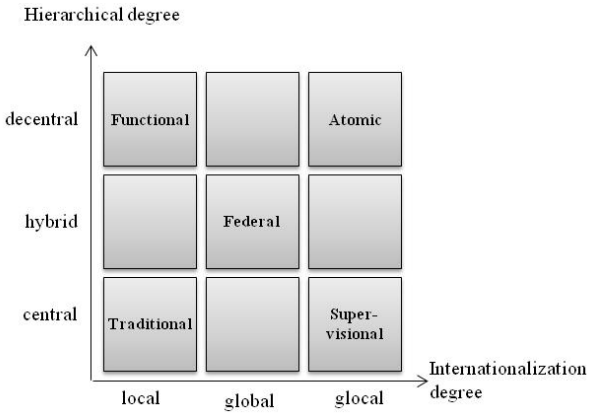


Fig. 2 Analytical model for CC procurement activities

Moreover, a company may have center-led IT departments, but decentralized preconditions for operational process owners or vice versa. Further, a company may have a high internationalization degree for its operations and process owners but a low internationalization degree for its IT-department(s) or vice versa. For a company´s position in the matrix, the interactions during the CC procurement between IT-departments and process owners are relevant. As mentioned before, there is an insidious risk of purchasing cloud services unorganized and too independent from internal IT-departments. Contrary, for hindering uncontrolled usage, it is not efficient to transmit traditional IT procurement processes (e.g. for on-premise solutions) on CC procurement processes. Even if the traditional processes have been proven to be good for many years, the process suitability has to be questioned. For analyzing the adequate degree of internal IT involvement as well as the responsibilities, the model makes it necessary to understand the actual vertical and horizontal positioning of a company and its IT-departments. And afterwards the way to the aimed CC procurement structure can be analyzed. This approach creates the basic conditions for enabling the full unfolding of CC advantages. In the below stated example (c.f. Fig. 3), the overall company has a higher internationalization than it’s IT-department(s). In the actual situation, central IT-involvement for procurement of CC is low and for on-premise solutions quite high. Due to the company aims to acquire CC more global and more federal, an increase of central IT involvement and an increase of IT internationalization is needed. Here, on-premise acquisition processes are strongly IT-driven and not adequate for CC. The arrow shows the path of change and the longer the arrow within the model, the bigger is the obvious need for change for the organization.

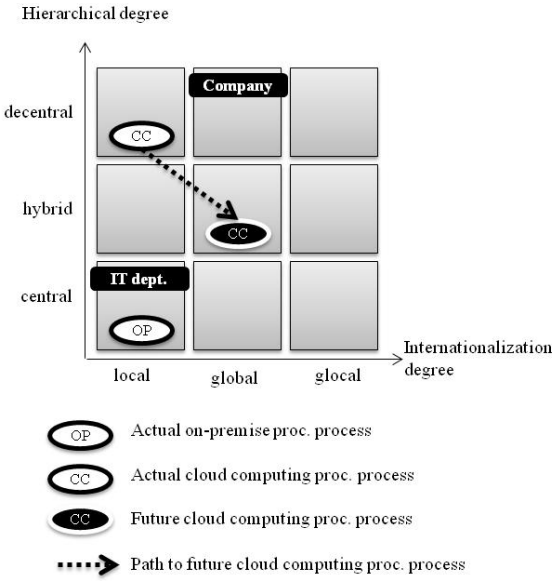


Fig. 3 Example for structuring the cloud procurement process

As mentioned before, this model was validated by IT-experts via interviews, where we received great support for the functioning of the model. Further, the experts assist to find adequate matrix terms in the boxes and at the axes. The developed model helps management to understand needed processes on high level. For a real-life usage, the model has to be transferred into a detailed process description that discusses the upcoming questions: Who bears the responsibility for which specific process step and what are the main pitfalls during the single steps? Here, for instance the RACI-concept used by COBIT [12] may constitute a good starting point (responsible, accountable, consulted, and informed). In order investigate these questions, the developed model serves as basis for an application in the case study. Herein, we will explore the single CC procurement steps on the one side and the organizational responsibilities on the other side.

## V. The Case Company and Model Application

### A. The Case Company

The company started to reflect on CC in more detail in 2010. It set up a "Cloud Readiness" project in order to develop and apply a customized assessment method for investigating selected, but rather specific IT-services, applications, and processes. The resulting magic matrices method is based on the persuasion that the IT-landscapes of larger companies will never be completely "cloud ready". The company´s findings meet our prior made statement that cloud services are beneficial especially for non-core operations.

In the meantime, the company has implemented a remarkable amount of cloud applications, ranging from simple, detached to more integrated IT-services that are mostly supplied by well-known cloud providers, e.g., for purchasing and logistics processes. In order to concentrate and share the gained practical knowledge, the company´s IT-management decided to start a second project called "Cloud Initiative". The project aimed to design a generally accepted source-driven approach to ensure a standardized cloud computing evaluation.

### B. Model Application

The underlying company has a high degree of internationalization. It is aiming a globally balanced sales portfolio in order to be less dependent on individual markets, leading to 300 locations and 443 legal entities all over the world. This overall strategy makes it essential to have a high degree of internationalization of the IT-departments as well, classifying the company as a real "glocal player".

In aspects of centralization, the company can be categorized as "hybrid". The 27 business units within the five divisions have a strong position and a high grade of responsibility for their own business. This is needed due to the company´s balanced customer portfolio between automotive and other industries, and the arising diversity of the company. Nevertheless, the last decision will be made by Corporate only. Derived from this organizational responsibility, the IT-departments are decentralized as well. Here, Corporate IT defines standards and is responsible for globally spanned IT-projects.

The company´s project team investigated our cloud procurement approach in detail and found no significant need to change the degree of involvement of any variable in the prior stated model. The combination "glocal/hybrid" marks the actual situation as well as the target. This is justified by the fact that on the one side the company has valuable experiences with external providers and services (e.g. the company has outsourced all its SAP operations) and on the other side the great amount of already implemented cloud services led to ongoing incremental organizational adjustments of responsibility involvement during the last years. Furthermore, there is no urgent guideline to increase the number of cloud services like in some other well-known organizations. At the underlying company, the cloud adaption has always to be compared with alternative solutions and just in case of a positive business case, the cloud solution will be implemented. With this attitude, e.g. a more atomic approach is not needed.

Hence, the project team decided that a global CC sourcing should be linked to a central coordination accompanied by sustaining a decentralized site level. Derived from the COBIT framework, center-led activities should contain 1) developing company-wide CC policies and procedures 2) identifying, evaluating, selecting, managing, and developing strategic CC providers and relationships 3) coordinating global CC sourcing opportunities, and 4) negotiating company-wide contracts and service level agreements. Decentralized activities should involve such as 1) ensuring technical preconditions, 2) aligning business process integration, and 3) running the service management (including monitoring service levels). When the CC-service is unique to a specific division, it has to cover mostly all aspects decentralized, ensuring alignment with IT-governance. Nevertheless, the project team had to define the single process steps during the overall procurement phase for center-led and decentralized deployment. Since the decentralized form involves more interaction between the participants, we will investigate this deployment type in the next section in detail.

## VI. Decentralized Cloud Procurement Process

### A. Preconditions

The cloud procurement process is a sub-process of the overall CC lifecycle. Due to the restrictions of the template format, we have divided the procurement process in two phases which have to be seen connected: IT-service preparation and IT-service procurement. The ***IT-service preparation*** phase involves the process of gathering, analyzing, and comprehending the overall IT-system requirements, identifying and classifying cloud services into service sets, and screening them. The ***IT-service procurement*** phase contains the alignment with functional and technical requirements as well as the business case calculation and contractual scrutinizing. As mentioned before, the case company views cloud services always as one possible solution that has to be compared in technical and financial manner with alternative solutions (if existing). In the following, we will explain the two phases of the standardized procedure in detail. Further, accompanying the single process steps during the phases, the company´s experts worked out checklists for every procurement activity (green boxes in Figs. 4 and 5) for ensuring standardized procedures. We uploaded an extract of these checklists with the most important requirements and questions with regards to the topics "data security", "data ownership", "contract design", and "provider health". The link is http://criteria.cwsurf.de/Check%20List.xlsx.

One IT-expert stated: "*The salesman of a cloud provider called one of our suppliers' plant logistics managers and offered a cloud service for warehouse management support. As no software installation was required, the manager did not even contact the IT-department. We have to raise awareness for cloud risks especially outside the IT-departments.*"

For the process description, we use the event-driven process chain (EPC) notation that was developed by Scheer [53] in the early 1990s and originally used in conjunction with SAP R/3. Tsai, Wang, Tepfenhart, and Rosca stated that "an Event-driven Process Chain (EPC) is an ordered graph of events and functions" [54]. It provides various connectors that allow alternative and parallel execution of processes. Furthermore it is specified by the usages of logical operators, such as OR, AND, and XOR. A major strength of EPC is claimed to be its simplicity and easy-to-understand notation. This makes EPC a widely acceptable technique to denote business processes." Especially for showing organizational interactions and control flows, this notation is getting more influence [55].

*B. IT-Service Preparation*

The goal of the first phase is to collect and list services for deeper evaluation. Because of the high number of available cloud services, the preparation phase needs to be addressed systematically. A senseless selection of IT-solutions offered on the market would only lead to inefficient use of time and resources. The major processes in this phase are shown in Fig. 4 and described in the following.

The process owner starts with the ***requirement analysis***. Here, the process owner is fully responsible for this process step since only the operational unit can assess its own demand. The analysis encompasses the process of understanding and determining the business justification as well as the functional specifications in accordance with user needs and company governance. As cloud service providers mostly offer standardized services, it has to be defined in advance which functionality is mandatory and which is optional. Generally, IT-system requirements are always business-specific and heterogeneous. The requirements may be of technical, financial or security nature. For CC there are a lot of requirements defined in scientific and practice-oriented literature. For instance, the framework by Wind, Repschläger, and Zarnekow [21] might contain adequate requirement criteria for your business needs.

With the documentation of the defined requirements, the process owner has to contact the responsible divisional IT manager for a market analysis. The ***market analysis*** encompasses the search for and acquisition of information on potential cloud solutions and comparable alternative services. Whereas the tracking of the compliance with the requirements is part of the subsequent procurement phase, in this phase, the requirements only serve to identify adequate IT-services. In order to create service performance equality between different options, it may be necessary to group services into service sets. The divisional IT manager has to be involved at this early stage since he possesses the needed CC know-how.

Detached from the previously defined requirements, the ***general screening*** process refers to the key conditions that the identified potential cloud solutions and cloud solution sets have to fulfill. Thereby, the process owner has to answer all of the following nine key questions in the positive (cf. Table I). Non-cloud solutions have a separate screening process which is not covered by the paper at hand. Although some of the questions might have appeared at the prior defined requirements and identification steps as well, the case company places great importance on their positive replies before delving deeper into cloud services.

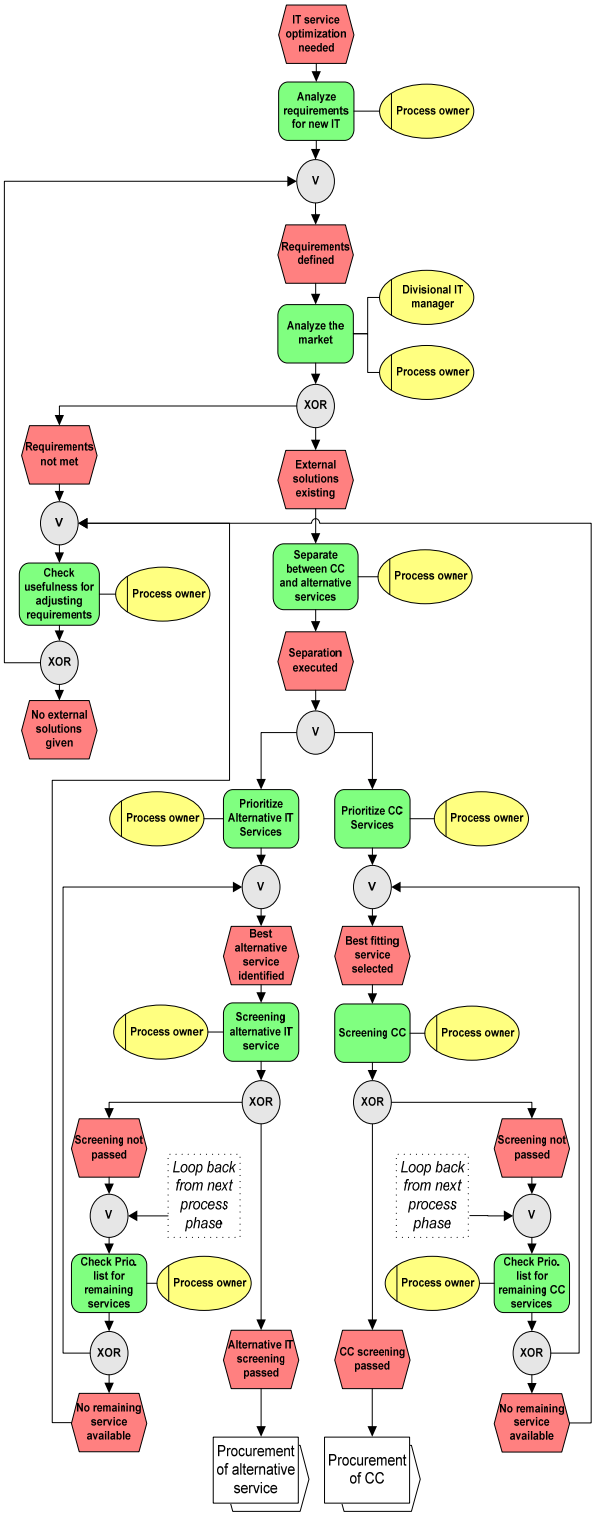


Fig. 4 IT-service preparation process

TABLE I
GENERAL SCREENING QUESTIONS FOR CLOUD COMPUTING

| # | Key Question |
|---|---|
| 1 | The company has no major competitors in the country where the cloud service provider is located (legal entity)? |
| 2 | Is the risk of state-sponsored industrial espionage in the country in which the cloud service provider is located acceptable? |
| 3 | Do local laws prohibit data transfer to third-parties? |
| 4 | Can the required performance targets (reaction times, latency) be met with a cloud service? |
| 5 | Can the required service levels, especially uptime, be met with a cloud service? (Please bear in mind that the cloud cannot provide a 100% availability as needed for, e.g., critical production IT-services.) |
| 6 | Is a strong dependency on an external provider acceptable? |
| 7 | In the event of failure of the cooperation with the cloud provider, is the time-consuming and laborious data retrieval and transfer into another solution acceptable? |
| 8 | Is this an encapsulated business process not requiring deep integration into other processes and data sources? |
| 9 | Are there comparable solutions available on the market? (Cross-company collusions excluded?) |

### *C. IT-Service Procurement*

The second phase, ***IT-service procurement***, covers the evaluation and selection of the appropriate IT-service (c.f. Fig. 5). This phase starts with ***evaluation of the new IT-system***. Herein a tender is needed that aims at evaluating the defined requirement within the prior preparation phase as well as data collection to enable the calculation of the business case in the next step. Because the IT-service candidates have to cover the whole business (sub-) process, the tender starts with a component-based evaluation through which comparable services are checked for fulfilling the specific requirements. In principle, cloud service providers offer sufficient room for testing to facilitate a business entry. Therefore, the process owner and the Division IT manager should design adequate qualitative and quantitative tests for validation of defined requirements.

Even when a selected service seems to basically fulfill the requirements, protocol, control, or data mismatches within the designed overall IT-architecture may lead to challenges or incompatibilities. Hence, the service connectivity with adjacent IT-processes must be investigated by means of an ***overall evaluation of the new IT-system***. This is done again in collaboration between process owner and divisional IT-manager. Special attention should be paid to 1) the service interactions along identified system critical paths, 2) the extensibility of the overall integrated IT-architecture, and 3) the overall system protection. If necessary, overall system tests should also be designed on this level as well. Finally, the overall system performance should be tested since the performance criteria are often system-level depended and can rarely be divided into subsystem level requirements. Here, the goal is to create elegant system and sub-system level services that are consistent, extensible, and robust.

The growing cloud usage and the increased process owner responsibility (compared with development-oriented solutions) may lead to additional coordination problems, because selections are highly depended on the interests of the process owners. In case of linked business processes of various process owners, deviating interests might contradict each other. Thus, by means of the tender dossiers, the final overall system must be clearly defined. Typically, the selection and prioritization of the appropriate services involve a tradeoff analysis between the available services, resulting in a though like “better fit than others”.

The ***strategic fit evaluation*** investigates the influences of the cloud service providers on internal IT-business processes. In accordance with the case company´s federal approach, here corporate IT has the lead and final approval, too. The other both functions have supporting tasks. Cloud services have some general specifics that require additional planning to ensure that all relevant issues are addressed during the tender: (1) In order to be competitive long term, cloud service providers continuously improve their offerings. As a consequence thereof, functionalities are subject to frequent, short-term modifications, which forces the user to go along with the provider (e.g., needed adjustments at interfaces). These vendor lock-in scenarios have to be analyzed in detail. (2) Mostly, cloud providers have proprietary data formats and solutions so that a fast change to other solutions or providers is not feasible in all cases. Therefore, contracts should be planned mid- and long-term and co-operations with reliable and sustainable providers should be preferred. (3) Special attention has to be paid to autonomous changes to functionality by the provider and his imposed maintenance windows. It has to be found out whether using company has to be involved and whether the using company should have approval rights. (4) As indicated before, it is not unusual for cloud providers to step out of business suddenly. To avoid this as much as possible, provider health checks[1] have to be executed and an adequate exit strategy has to be developed. It should clearly be specified what to do and how to keep the business process running without the specific cloud solution. Hence, questions regarding data transfer, transition support, and parallel operations have to be answered and taken into consideration for an exit strategy report. (5) Like most companies, also cloud providers follow determined business strategies (e.g., technological leadership, cost leadership, expansion through take overs). Especially valid for long term contracts, users should evaluate the possible advantages and disadvantages for their own processes and the alignment with the user´s IT-strategy.

One IT-expert stated: “*The cloud market is very dynamic and some providers are venture capital financed, with positive and negative facets. For example, the cloud provider Nirvanix went bankrupt a few months ago. The provider simply informed his customers that the service will only be available for a further period of just two weeks.*”

[1] The authors created a provider health checklist. The underlying questions can be viewed at http://criteria.cwsurf.de/Check%20List.xlsx.

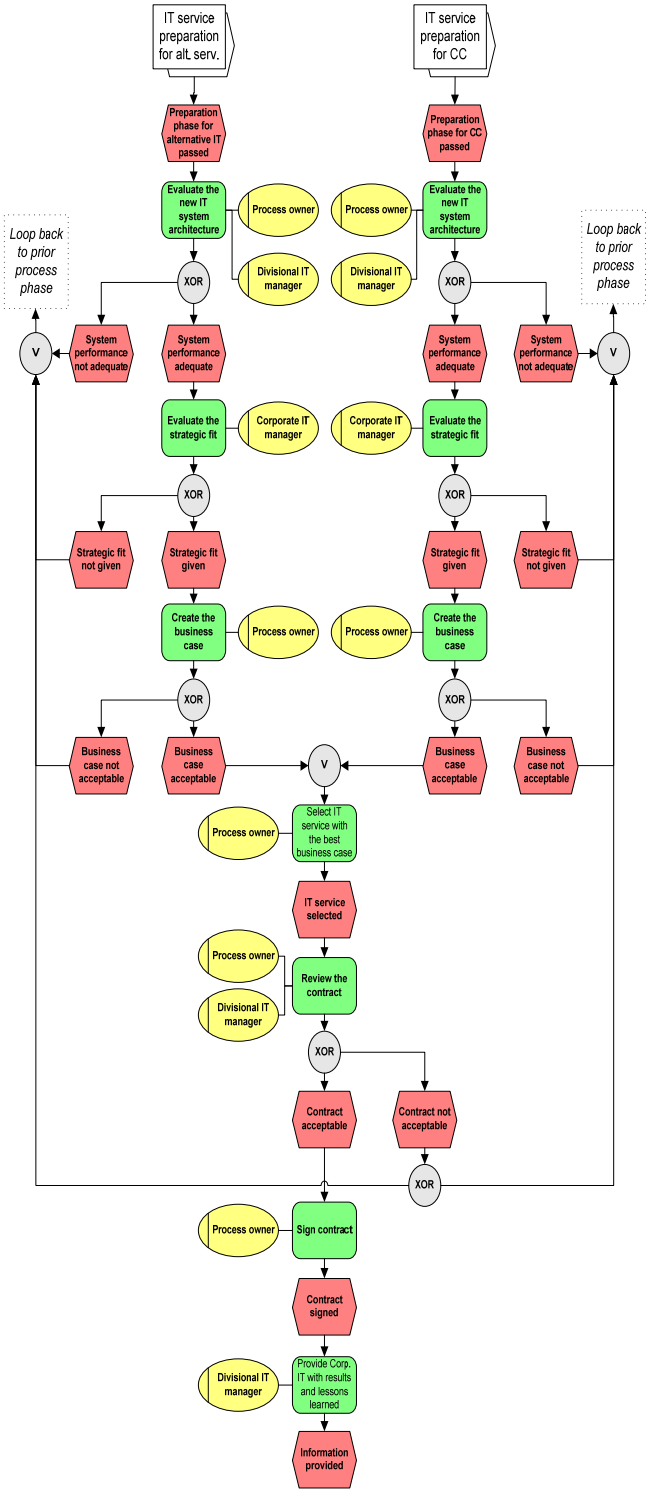


Fig. 5 IT-service procurement process

The best fitting IT-services within the left and the right path (c.f. Fig. 5), identified during the tender process, will be recognized for financial analysis. The guiding question of the ***business case*** calculation is: how does the use of the service impinge on the financial result for a defined period of time? For the comparison between the selected services the "total cost of ownership (TCO)" serves as basis. The business case calculation has to be managed particularly by the process owner since the process owner bears the costs for the required service. The Divisional IT-manager has a more supporting role.

Furthermore, the case company considers volatility scenarios (amount of users and/or utility per user). The slogan "pay per use" is often stated by cloud providers, and the model hiding behind this slogan leads to a linear relationship between usage and costs (scalability). This assumption does not apply to traditional IT-services, as usage costs normally decrease with increasing use (economies of scale). With a purchased software with low license costs per user or self-developed, proprietary software, there will be relatively low additional costs for additional users (incremental production). Hence, a cloud solution may be advantageous for 10, but detrimental for 100 users.

For the ***contractual process***, internal specialists in law, tax, IT-security, IT-purchasing, and IT-contracts and licenses designed a standard framework agreement that has to be used for every conclusion of a cloud computing service contract. However, especially the main cloud providers, given their market shares, rigorously insist on concluding their own standard contracts. Therefore, the case company´s experts also worked out a checklist covering the most important points to be discussed with respect to the subject terms of contract.[2] Finally, in the procurement process, there is an interconnection to Corporate IT in order to document the results and the lessons learned. This coordination is done by the Divisional IT manager.

## VII. Discussion

The paper at hand uncovered an important gap in scientific literature, namely the ***increasing importance*** of organizational aspects in CC procurement processes. The conducted expert interviews as well as the case study acknowledge the increasing importance of rethinking procurement structures and participants´ responsibilities when implementing standard processes for CC. The mentioned gap was filled by creating an overriding model (c.f. Fig. 2) and further refined by a detailed business process description (c.f. Figs. 4 and 5).

Although CC is mostly used for non-core operations, it has strategic relevance [3], [9]. In general, it is apparently difficult but compelling needed for research to augment already existing technical CC knowledge with adjacent disciplines in order to embed the technical functions in social environments. This paper helps scientific research to shift to a more ***interdisciplinary view*** of CC. We have shown that adding knowledge from organization and procurement domain theory (procurement research is often assigned to supply chain management research) helps to manage the business process of CC procurement.

[2] The authors created a contract design checklist. The questions can be viewed at http://criteria.cwsurf.de/Check%20List.xlsx.

Furthermore, scientific research benefits from our analysis of ***participants´ interactions***. The degree of internationalization and the hierarchical structures have a direct influence on the interactions between IT-experts and process owners. We have demonstrated that it is necessary to understand these complex dependences before investigating standard processes.

Although this paper raised the attention for the underlying topic, it has ***limitations***, too. By definition, single-case studies do not allow for theoretical sampling. Hence, in order to triangulate the key findings and extend the existing body of knowledge, future research should investigate similar empirical cases, considering the characteristics of the underlying company (size, internationalization, centralization). In addition to that, replications of the findings should take into account the experiences with CC of the determined company.

However, future research may ***adjust the overriding model*** (c.f. Fig. 2) by exchanging dimensions or adding new dimensions such as "IT-experience" or "IT-system relevance", which have then to be evaluated through empirical investigations as well. Thereafter, comparing the gained socio-technical results with existing body of knowledge from traditional IT and IT-outsourcing solutions may lead to new useful insights. Further, taking our model as basis, it would helpful to measure the success of CC implementations in ***various hierarchical and structural environments*** (e.g. central vs. hybrid). Also the deep and the width of a standardized procurement approach for CC and consequently the repression of flexibility should have a significant impact on CC success. For analyzing these organizational preconditions, it is necessary to integrate behavioral sciences. In principle, combining CC procurement processes with generally accepted theories in socio-technical sciences such as "socio-technical-systems" theory or "information-processing" will constitute a fruitful area for future research.

Managers may benefit from the paper because it offers real-life pieces of advice in the complex task of structuring CC procurement. We have demonstrated a valid cloud procurement process that managers may adopt, adjust, or extend to their specific cases. In order provide managers with further implications, we asked experts during the third (expert interviews) and the fourth (case study) research phases for the most important attentions in the CC procurement context. Derived from that, the five upcoming implications for practice can be understood as lessons learned.

***Address IT-governance upfront*:** The expert´s experiences show that the alignment of plans for data governance and cloud service integration prior to the use of cloud services is of importance. The ease of consuming cloud services should not obscure the associated risks. Many IT-policies may apply when sensitive data such as employee or financial information is transferred to the cloud. Further, even if traditional frameworks such as COBIT do not address the architectural and organizational requirements of CC adequately, it is strongly recommended to link the CC procurement processes to the individual pre-existing IT-governance. The CC procurement process should be implemented as a standard business process with clear rules, sequences and responsibilities. As mentioned before, COBIT may serve as a starting point with its governance maturity models and various tools such as RACI.

***Involve all stakeholders right from the beginning*:** To ensure that all relevant aspects are covered during selection and integration of a cloud solution, for instance, the case company uses supporting "sourcing committees" with representation of the process owner, IT, Information Security, Purchasing, and Legal. The cloud service sourcing process will continue to be an inter-functional procedure that depends on an effective collaboration of many different organizational departments. And also the responsibilities are shared across various functions. For managing and structuring these multifaceted functional relations effectively, roles and tasks should be clearly defined upfront. Further, involving all relevant stakeholders from the beginning, helps to accelerate the presented CC procurement process and to increase the acceptance of a standardized CC procurement process.

***Prepare your organization for the cloud:*** As the number of IT-services sourced from the cloud increases, organizations need to prepare themselves for the changed skill profiles this will require. Development and operations will become less important whereas the demand for security and integration experts, service management specialists, and persons with a deep knowledge of the cloud services market will increase. Companies have to address this in their long term personnel and organizational development strategy. In general, stakeholders and process owners (mainly not IT-experts) should be educated perpetually about the risks of cloud applications, because more business processes will bypass the internal structures. A standardized CC procurement process requires an adequate level of knowledge for all related stakeholders. As shown in Figs. 4 and 5, there are many comprehensive events which might be new for some stakeholders. Further, the surveyed experts experienced that strongly business-led adoptions with low IT-involvement do not comprehensively address technical requirements, support for data access, and integration capabilities.

***Utilize crowd intelligence:*** For knowledge exchange, the experts emphasized the importance of forming IT-councils for subjects of cross divisional importance in which internal experts from all areas of the company refine strategies and standards. These councils should be hosted by dedicated Corporate IT-experts who also monitor the market, especially for innovations that could provide added value.

***Design suitable checklists:*** Checklists provide and ensure a standard process during the evaluation phase [30] and facilitate the process owner to deal with the topic in detail. Depending on the individual circumstances and situations of each company, individual checklists should be created and adjusted continually for each business. The checklists provided in the paper at hand may serve as a basis. In the beginning of the company´s "Cloud Initiative" project, the project team collected more than 650 questions from internal and external sources. To take all these questions into account would go beyond the scope of the discussion and the approach

would never gain acceptance within the organization. Therefore, the list of questions should be detailed, however, at a manageable level. The project team of the case company defined a specific check list for every activity during the whole CC procurement process (green boxes in Figs. 4 and 5).

## VIII. Concluding Remarks

Today, the speed with which new cloud services are introduced to the marketplace makes cloud sourcing an extremely intricate and volatile process. Based on a developed model and refined with the mentioned case study, this paper investigates a source-driven approach for standardized and comprehensive cloud service procurement. In research, neither the scientific body of knowledge nor the practitioners' society has presented cases up to now that allow as much insights into the cloud sourcing processes as the underlying case company does. We believe that the described procedure of the determined approach as well as the "lessons learned" may support companies that face the same challenges.

Marston, Bandyopadhyay, Zhang, and Ghalsasi, who wrote one of the most cited CC paper (circa 700 times) [3], stated that they "believe that CIOs and CTOs should proactively develop an overall "cloud strategy" in order to determine a time-based plan about which of their applications they can move to the cloud…". Having uncovered the need for rethinking organizational structures in aspects of CC, we would like to extend the statement: A sustainable and proactive overall "cloud strategy" involves application determination as well as organizational structure and related business process determination for managing these applications.

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