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Abstract
Cloud technology is by today common in consumer targeted IT markets. In industrial B2B markets however, cloud technology may provide added value for the customers, but these markets behave more traditional and conservative compared to B2C markets and are therefore slower in adapting the new technology. This highlights the need for the development of appropriate business models accompanying the introduction of cloud technology to industrial B2B markets. This industrial study introduces a new framework for the analysis of cloud business models and examines three B2B cloud business models from a broad range of industries. It was found first that cloud technology may be very suitable for B2B businesses, as it poses the opportunity to address multiple roles within a customer organization at once but with different offerings. Secondly, the examined cloud business models did not replace existing offerings in the respective market, but introduced new added value for the customer. Third, the majority of the B2B cloud offerings could also be solved with a service-client architecture, but that a "cloud" label can support marketing related efforts. This study builds the basis for deriving common patterns from B2B cloud business models, which may in the future enable the efficient development of B2B specific business models for industrial cloud offerings.

Keywords: cloud computing, business model innovation, business model analysis, B2B, industrial case study

1 Introduction

Cloud technologies are becoming increasingly popular. Most commonly-known cloud-based business models address consumer markets (B2C), e.g. Google Mail, LinkedIn, Spotify. B2B business models making use of cloud technologies to create value to customers usually comprise only the provision and administration of the technology as such (IaaS, PaaS), e.g. Amazon Web Services, Microsoft Azure, Google App Engine. Therefore, there is a need for understanding how B2B businesses, such as the industrial automation business, can make use of cloud services in order to create an added value to the customer, and how such business models can look like respectively. In this study a methodology to derive business models from existing cloud offerings is introduced and subsequently used to analyze cloud business cases from three different B2B markets to foster the understanding of B2B cloud business models and their applicability to other industry markets. Parts of this study have previously been accepted at the WiWiTa 2014 conference [16]

2 Research Approach

In this industrial study we have analyzed three cloud-based B2B business models on how potential value is created. The cases were selected from related industries nearby the industrial automation sector, so that
a broad view on feasible cloud-based industrial B2B business models can be drawn. These are: medical imaging diagnostics [10], Internet of Things [11], and building management [12]. For the business model analysis we have first gathered information from press releases, product web pages, and trade publications. Next, we structured the gathered information utilizing the Business Model Canvas methodology [21] and checked the business models against the NIST criteria for cloud computing [18] as shown in Table 2. The results were then discussed in the project team, with the long-term goal to identify common patterns in existing business models. The incentive for this is that such cloud-specific “Business Model Patterns” for the industrial B2B-sector could significantly increase the efficiency of developing new business models in future. Figure 1 illustrates our approach.

Table 1: Overview of the examined application cases, as well as the test of applicability of the NIST cloud criteria: 0 = not necessary, 1 = supportive, 2 = essential.

<table>
<thead>
<tr>
<th>Application Case</th>
<th>Specific Offering</th>
<th>On-Demand</th>
<th>Broad Network</th>
<th>Resource Pooling</th>
<th>Rapid Elasticity</th>
<th>Measured Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical Imaging</td>
<td>[10]</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Building management</td>
<td>[12, 15]</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Internet of Things</td>
<td>[11]</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

3 Special Characteristics of B2B Markets in the Industrial Context

Requirements of business models for the industrial sector (B2B) differ significantly to the consumer sector (B2C). For example, in B2C, a service downtime of 5% is often acceptable or can be made up for with an adequate price discount. In an industrial production, on the other hand, every minute of downtime can cause millions of Euros loss, so that the loss can be much higher than any discount granted [14]. The issue of security also plays a much more important role in the industrial sector than in the consumer market [14, 19], even despite current security discussion in the consumer IT sector. Furthermore, new technologies are adopted faster in the B2C market, e.g. due to an improved usability or simply because
of their newness [20]. In B2B markets, on the other hand, cost is the decisive factor [20]. The industrial production market is much more conservative with regard to making frequent changes to a plant, while stability of the plant and its production processes is a higher maxim. Today, the adoption of cloud technologies in B2B markets is additionally hampered by a lack of suited service level agreements (SLAs) [14], however, first research in this area is ongoing [1, 2]. The introduction of cloud technologies therefore also implies the introduction of new service-specific business models in the industry [9] in terms of a business model innovation, which is discussed in literature under the term of ”Servitization” [3].

### 4 Value Propositions of Analyzed Cloud-based Business Models

#### 4.1 Medical Imaging Diagnostics

The first B2B cloud-based business example is from the medical imaging diagnostics sector [10]. The specific offer aims at supporting IT processes between hospital departments and/or private practices (Fig. 2). Here, the cloud technology is used to exchange medical imaging data in a fast, and easy-to-use manner, as well as to provide an efficient way to obtain an expert opinion on the images, e.g. with the help of annotations. The value proposition to customers is, that he can save a lot of time and thereby cost when images can be exchanged via the cloud, as opposed to the traditional handling of physical patient’s files. Figure 3 shows the business model canvas for the medical imaging example, as it was created during the analysis of the case.

![Figure 2: Illustration of the investigated example in the field of medical imaging. In the course of the imaging-based diagnosis, various hospital departments and/or private practices need to communicate and share imaging data. This is traditionally done using DVDs and printed letters. This way of communication poses the risk of obscuring or losing data. Figure based on [16].](image-url)

Figure 2: Illustration of the investigated example in the field of medical imaging. In the course of the imaging-based diagnosis, various hospital departments and/or private practices need to communicate and share imaging data. This is traditionally done using DVDs and printed letters. This way of communication poses the risk of obscuring or losing data. Figure based on [16].
4.2 Building Management

The second examined cloud business example is from the building management sector [15]. The cloud offering targets building operators of distributed office or industrial buildings. The value proposition to these customers is being able to save personnel, as the cloud enables the customer to manage all buildings centrally from a single location (Fig. 4). One highlighted feature of the cloud-based solution is, for example, the visualization of building KPIs. Furthermore, optional optimization services are offered, including services from 3rd parties, which can leverage the building data gathered. The customer can book such services on-demand self-served and can adjust the services on his needs. Figure 5 depicts the business model canvas for the building management case.

4.3 Internet of Things (IoT)

The third example of a B2B cloud-based offering targets the Internet of Things (IoT) [11]. The specific offer is the provision of gateways that enable customers to integrate arbitrary devices into the cloud and transfer device data to the cloud (Fig. 4). Here, the value proposition to the customer is that he can easily integrate his devices into the cloud without having to worry about gateway development, and thereby saves cost and stays flexible (Fig. 5).

5 Discussion

Creating an added value through cloud technologies seems to be a challenge, especially in traditional industry sectors, such as the automation technology industry and industrial engineering that are characterized by special requirements e.g. on availability, reaction times, and security. Many B2B applications therefore do not fully leverage the technical advantages of the cloud. However, cloud technologies such as "Hadoop" and "MapReduce" can provide an advantage wherever large amounts of data (so-called "big data") has to be processed and analyzed – and it is precisely in the aforementioned very IT-intensive
Figure 4: Illustration of the example from the building management industry. One customer owning multiple buildings currently manages all buildings individually using separate building management systems. The cloud enables a central management of all buildings. It may also provide access to 3rd parties for providing advanced services for the customer. Figure derived from [12].

Figure 5: Business model canvas for the building management example.

automation industry where such large amounts of data accumulates. The strong argument for the cloud is not that big data analysis will be able to run faster, be easier or more cost effective [13], but that analyzing truly big data is often possible only with the help of large distributed (i.e. cloud-based) computer resources, whereas the big data can easily drive more monolithic analytics systems to their limits, let them become instant (e.g. due to insufficient memory). If an industrial customer wants to gain valuable
insight into his plant data that he gathered over many years, he may need the cloud. Currently there are still open legal questions on how to handle customer data in a non-private cloud [19], which need to be resolved by the legal instances on a global level in the future. From the technical perspective, the added value in some application cases can also be delivered using server-webclient solutions. This became e.g. apparent when testing the B2B cloud computing examples against the NIST criteria for cloud computing. This analysis revealed that the cloud computing offerings do not fulfill all NIST cloud criteria to the full extent (Table 2). However, “cloud” can in these cases be used for marketing reasons whilst the realization using server-client technologies can reduce costs for the “cloud”-providing company [20]. The business model analyses show, that cloud-based business models typically address natural persons as “customer segments”, despite targeting in the B2B sector. For example, the pure provision and visualization of data seems to be a successful value proposition for some market segments and applications. A special feature of cloud-based business models compared to more traditional business models without the cloud, seems to be the opportunity to address the managers in a company who make the business decisions but usually
do not get into direct contact with the products. Here, a cloud-based solution, which can be accessed easily from multiple locations – also e.g. from the administrator’s office desk –, can provide an added value for the customer. In the course of developing appropriate business models in the B2B sector, it is of major importance to pay attention, which roles with different competencies at the customer side are to be addressed (e.g. facility manager or CEO of a building management company). Furthermore, it is essential to clearly communicate the advantages and differences of the cloud-based solution compared to more traditional offerings. In the consumer market, different roles (decision maker, user and sponsor) are combined in one natural person – the customer. In the B2B market, these roles are split onto at least three different natural persons in the customer organization. The persons all have different needs and desires and thus require individual value propositions. B2B business models therefore need to provision value propositions addressing all customer roles to be able to survive in the market. Cloud technology brings a great advantage in this respect, as data can be accessed from anywhere, and the outcome of data-based services can be worked up differently for each role within a customer organization. Changing from classical software to cloud technology is often compared to outsourcing [17, 22]. However, in the sector of industrial applications cloud computing will not replace existing solutions, but will rather introduce new functionality and indirectly along with this added value [20]. The added value in cloud-based B2B offerings is thereby often delivered through additional services utilizing the data in the cloud. The cloud-technology acts as an enabler for new offerings [3] and only partly as the added value directly. This industrial study is limited in some aspects. First, it was assumed that all investigated business models are successful and thus can be seen as role models for other industries moving towards cloud business. For future studies it could also be of interest to identify and analyze failed business models, e.g. of products taken from the market or from companies which went bankrupt. The accompanying business models might provide further insights how B2B cloud business in the industrial sector works. Another constraint of the present study is that the business model canvases were created retrospectively and with an external view based on existing business ideas. The external position of the authors, which to some extend also marked a competitor view, did not permit a validation of the retrospectively generated business model analyses with the original companies. Purely academic and independent research institutions might be in a better position for asking for a direct feedback on the business model analysis at the offering companies, but, on the other hand, might lack the insight in the industrial environment and the deep understand of it. The small number of investigated cloud business cases is a further limitation of this study. Future studies should investigate a larger number of cases, despite the lack of B2B cloud business cases in the industrial environment. These studies may also focus on specific industry segments in contrast to the present study, which aimed at getting a broad overview of possible B2B cloud business cases. Further research is necessary to develop industry-specific cloud B2B business models. For this purpose, available classification methods for cloud business models may be used [6, 4, 5]. Furthermore, some frameworks for the ground-up development of cloud business models are available [7, 23]. Based on the analyses of existing cloud business models, future research may additionally look for generic cloud business patterns. These can then be derived from successful businesses and applied to cloud offerings in other industrial segments (Fig. 1).

6 Conclusion

In this industrial study a methodology to derive business models from B2B cloud offerings was introduced and used to analyze three exemplary cases of B2B cloud business models related to the industrial automation domain. The major findings covered that B2B cloud business models differ from B2C cloud business models, as e.g. in B2B customer organization roles are separated onto different individuals, whereas in the B2C market these roles are combined in one natural person. Cloud solution can thereby
foster the acceptance of new services, as data can be easily stored, distributed and visualized for roles within an organization. The analyses also revealed, that B2B cloud business models are not only to be seen as IT outsourcing, but that they can rather address previously unsolved customer concerns and needs. From a technical perspective, this study showed, that some examined B2B offerings may not need cloud technology and can be realized using regular server-client approaches, but that a “cloud” label can support the marketing and sales of the offering. Further research in this area may investigate B2B cloud business models for specific industry segments in more detail as well as examine the possibility to derive patterns in B2B cloud business models to support the development of business models for new B2B cloud offerings in the industrial environment.

References


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