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Applying an Open Innovation Method for identifying Challenges in the Cloud Business Environment

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Abstract

The success of connected life services is strongly related to the success of cloud computing. These enormous data volumes can only be handled economically with cloud-based services. Therefore, cloud computing can be seen as a basic technology for successful connected life services. However, the actual use of cloud-based solutions within the B2B sector is due to existing uncertainties by the customers still limited. Therefore, the research question of the study is: Which challenges do cloud users have and how can these challenges be overcome? To answer this question a workshop was designed applying the lead user method as part of the open innovation approach to identify challenges of the daily work life and to develop user centered and innovative cloud-based product/ service concepts. A total of 10 lead users have participated in the workshop. All participants are customers of a German small- and medium-sized enterprise (SME), which offers a number of cloud-based services for the business sector. In a first step the participants identified 42 challenges of their daily work life. In a second step the participants, who were separated into three groups, developed solution concepts to overcome selected challenges. To structure the development of the solution concepts the Business Model Canvas has been used. The workshop results show that the lead user method is appropriate to identify the challenges of the daily work life and to elaborate cloud-based solution concepts therefore. The customer integration in the product/ service development process is suitable to develop user centered and innovative concepts.

Open Innovation, Lead User, Cloud Computing, Cloud Service, Workshop, Uncertainties.

1 Introduction

For several years a progressive market change can be observed. Driver of this development is the proliferation of technology, known as the “digitization of the economy” (Hess, 2012). The increasing proliferation of technology has main impacts on daily private and business life and sets

greater requirements on these than it was just a few years ago. Particularly affected by these changes is the business sector using and offering cloud services or technologies based on cloud computing solutions, as connected life services. In the context of connected life, the success of these applications, services and products is strongly related to the success of cloud computing (BITKOM, 2010a). Nowadays these services contain and process enormous data volumes, so called “Big Data”, that can only be handled with the aid of innovative cloud computing solutions. Therefore cloud computing can be seen as a basic technology for successful connected life services (Bryant, Katz, & Lazowska, 2008). Research and practice show that the most important stakeholders are the customers regarding the acceptance and usage of new products and services (Marston, Li, Bandyopadhyay, Zhang, & Ghalsasi, 2011). Customers have a greater appreciation of the problem and the challenges, because of their daily interaction. To develop user centered and innovative concepts it is appropriate to integrate customers in the product/ service development process at an early stage. Offering customer- and problem-oriented innovative services by integrating the customer into the development process of new services creates lucrative added value. The integration comes with advantages, such as the potential to create a long-term customer relationship and long-term market success. For this purpose, a closer investigation of the challenges of cloud users and an elaboration on how to overcome these challenges appears to be of significant interest. However, thus far, there is no focus on identifying challenges in the cloud business environment and elaborating them by using the business model canvas in the literature. Hence, no conclusions can be drawn on how companies offering cloud solutions can overcome these challenges. Therefore, the aim of the study is to develop user centered and innovative cloud-based concepts by first identifying challenges of the daily work life and secondly elaborating cloud-based solutions on how to overcome these challenges. Following this, the main research question is: *Which challenges do cloud users have and how can these challenges be overcome?*

2 Related Work

2.1 Cloud Computing

At present, cloud computing is referred to as a central paradigm of the IT which can change IT fundamentally and permanently (Bitkom, 2010b). Further, the cloud computing market turnover and user numbers are forecast to grow faster in the next years (Morgan Stanley Research Global, 2011). Based on the innovative approach of cloud computing, a new global market infrastructure and standardization can be achieved, which is similar to other utility industries, such as water, electricity, gas and telecommunication. In accordance with the cloud computing infrastructure, IT services can be traded and obtained in a similar manner to electricity traded in an electricity exchange. Recent studies show that 90% of market and technology leaders will resort to the utilization of cloud services by 2015 (Berman, Kesterson-Townes, Marshall, & Srivathsa, 2012). A HfS Research (2010) study showed that two-third of the leaders predict that cloud computing will be an enabler for new types of services, which will advance innovations. This shows that cloud computing currently is important and will remain very important in the future. The most quoted definition of cloud computing is from the National Institute of Standards and Technology (NIST),

defining cloud computing as "*a model for enabling 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"* (Mell & Grance, 2011, p. 2).

2.2 Uncertainties in the Cloud Environment

Despite the advantages of Cloud Computing its use within the B2B sector is still very limited (Golkowsky & Vehlow, 2011), due to existing uncertainties by customers. Research shows that reasons for the limited adoption of new technology are a lack of trust (Gefen, Karahanna, & Straub, 2003) and perception of risks (Featherman & Pavlou, 2003) or both (Joubert & Belle, 2009). According to this, the willingness to adopt a new technology can be increased by building trust and reducing risk perception (Gefen et al., 2003). Prerequisite for reducing risk perception is identifying existing uncertainties. Various research (e.g. Armbrust et al., 2009; Gebauer, Söllner, & Leimeister, 2012) have already elaborated several uncertainties against the adoption of Cloud Computing. For example, discontinuity or absence of the service, attacks against the system, network problems (speed and availability), limited scalability, time-consuming and costs-intense data transmission, lack of data integrity, dependency on the cloud service providers, dependency on the other users of the cloud service, lack of control respectively monitoring mechanism, lack of reliability (e.g. poor trust against the provider), lack of legal standards and hazard for the internal IT (Gebauer et al., 2012). Despite this, it is also required to identify customer-specific uncertainties – through customer involvement – concerning specific cloud solutions, because offered services are propably characterized by particular properties. These properties can cause a set of other uncertainties. Based on these, measures can be derived to reduce the risk perception.

2.3 Lead User Method – An Open Innovation Approach

One approach, which allows developing a product range that meets the needs of a broad range of customers and thus maximize the market of the enterprise, is the lead user method. Here the most innovative customers are included in the innovation process of a company (von Hippel, 1986). Lead users are defined by the following two criteria (Urban & von Hippel, 1988):

1. Lead users feel a need for new solutions that will be established in the market, already months or years before the remaining participants of the market.
2. Lead users expect a high economic benefit of the satisfaction of their current needs.

Because of the need for new solutions, lead users, compared to traditional customers, develop more easily new product concepts. They already know the problem and the application context of the new product. Thus, they are not dependent on imagine the use of possible future products, which reduces the problem of functional fixedness significantly (Urban & von Hippel, 1988). The fact that lead users draw a high benefit from a solution to their needs is their second central characteristic. This criterion refers to the commitment of the individual lead users in the context of the innovation process. The higher the value, which an innovative customer expects from a particular solution, the higher the readiness for it to be engaged, will be. Urban and von Hippel (1988) show that products that were developed by lead users exhibited a substantially higher

customer acceptance, compared with other product concepts. These results realized further interest of research and it was found out that IT-systems developed by lead users are regarded as products that promise a high potential for the commercial use (Morrison, Roberts, & von Eric, 2000). The lead user approach is typically divided into four major phases (von Hippel, 1986). Firstly important market trends in the company's environment have to be identified and measures to evaluate the success of the lead user project have to be developed. In a next step company representatives have to identify lead user, who are capable to develop product concepts related to the identified trends. The execution of the lead user workshops is the third step within the approach. In these workshops the identified lead users are developing new product concepts related to the identified trends. Finally the results of the workshops are evaluated according to the developed success measures.

In order to develop a highly scripted workshop that makes use of the *thinkLet* concept we used a procedure that was proposed by Churchill et al. (2009). Whereas this procedure comprises all activities that are necessary to conduct a lead user workshop, some important questions are still unanswered. Among them are the questions which technique should be used to conduct the activities within the workshop, what tools should be used to conduct the activities and what the participants are expected to do and say within the activities. However, leaving these questions unanswered would contradict our purpose as we intend to provide SME's with detailed instructions how to conduct a lead user workshop in order to enable them to make use of the approach without being depended on specialized facilitators. Moreover, by providing detailed instructions about the techniques, tools and behaviours within the several workshop activities we want to eliminate as many variances as possible. Doing so would not only give us the possibility to compare the results of several workshops but would also enable us to selectively modify the workshops in order to gain new scientific insights into the characteristics and mechanisms of a lead user workshop. One possible approach to generate detailed instructions for a lead user workshop is the application of collaboration engineering.

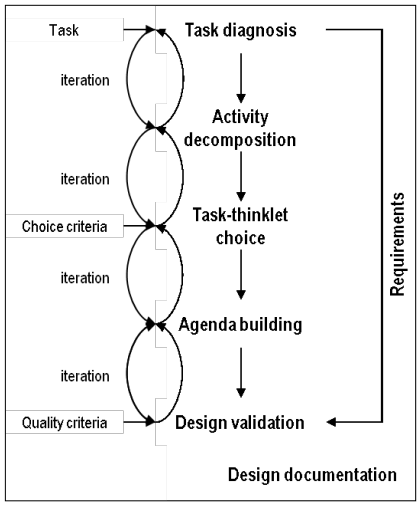
3 Research Methodology

3.1 Collaboration Engineering

Collaboration Engineering has its roots in the observation that while some groups can be highly successful working together, other groups struggle with the challenges that are related to team work (Nunamaker, Dennis, Valacich, Vogel, & George, 1991). Examples for these challenges are social loafing, the dominance of particular group members or coordination problems due to the size of the group. Collaboration Engineering emerged in order to enable groups to execute collaboration processes without the intervention of a professional facilitator, and to come up with predictable results (Kolfschoten, Briggs, de Vreede, Jacobs, & Appelman, 2006). Therefore, Collaboration Engineering intends to codify facilitation interventions, and to provide them to practitioners in a reusable manner. In order to capture all aspects which influence the design of collaborative tasks, the Collaboration Process Design Approach (CPDA) was developed by Kolfschoten & de Vreede (2009) and makes possible to develop collaborative tasks systematically.

Figure 1: The Collaboration Process Design Approach (according to Kolfschoten et al. 2009)

As presented in the figure below, the CPDA contains of five repetitive steps. First of all, an analysis of the performed tasks is carried out within the scope of which the characteristics of the group are analyzed. The second step consists of dividing the whole process into several, smaller activities. Subsequently, the selection of suitable thinkLets follows in the third step. The fourth step deals with the development of a program sequence for the workshop. The last step of the CPDA involves the validation of the design, meaning this step is supposed to evaluate if the process delivered the intended results. The ensuing subchapter will examine each step individually. The resulting design recommendations are oriented towards the initial lead user workshop concept (Churchill et al., 2009).



3.2 Development of a ThinkLet-Based Workshop Concept

The task **diagnosis** can be divided into *Analysis of Tasks, Analysis of Stakeholders, Resource Analysis and Facilitator Assessment.* In the course of the *task diagnosis*, the aim of the workshop, the intended results, the quality criteria to control the results, as well as the further application of the results are examined. In the case of a lead user workshop, the aim is to uncover the participants needs, and to convert them into innovative products (von Hippel, 1986). Based on this aim, the intended results can be derived (Briggs et al., 2009). In this context the results consist of innovative concepts and prototypes, which are accepted by the group, rated in terms of quality, and prepared for further use (Churchill et al., 2009). The next step focuses on the *analysis of the stakeholders* of the process in terms of who is supposed to participate in the process and what kind of purpose they pursue (Kolfschoten & de Vreede, 2009). Typically, eight to ten participants, who are supposed to represent different demographic characteristics, work together to reach the intended results in a lead user workshop. Additionally, three representatives of company personnel who have solid technological knowledge and sufficient marketing skills and three representatives of company personnel who have planned the workshops are supposed to participate. In this study, we invite 10 individuals to participate in the workshop, so as to be able to divide them into subgroups without losing heterogeneity within the individual subgroups.

After the number of participants is determined, it is necessary to analyze the objectives more precisely as well as the capabilities and skills of different participants. A support of participants' goals is inevitable as the degree of coverage between private goals of participants and the defined

objectives of workshop determines their satisfaction, their commitment and the success of the group (Briggs et al., 2009). In the case of the lead user, this level of coverage can be viewed as high, as lead users are awaiting the workshops' results in order to cover or consider their so far unsatisfactory needs (von Hippel, 1986). The next step in CPDA is an *analysis of resources* needed for carrying out the workshop (Kolfschoten & de Vreede, 2009). Besides the time required executing the workshop, a working space in which the workshop should take place has to be determined. In addition, it is also necessary to take the room size into consideration. The final point refers to the selection *suitable facilitators* who will be in charge of the lead user workshops. Hereby, attention should be paid to the fact that facilitators should have experience in carrying out group meetings and must have social and analytical skills (Niederman, Beise, & Beranek, 1996) as well as the required knowledge to help participants in case of comprehension problems.
Within the task **activity decomposition** it is possible to start dividing the whole process into separate activities (Kolfschoten & de Vreede, 2009). In case of the lead user approach, a procedure has been documented by Churchill et al. (2009). The twelve activities of a lead user workshop will be refined to obtain a standardized procedure of the workshop. For this purpose, thinkLets will be used. With the help of thinkLets, it will be possible to produce predictable and repeatable patterns of collaboration among participants of the lead user workshops (Briggs et al., 2009). Moreover, the transferability of the design will be simplified, and the knowledge, which is necessary for the facilitation of the workshop, will be reduced (Kolfschoten et al., 2006).
In order to allocate suitable thinkLets (task **thinkLet choice**) to the activities, the desirable results of the activities have to be analyzed. The selection of particular thinkLets is based on a comparison of the intended results of the various activities in a lead user workshop (Churchill et al., 2009) and the results that can be expected from the respective thinkLets (Briggs & de Vreede, 2009).
After the necessary thinkLets have been identified by means of implementing the processes, they should be transferred to an agenda (task **agenda development**) for the workshop (Kolfschoten & de Vreede, 2009). This agenda includes not only individual activities of the workshop, but also predefined breaks and presentations as well as the required time.
To validate the proposed workshop design, task **design validation**, we conducted a series of pilot workshops. As the aim of the design efforts is to eliminate the need for a specialized facilitator, these pilot workshops were executed without the help of such facilitators. In order to get comparable input for the several following workshops we used identical procedures for this preparation steps. To identify relevant market trends industry- and technology reports were reviewed and consolidated with the help of interpolation (Reichwald & Piller, 2009). After that, the identified trends were validated and assessed by interviewing experts in the related field. Finally, we identified potential participants for the several lead user workshops with the help of the pyramiding approach (von Hippel, Franke, & Prügl, 2009). After this the lead users were invited to participate within a workshop that was hosted by a participating German SME.

3.3 Sample Description

The lead user workshop was conducted in cooperation with a German small- and medium-sized company, which offers several cloud solutions for the B2B sector and which is not affected by the

Figure 2: Excerpt of cloud user challenges in B2B context

Patriot Act. Overall, 14 persons attended the workshop: 3 moderators, 1 company representative and 10 customers of the company. A total 6 men and 4 women participated. On the one hand the participants came from different business sectors, e.g. IT-sector, mining industry, shipyard instustry, social services or medical technologies. On the other hand the participants came from various company units, e.g. management, marketing and communication, IT unit.

4 Findings

4.1 Identified challenges of cloud users

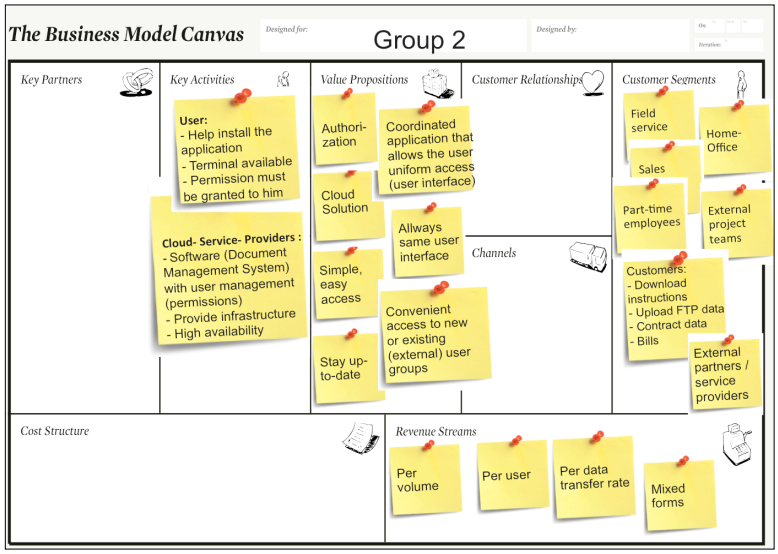
Within the workshop, the ten participants identified 42 different challenges that were clustered into four distinct categories (an excerpt is shown in figure 2). These categories include security, interfaces, data integrity and access. The participants identified most challenges in the category "security", in particular data security and the handling of sensitive data referring to the sectors of the participants (as healthcare and social donate facilities). Further challenges concerned the access to data that has already been uploaded into the cloud as a backup (see category "access"). In the category "data integrity" there were especially challenges identified which facilitate the use and handling of the increasingly large amount of data. Of main focus was data transfer and data size. The challenges referring to the topic "interface" concern mainly the internet connection and the devices through which the access to the cloud application is being realized. The participants note that the internet connection is often problematic, when dealing with large data sets. The interface issues were also mentioned in the context of the usage of different operating systems, like OSX (Macintosh), Windows or Linux. It was pointed out that jobs are continuously changing and require differentiated demands.

Category: Security	**Category: Data integrity**
- Ensuring data security, e.g. customer data bank or when working in groups and managing common data. - Carrying out secure backups → What must be noted? - Data extraction → Which data is permitted to be uploaded in the cloud? - Web service security → Which service is secure and which not? - Data retrieval → How to find already uploaded data?	*(type, exchange, management)* - Datamanagement solution → Existing solutions doesn't fit customer needs. - Data transfer rates → Data handling in GB/TB still problematic and difficult to realize. - Overview/ control/ location of uploaded data → Which data has been uploaded, when, where to find? - Backup solution → too many backups on too many different systems all over the world. - Flood of data → Mailaccount overfilled
Category: Access	**Category: Interface**
- Mobile connection → Ensuring mobile access to cloud service. - Administration → Distribution of access rights. Who is allowed to access service and data? - Internet Service Provider (ISP) → How to find a trustful and reliable ISP? - Home office → Facilitate working from home through easy and secure access. - Backup volume → Access to backup volume from every device independently from OS.	- Internal processes too complex → Many different existing systems with plenty options. - Distributed work; Teamwork → Working together on documents from everywhere and independently from the system (PC/MAC) - Support → Creating interface through which provider can access users PC in case of problems and support requests - Different workspace → Workspaces differ; MAC/PC; iOS, Android, Windows, BlackBerry OS, etc.

Figure 3: Elaborated Business Model Canvas building blocks from the customer perspective

4.2 Example on elaborated Cloud Solution

Based on these identified four categories three potential business models have been developed to overcome the identified challenges in the context of cloud computing. The Business Model Canvas (Osterwalder & Pigneur, 2010) guided this elaboration. Five of the proposed nine building blocks were drafted. This suggested solution, as an instance of the three elaborated ideas, deals with the problem that within the everyday business a storage solution is needed through which users with different access rights have to cooperate. Examples for this are the collaboration of sales representatives, executives in the home office, as well as temporary external project teams. So far the problem exists that the different access rights are difficult to administer and sometimes the provided connections are too slow (e.g. by using a VPN client). As a solution to the above-mentioned problem a cloud service has been proposed which can handle data with an integrated authentication and authorization, through which users with different rights can access and corporate data independent of their location. As basic properties for the cloud based solution the participants defined that using the service should be flexible and terminal independent and the access should be granted from everywhere. Payment depends on the demand of the service. It should be possible to simultaneously edit document files (versioning) and merge different document versions. Finally the service should be certified to convey a sense of security. The building block *customer segment* describes one or more group(s) of people and organizations who want to reach and operate a solution (see figure 3). Due to the large number of specified customer segments the solution addresses a mass market, but it is also applicable to medium-sized needs. The building block *value proposition* describes the package of products and services that draw value for a particular customer segment. To implement the solution from the customer's point of view the components in figure 3 are considered as valuable. The building block *key activities* describe the most important things that a company must do to ensure that the value proposition for the customer can be satisfied. These *key activities* had been separate in key activities concerning the user and the cloud service provider (see figure 3). The building block *revenue streams* describe the income derived by a company from each customer segment. As possible payment models for the above-mentioned solution, the participants draw several possibilities on how to price the solution.



5 Discussion

The findings show that the idea to apply a lead user workshop as part of the open innovation approach is appropriate to identify challenges in the cloud business environment. The integration of customers in the development process is highly suitable to develop user centered and innovative concepts. Following the instruction of the Business Model Canvas makes it possible to guide this development process and to generate intended results. The groups of this workshop elaborated similar cloud solutions despite their different problem definitions. All these concepts of solution refer to project-based data and document management systems, which were characterized by a location-independent, secure access through different devices and operating systems. Future research should include the perspective of further stakeholders of this cloud provider to enable the development and elaboration of a whole Business Model (Canvas). In addition to this, the elaboration process should be more structured to enable an independent development process. Furthermore it would be of interest to evaluate the elaborated cloud solutions and to identify their degree of innovation. Further, the applicability of the lead user method and the corresponding lead user handbook had been tested and evaluated as applicable in a real business setting. By identifying challenges together with leading edge customers, the study at hand presents challenges, which will arise in future day-to-day work in especially the case of this German SME. Thereby the study at hand helps this company in preparing for the challenges. These identified challenges qualify the considered company to develop new innovative and user oriented cloud services. One limitation of our study is the focus on the B2B domain. Following this no challenges of the B2C domain has been considered. A further limitation is that the study design has only been conducted ones, because of this the results has not been proofed with other participants yet. The study only considered one company and its customers. Because of this the identified challenges are only valid for the customers only of this focused company. At least the elaborated challenges are based on only the twelve invited customers of the company without taking into account further challenges of other customers.

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