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The shift to Cloud Computing: The impact of disruptive technology on the enterprise software business ecosystem

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ABSTRACT

The rapid diffusion of Cloud Computing influences the way enterprise software is developed, distributed, and implemented. This uptake of Cloud Computing has profound implications for the IT industry and related industries, as it does not only affect the vendors' business models but also the other actors in the business ecosystem. This paper addresses how the value network of enterprise software solutions changes as a consequence of shifting from on-premise to Cloud-based technology. Based on a literature study and fifteen expert interviews in three case studies, we present a generic value network for Cloud-based enterprise software. We analysed the impact of the shift to Cloud-based enterprise software for each stakeholder in the network. In particular, we found that the role of the consultative partner is more focussed on business process management and that technical consulting remains relevant due to IT security, data migration, interface definition, customizing, and mobile application development. The vendor becomes a service provider and acts in several roles. The emerging technological platform offers opportunities for external developers, partners, and customers. The Cloud consumer can concentrate on his core business, but needs to consider applying best practices processes when receiving public Cloud services.

1. Introduction

Due to Cloud Computing, the way computing resources are "invented, developed, deployed, scaled, updated, maintained and paid for" (Marston, Li, Bandyopadhyay, Zhang, & Ghalsasi, 2011, p. 1) is drastically changing (Mell and Grance, 2011). In fact, more and more software and hardware solutions are transferred to Cloud-based technology (EMC, 2016; Pussep et al., 2013). Moreover, the big players of Enterprise Resource Planning (ERP) systems such as Oracle, Sage, SAP, and Microsoft offer their ERP now also in a Cloud-based environment (Chen et al., 2015; Johansson & Ruivo, 2013). This implies not only a change in utilizing computing resources for customers but also a profound shift in the value creation logic of vendors and their partners' business models (Boillat and Legner, 2013; Marston et al., 2011). Hitherto, traditional enterprise software vendors have distributed their software solutions through partners such as Value-Added Resellers (VAR) to their customers (Hedman and Xiao, 2016; Rebsdorf and Hedman, 2014). The VAR's activities typically include sales, installation, technical consulting, training, modification, and customization of the software at the clients' organization (Sarker et al., 2012). A VAR has personal contact with the end-customers and possesses industry-specific expertise. Thus, the role of the VAR is important for both customer satisfaction and the overall success of the product (Boillat and Legner, 2013). In the past, many enterprise software vendors (e.g. Microsoft, SAP, and Oracle) have introduced partner programs in order to reinforce the relationship to their partners (Hedman and Xiao, 2016).

With service infusion through Cloud Computing, the traditional way of delivering software to the end customers is changing. There is nothing to resell, technically install and there are no opportunities for providing any kind of logistics anymore (Hedman and Xiao, 2016). The delivery of Cloud service is clearly different from the delivery of traditional IT systems, which implies a transition from a goods-dominant logic to a service-dominant logic (Ojala and Tyrväinen, 2011; Vargo and Lusch, 2004). In relation to this shift, scholars have mainly focused on Cloud Computing technologies adoption, economic benefits of users, the business model evolution of software vendors, and the changing value creation logic through value networks from a rather broad perspective (see e.g. Boillat and Legner, 2013; T. Li et al., 2015; Mohammed et al., 2009; Ojala and Helander, 2014). However, the characteristics of enterprise software such as complexity, high level of

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dependency, high data volume, and security comprise a special case (Kees, 2015). As on-premise enterprise software rollouts at a client's organization traditionally include several actors in an ecosystem (e.g., VAR and consultancy firms), Cloud Computing seems to disrupt this ecosystem by providing the solution remotely as a service (Ojala and Helander, 2014). Nevertheless, enterprise software solutions still need to solve complex problems and function in a convoluted organization, which cannot be ignored. Conclusively, the value network of Cloud-based enterprise software is not sufficiently investigated.

Little is known about the impact of Cloud Computing on the relationship between enterprise software vendors and business partners as well as about the value creation logic. Although researchers have mentioned the change of the actors' relevance in the value chain of enterprise software, there is no clear answer regarding the future role of those actors (Boillat and Legner, 2013). Therefore, this paper aims to analyse the changing value network of the enterprise software industry through Cloud Computing.

2. Cloud Computing, Enterprise software and Value-Added Resellers

To understand the shift of enterprise software to Cloud Computing better, we first briefly describe what Cloud Computing and enterprise software are. Also, we explain the role of Value-Added Resellers (VARs).

2.1. Cloud Computing

The National Institute of Standards and Technology (NIST) defines Cloud Computing 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*" (Mell & Grance, 2011, p. 2). Armbrust et al. (2009) highlight the differences between "the Cloud", which includes the data centre's hardware and software, and the actual service. NIST goes beyond a general definition of Cloud Computing by differentiating between categories of services (Mell and Grance, 2011), i.e., Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS).

2.2. Enterprise software

Enterprise software is a collection of business software applications, tools for modelling organizational processes, and IT development tools. By providing business logic functionality, such software solutions aim to solve both enterprise-wide problems and improve productivity and efficiency in order to gain a significant competitive advantage (Ehrenhard, 2006). *"Enterprise software comprises all software applications that companies use to support their core business process operations, such as enterprise resource planning (ERP), customer relationship management (CRM), or supply chain management (SCM) systems"* (Boillat & Legner, 2013, p. 41). Another aspect is the huge amount of data that is created through the business processes and needs to be stored in and used by the enterprise software applications. *"Enterprise applications are about the display, manipulation, and storage of large amounts of often complex data and the support or automation of business processes with that data"* (Fowler, 2002, p. 6). Many enterprise solutions provide interfaces to enable connections to other enterprise software.

2.3. Value-Added Resellers

The implementation of enterprise software is often realized through specialized third-party providers, as it requires deep knowledge and expertise in terms of technology, applying the software, business processes, and industry standards. Therefore, the distribution of such complex software solutions is traditionally realized through VARs (Hedman and Xiao, 2016; Rebsdorf and Hedman, 2014). The VARs' activities in regard to on-premise enterprise software typically include selling, installing, technical consulting, training, modification, and customization of the software at the clients' organization (Sarker et al., 2012). A VAR has personal contact with the end-customers and possesses industry-specific expertise.

As on-premise enterprise software rollouts at a client's organization traditionally include several actors in an ecosystem (e.g. VAR and consultancy firms), Cloud Computing seems to disrupt this ecosystem by providing the solution remotely as a service (Ojala and Helander, 2014). The impact of Cloud Computing on adopting organizations has been discussed extensively in recent research (see, Chauhan and Jaiswal, 2015). Scholars agree that the emerging Cloud technology affects the way in which software is distributed to customers, but mostly focus on the vendor's perspective (Boillat and Legner, 2013; Hedman and Xiao, 2016; Ojala and Helander, 2014; Rebsdorf and Hedman, 2014). Nevertheless, enterprise software functionalities still need to solve complex problems and function in a complex organization. Hitherto, the value network, especially the role of the VAR, of Cloud-based enterprise software needs further investigation.

3. Value networks of on-site and Cloud based enterprise software

This section first discusses how value creation in the business ecosystems of Cloud Computing business ecosystems occurs. We then identify the roles, actors and activities from literature for both on-premises and Cloud Computing enterprise software to demonstrate the major differences between the two.

3.1. Value creation in the Cloud Computing business ecosystem

The value network concept concerns the co-creation of value by interrelated actors within a network. Cloud-based services consist of several roles, actors, and activities that interact with each other in order to provide the service. To better understand value creation one needs to analyse the business ecosystem. The business ecosystem perspective focuses on three main characteristics: the *platform*, *symbiosis*, and *co-evolution* (Li, 2009). Moore (1993) introduced the business ecosystem concept as a network of opposing and collaborating actors from distinct sectors that are involved in the provisioning of services or products around a specific *platform*. Our paper is therefore firmly positioned in the platform ecosystem stream as described by Thomas et al. (2014). The platform is often provided by a single firm and it includes services, tools, and technologies that are used by stakeholders involved in the platform, e.g. the PaaS technology Microsoft Azure as the platform and a software developer as a stakeholder (Li, 2009). The stakeholders within an ecosystem gain a certain level of *symbiosis*, as competition is usually stronger between distinct ecosystems than within the ecosystem (Ehrenhard et al., 2014). Such an ecosystem *evolves* over time, thus, creating additional value by adding complementary products and services to the core platform (Ehrenhard et al., 2014; Thomas et al., 2014). A business ecosystem can be analysed by looking at the value network concept that describes and analyses a platform-based product or service offering (Ehrenhard et al., 2014; Kijl et al., 2010; Peppard and Rylander, 2006). According to Peppard and Rylander (2006), a value network is a "set of relatively autonomous units that can be managed independently, but operate together in a framework of common principles and service level agreements (SLAs)" (p.132). In a network, relationships are essential to the firms' competitive advantage; also the structure of the network is decisive for industry performance and evolution (Madhavan et al., 1998; Peppard and Rylander, 2006).

3.2. Value creation logic in the case of on-premise enterprise software

Literature about the value creation logic in the case of on-premise

enterprise software is rather rare. Furthermore, most studies related to enterprise software value creation focus on how a software vendor develops or directly delivers the product to the client's organization. Most researchers assume a one-way transfer of the software from the vendor straight to the customer; ignoring that: *"in many contexts, the business model involves vendors selling, extending, and delivering packaged software through partners, who contribute to value addition for the customer firms"* (Sarker et al., 2012, p. 318). This is why Kohli and Grover (2008) highlight that studies should rather focus on value co-creation instead as vendors interact with partners in the context of development, sales, customization, implementation, and maintenance. Traditional enterprise software vendors distribute their software solutions through VARs to their customers (Hedman and Xiao, 2016; Rebsdorf and Hedman, 2014). Piturro (1999) differentiates between consultant and VAR. While the VAR is bound contractually to a software vendor, "their advice as consultants may be coloured by close ties to particular suppliers" (Piturro, 1999, p. 44). Furthermore, she states that the VAR also offers tailored training to the client. Consultants are more independent than VARs but, in fact, "many are more familiar with one vendor's products than with others', and some get advertising subsidies or referral fees through vendors" (Piturro, 1999, p. 44). We have identified the roles, actors, and activities for the case of on-premise enterprise software provision in great detail from literature (Kohli and Grover, 2008; Piturro, 1999; Sarker et al., 2012; Simpson et al., 2001; von Arb, 1998). Fig. 1 is an overview of the value network and summarizes the main activities of the actors of the value network.

3.3. Value creation logic in the case of Cloud-based enterprise software

Mohammed et al. (2009) propose a Cloud value chain reference model that differentiates between various services of Cloud Computing. This model provides valuable insights but ignores that the value is created through multiple actors in a value network. The NIST Cloud Computing reference architecture provides a rather generic view on Cloud Computing, without differentiating between B2B and B2C cases (Liu et al., 2011). Both, Marston et al. (2011) and Ojala and Tyrväinen (2011) proposed a value network perspective, while specifically Böhm et al. (2010) used the e^3-value method (Gordijn and Akkermans, 2001) to distinguish different roles in a Cloud Computing value network. Boillat and Legner (2013) propose Cloud Computing as a technology that offers new profitable value adding activities, also for traditional partners, which is in line with other scholars (Beimborn et al., 2011; Hedman and Xiao, 2016; Rebsdorf and Hedman, 2014).

In particular, Boillat and Legner (2013) investigate the differences between software vendors' business models by looking at different deployment models (SaaS and PaaS) in the case of enterprise software. While SaaS is equal to the value network of Marston et al. (2011), the value network of PaaS offers additional roles of value creation. Developers and other software vendors can use the platform to offer their own content or additional software, which add more value to the primary service. The authors suggested a business model called *Enterprise SaaS + PaaS* in which the primary enterprise software is provided together with a platform for value adding content of the partners. Also for the case of on-premises enterprise we have identified roles, actors, and activities of the value network of Cloud Computing for SaaS, PaaS and IaaS deployment platforms.

4. Methodology

Our study combines two qualitative methods by enriching desk research into three specific cases with semi-structured interviews with experts. Case studies lead to detailed insights into the interrelated actors in a value network and how Cloud Computing changes the value network of enterprise software. By using multiple cases the external validity increases (Saunders et al., 2009).

The selection of the cases is driven by theoretical sampling (Eisenhardt and Graebner, 2007), i.e., based on their commonalities and differences in order to obtain contrasting results and to extract generalizable patterns (Boillat and Legner, 2013; Saunders et al., 2009). We looked at three specific Cloud-based solutions, i.e. Microsoft Dynamics AX, SAP/4HANA and Salesforce Sales Cloud (see, Table 1).

Our desk research considered industry magazines, documentaries, product information, websites, reports and other available materials. The three case studies provide valuable information from real-life examples of Cloud-based enterprise software value networks. From the desk research into these cases both the roles, actors, and activities and their relational constellation are derived.

The findings of the case analysis were enriched with semi-structured telephone interviews, lasting between 35 and 60 min, with fifteen industry experts in the field of enterprise software and Cloud Computing. Our experts were drawn from a variety of industries, such as banking, insurance, automotive, engineering and IT services, and electricity network providers. We selected respondents from established companies that co-create innovative technology in the field of enterprise software solutions. The experts are employed by enterprises that are stakeholders of the traditional value network. The job roles of interviewees are: senior consultant (3), project manager (2), developer (2), director, senior Manager, senior account manager, business development executive, junior partner, key account manager, head of an IT department, CEO, and a subject specialist in infrastructure management. The focus of the interviews added additional insights on the activities, actors and roles in the current and future value network (also

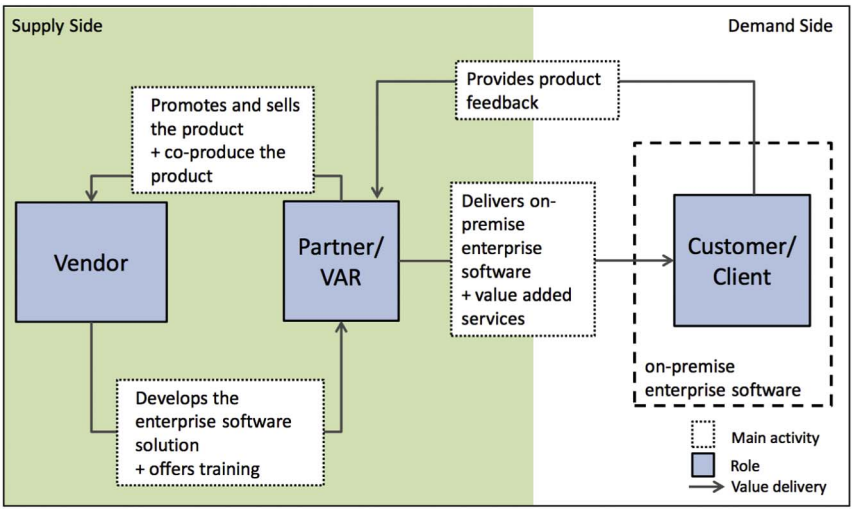

Fig. 1. Value network of on-premise enterprise software.

Table 1
Case study characteristics and selection criteria.

Dimension	Microsoft Dynamics AX	SAP S/4HANA	Salesforce Sales Cloud
Functional scope	ERP	ERP	CRM
Market launch/maturity	Yes	Yes	No
Possible deployment models	Public, private, hybrid and on-premise	Public, private, hybrid and on-premise	Generally public, put also possibility on-premise
Scenario	Cloud hosted by Microsoft in a public Cloud	Cloud hosted by a partner in a private Cloud	Cloud hosted by Salesforce in a public Cloud
Service models of the scenario	SaaS + PaaS (Azure)	SaaS	PaaS + Paas (force.com)

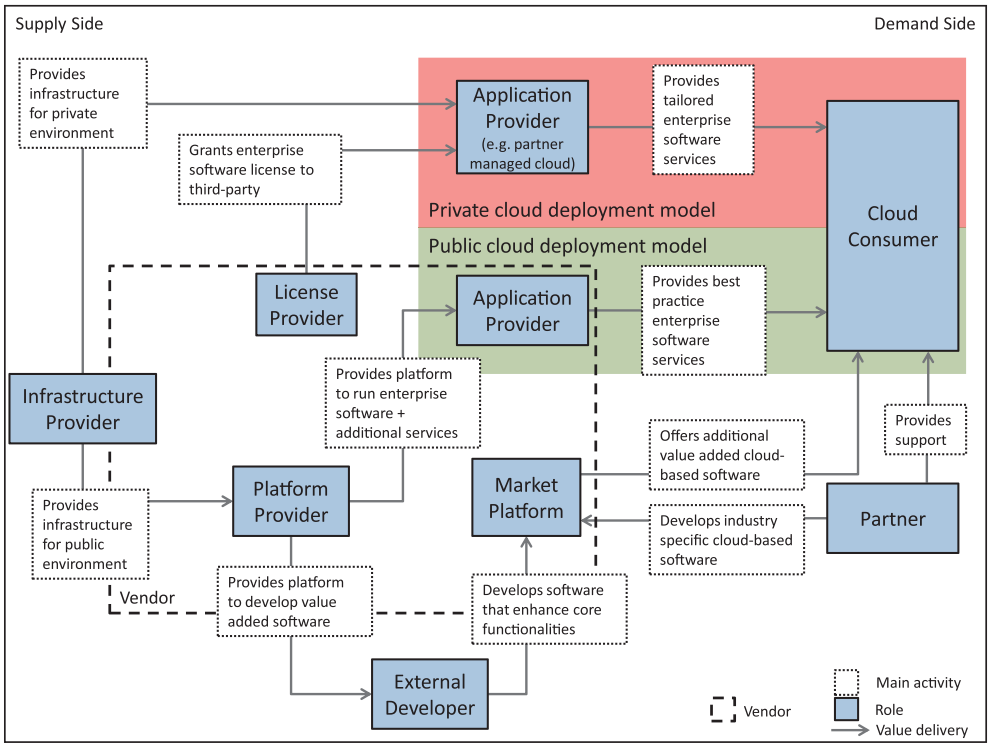

Fig. 2. Generic value network of Cloud-based enterprise software.

see, Ehrenhard et al., 2014). We agreed with respondents that our results would be anonymized.

5. Findings

We first briefly summarize our desk research findings for each of the three cases to provide context to our study. Next, we develop a generic value network based on our literature study, desk research, and semi-structured interviews with experts. This generic value network is then used to analyse the consequences of the shift to Cloud Computing.

5.1. Case study findings

Case 1. Microsoft Dynamics AX. Microsoft Corporation is an international software and hardware company headquartered in the US. Dynamics AX is one of Microsoft's ERP products that has been developed to operate on Microsoft's Cloud Computing market platform Azure (Microsoft Corporation, 2016). The platform enables building, deploying, and managing applications, as well as offering access to online tools, frameworks, and services of Microsoft or Non-Microsoft services. Microsoft operates a global network of partners distributing the Dynamics products to clients. Microsoft's Dynamics partners provide industry expertise and process know-how. The Microsoft Dynamics Lifecycle Services (LCS) is a collaborative workspace for customers and partners, which has been initiated to help organizations to improve the quality Dynamics AX implementations by applying standardized solutions. As Microsoft is responsible for running the software flawlessly in the Cloud, standardized software optimizes the maintainability, which in return reduces cost.

Case 2. SAP S/4HANA. The company SAP was founded 1972 in Germany. SAP S/4 HANA provides Cloud-based ERP that transforms SAP from an on-premise software vendor into a Cloud-based service provider (Schreiner, 2015). The Cloud-based ERP solution is offered either in a public Cloud or a private Cloud. The public Cloud edition is designed for companies that need standardized Cloud integration offerings that cover the core business processes (Gellaw, 2016). S/4HANA in a private Cloud is provided either by SAP or SAP partners as a Partner Managed Cloud. Non-SAP solutions, as well as newly developed capabilities, can be integrated using APIs (Gellaw, 2016).

Case 3. Salesforce Sales Cloud. Salesforce reinvented the CRM software market by shifting CRM into the Cloud. In 1999, the CRM solution Sales Cloud was introduced (Boillat and Legner, 2013). Main functionalities of Sales Cloud are account and contact management, partner management, sales prognoses, and opportunity management (Salesforce, 2016). Sales Cloud offers standardized best practice processes that cover most of the customers' requirements. Force.com is a PaaS environment that operates the applications and provides several developer tools and methods. The advanced applications are distributed through the market platform AppExchange. AppExchange applications are web-based applications that interoperate with the Force.com platform (Salesforce, 2016). Salesforce works with own data centers as well as with third-party infrastructure providers. Furthermore, Salesforce certifies partners who support the

implementation, customization and training of Sales Cloud at the client's place (Salesforce, 2016).

5.2. Analysing the generic value network of Cloud-based enterprise software

We have used our data to first construct a value network for each of the three deployment platforms. We then have composed a generic value network of Cloud-based enterprise software that we refined through semi-structured interviews with fifteen experts in the field of enterprise software and Cloud Computing drawn from a variety of industries (see, Fig. 2).

Our objective was to understand how the value network of enterprise software solutions changes as a consequence of shifting from on-premise to Cloud-based technology. More specifically, how do roles, actors, and activities emerge, disappear, and change while migrating from on-premise to the Cloud-based enterprise software? Our findings based on the literature, desk research, and interviews are as follows.

First, the shift from on-premise to Cloud-based technology does not mean that roles, actors, and activities related to IT simply disappear. Instead, the activities occur no longer at the client's location but with another actor. From the customer's perspective, Cloud Computing means a shift of complexity from customer's on-premise infrastructure to the vendor or the partner.

Second, as IT infrastructure at the client's location becomes less complex, and the enterprise software becomes more standardized, the role of the consulting partner changes from an IT-intensive role to a more business process management role. This is especially the case when enterprise software is deployed in a public Cloud environment. Public Cloud enterprise software follows best practices approaches, standardized processes, and limited customization opportunities. Therefore, customers in collaboration with partners need to analyse whether best practices fit their current or future business model. If this is not the case, a private hosted environment might be a more appropriate deployment model. However, the vendor's focus on standardized solutions has advocates and opponents. Nevertheless, both advocates and opponents agree that standardized solutions rather fulfil SMEs requirements; whereas, the best practice approaches are not sufficient for big companies.

Third, technical consulting still keeps its relevance due to IT security, data migration, interface definition, customizing, and mobile application development. As soon as the standardization of enterprise software prevails, also customization activities will become marginal. With Cloud Computing IT security demands more attention and educational work at the clients place.

Fourth, new emerging fields for value-added services provided through partners are financial consulting, license management, environmental consultation, and service aggregation. Financial advice regarding CapEx and OpEx are of particular importance in the selling process to support the customer regarding the economic evaluation process. Our research shows, that the lack of transparency of licenses discourages potential customers to enter into a contract. This also includes the monitoring of SLA critical indicators and can be handled through a Service Aggregator. Also, many companies aim to reduce their carbon footprint, which can be achieved through energy efficient Cloud Computing solutions.

Fifth, the vendor transforms into a service provider and acts in several roles, namely: Infrastructure Provider, Platform Provider, Application Provider, and License Provider (for partner managed Cloud). Nevertheless, as the business model of the vendor changes, also the revenue streams for partners change from a short-term revenue stream into a long-term revenue stream. Therefore, vendors need to create new incentives for partners to sell Cloud-based solutions to the customers.

Sixth, the shift also changes project management concepts to a quicker and agile approach that better fits the rapid implementation process of Cloud-based enterprise software.

Seventh, the technological platform, which is provided by the vendor, offers the opportunity for the external developers, partners, and customers to develop applications that extend the core functionality of the enterprise software. Through market platforms, external developers and partners can offer and distribute their value-added solutions more easily.

Eight and final, as the IT infrastructure becomes less relevant for Cloud consumers, they can concentrate on their core business, but need to consider applying best practices processes when receiving public Cloud services. Furthermore, the Cloud consumers can take advantage of the rapid deployment of services by trying out new innovative Cloud-based technology.

6. Discussion and future research

Many stakeholders of the enterprise software business ecosystem are facing a fundamental change due to Cloud Computing. Therefore, stakeholders need to understand how the ecosystem is going to change to adopt the new technology and transform their competencies into new value propositions for customers and other stakeholders. Regarding the on-premise enterprise software, there are three main functions, namely: vendor, partner, and customer. While the vendor develops the software and does marketing, the partner sells the software and supports the customer in mainly technical regards. The customer takes care of the technical and organizational rollout of the on-premise enterprise software, as well as ensures sufficient operation of the system by staffing IT experts and continuously improve IT infrastructure. We used a multiple case study and semi-structured interviews with experts in order to find out how the value network changes. The empirical research contributes to the literature by deriving a generic value network for Cloud-based enterprise software that was summarized in Fig. 2.

The generic value network illustrates the value created by each actor and the interaction between actors. Even though the literature provides a profound basis, this research delivers valuable new findings by determining more precisely roles, actors, and activities in a generic value network of cloud as opposed to on-premise enterprise software. Moreover, this present research demonstrates how service oriented business ecosystems can be studied from a value network perspective – complementing the platform ecosystem stream as described by Thomas et al. (2014). While previous literature has a rather general character, this work provides more in-depth insights of how exactly roles change by analysing in detail the value exchange in a multi-actor setting. Especially, our additional in-depth focus on Value-Added Resellers next to platform providers is a valuable addition to the literature (Boillat and Legner, 2013; Ehrenhard et al., 2014; Thomas et al., 2014). Moreover, the value network of on-premise enterprise software is already complex, which is only exacerbated by the shift to the cloud. Cloud enterprise systems are therefore an excellent research context to demonstrate the value of the platform ecosystem approach (Thomas et al., 2014).

The generic value network can be used by practitioners in order analyse the changing business ecosystem. Practitioners can then transform specialized competencies into value propositions with market potential to customers and other stakeholders of the value network. The technical support regarding on-premise installation and system administration needs to be adopted. This research points out that vendors are penetrating the partner managed Cloud market by offering substitute services and rising prices for licensing the service. However, technical consulting regarding IT security, interfaces development, customizing, and data migration is still demanding by clients. Our research shows that the role of the consultative partner changes from an IT-intensive role to a more business process management role. Therefore, expertise of customers' workflow and industry specific business processes is indispensable.

We find it important to point out that the generalizability of our

findings is limited in a number of aspects. First, the case studies did not include the hybrid Cloud deployment model, thus our findings may not hold in that context. Second, our research focused on the main roles, actors, and activities most relevant to value creation and thus did not aim to be completely comprehensive. Third, since the IT industry is characterized by short innovation cycles, findings of this research might be quickly outdated.

Future research considering different scenarios, deployment models and enterprise software types can enhance the current model. Also, future research can build on this study by applying the quantitative abstract cost benefit model introduced by Kijl et al. (2010). This might also help stakeholders of the value network to understand the new revenue streams due to Cloud Computing. This aids vendors to create incentives for partners to sell Cloud-based solutions. Furthermore, future research can focus on gaps between value creation and capture in the Cloud-based enterprise software value network and develop new roles, activities, and business models in order to generate new value streams. Finally, we concur with Thomas et al. (2014) call for research into platform ecosystems beyond information technology and Internet sectors. Our study of enterprise systems that are used in a wide variety of sectors is therefore an important step but more research is needed.

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