Aalto University
School of Business

# Cloud Computing Ecosystem: Insights from an Exploratory Study in SaaS and PaaS Value Networks

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AALTO UNIVERSITY SCHOOL OF BUSINESS ABSTRACT
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# ABSTRACT

**Objectives of the Study**

This thesis studies software ecosystem in cloud computing context. It gives additional insight into the characteristics of the cloud ecosystem, and into the roles recognized in the ecosystem, as well as network management. Furthermore, it recognizes benefits that cloud computing vendors gain by establishing an ecosystem, as well as network effects involved in the ecosystem. In this research, SaaS and PaaS delivery models are taken into closer review. The purpose of this research is to gain familiarity with the phenomenon, and acquire new insight into cloud computing ecosystem in order to develop hypotheses, and to formulate more precise research problems for further research.

**Academic background and methodology**

This qualitative research utilizes systematic combining where theoretical framework, empirical fieldwork, and case analysis evolve simultaneously. Moreover, it explores a new field of cloud computing ecosystem through a multiple case study from the software vendor's angle. Data collection is performed via semi-structured interviews among key persons of the case company. Also various Internet sources are utilized to collect data. Because of the abductive approach results are combined with existing theory on the field.

**Findings and conclusions**

The findings reveal that task of building trust and managing customer relationships becomes more important for the partners. They concretize that SaaS delivery side network consists of SIs, Service providers, VAPs, and SaaS app stores. On the other hand, PaaS scenario consists of PaaS providers, ISVs, and the SaaS customer. Cloud computing offers partners possibility to move towards providing high value services, for example, business process consulting instead of basic system configuration. On the other hand, platform providers will need to invest more into marketing to support the ecosystem. Also, software vendors should apply new network management principles in cloud computing ecosystem. Given the nature of exploratory study, the results of this research are not applicable for decision-making as such. However, they can provide significant insight into the context.

**Keywords**

Cloud computing, Cloud services, Ecosystem, Software Supply Network, Business Network Management, Software as a Service, Platform as a Service, Network effects, Network externality

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# ABSTRAKTI

**Tutkimuksen tavoitteet**

Tämä gradu tutkii ohjelmistoteollisuuden ekosysteemia pilvipalveluiden kontekstissa. Tutkimus tuo uutta tietämystä pilvipalveluiden ekosysteemin piirteisiin ja uusin rooleihin verkostossa. Lisäksi se lisää ymmärrystä verkoston johtamiskäytäntöihin ja ekosysteemin hyötyihin. Tutkimus on tehty erityisesti SaaS ja PaaS toimistomallien näkökulmasta. Tutkimuksen tarkoitus on lisätä ymmärrystä aiheeseen, jotta aiheesta voidaan kehittää hypoteeseja sekä muotoilla tarkempia tutkimuskysymyksiä tulevaisuuden tutkimuksia varten.

**Kirjallisuuskatsaus ja metodologia**

Tämä kvalitatiivinen tutkimus käyttää systemaattista yhdistelyä, missä teoreettinen viitekehys, empiirinen tutkimus, ja case -analyysi kehittyvät saman aikaisesti. Tutkimus käyttää moninkertaista case -tutkimusmetodia, jossa data on kerätty puolistrukturoitujen haastattelujen ja ammattiblogien ja muiden Internet-lähteiden avulla. Koska kyseessä on abduktiiviseen päättelyyn perustuva tutkimus, on empiirisen tutkimuksen tuloksia yhdistetty olemassa olevaan teoriaan.

**Tulokset ja päätelmät**

Tulosten mukaan luottamuksen rakentaminen korostuu pilvipalveluissa, koska asiakassuhteissa on tavoiteltava pitkäjänteisyyttä. SaaS -palveluiden verkosto koostuu integraattoreista, palvelun tarjoajista, lisäarvoa tuovista partnereista ja SaaS –sovelluskaupoista. PaaS –palveluiden verkosto koostuu PaaS –palvelun tarjoajista, itsenäisistä ohjelmistoyrityksistä ja SaaS –asiakkaista. Yleisesti pilvipalvelut tarjoavat partnereille mahdollisuuden siirtyä kohti korkeamman lisäarvon palveluita. Toisaalta pilvipalveluntarjoajat joutuvat kehittämään uusia keinoja verkoston hallintaan. Ottaen huomioon tutkimuksen eksploratiivisen luonteen, sen tulokset eivät ole käyttökelpoisia päätöksentekoon sellaisenaan, mutta voivat tuoda merkittävää tietoa kontekstiin.

**Avainsanat**

Pilvilaskenta, pilvipalvelut, ekosysteemi, ohjelmistoteollisuus, liiketoimintaverkostojen hallinta, verkostot, SaaS, PaaS, verkoston ulkoisvaikutukset

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The people who participated in my study were generous with their time, and therefore, I would like to thank all the people from case company who provided indispensible insight into my thesis.

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# ABBREVIATIONS

| | |
|---|---|
| API | Application Programming Interface |
| ASD | Application Software Developer |
| ASP | Application Service Provider |
| CRM | Customer Relationship Management |
| ERP | Enterprise Resource Planning |
| HW-D | Hardware Developer |
| IAAS | Infrastructure as a Service |
| ISD | Infrastructure Software Developer |
| ISP | Internet Service Provider |
| ISV | Independent Software Vendor |
| LAR | Large Account Reseller |
| OEM | Original Equipment Manufacturer |
| PAAS | Platform as a Service |
| SAAS | Software as a Service |
| SI | System Integrator |
| SLA | Service Level Agreement |
| SSN | Software Supply Network |
| TCO | Total Cost of Ownership |
| VAP / VAR | Value Added Partner / Reseller |

# 1 INTRODUCTION

Cloud computing as a computing resources delivery model is currently widely hyped technology. According to CloudTimes (2011) *"as companies turn increasingly to the cloud for their IT needs, 80 percent of the companies in the Fortune 1000 are expected to be using some kind of cloud computing services as early as next year, and 20 percent of those companies may not own any hardware assets at all."*

Mell & Grance (2011) 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.* Ojala (2011) summarized that *"cloud computing refers to the provision of computing capacity, storage capacity, and applications as a service across the Internet."* Moreover, besides cloud computing definition, Mell & Grance (2011) provide a baseline for cloud services and deployment strategies built on cloud computing.

I acknowledge the importance of making a clear difference between these concepts of cloud computing, cloud services and cloud deployment strategies, as well as deepening the understanding of the technological aspects of cloud computing. Nonetheless, I see interesting avenues of research opening also in the evolving software ecosystem. Considering the industry's entire value chain, including software vendors, hardware OEMs, service providers, distributors, resellers, and retailers, and how they will operate and how they are orchestrated compared to the situation in the past.

According to Ojala & Tyrväinen (2011) *"value networks in cloud computing are attracting increasing attention because of the dramatic growth in cloud computing. By the end of 2011, at least 35% of medium-sized enterprises in the US will be using cloud computing solutions, and 40% of SMEs in the world will be using cloud computing –based applications."*

Cloudtimes (2011) argue, *"the vision has not been fully realized yet. The adoption of cloud computing by enterprises is still mostly limited to e-mail and collaboration tools such as Google*

*Apps, selected sales and marketing applications such as Salesforce.com, and some cloud-based provisioning of core computing via services such as Amazon Web Services.*"

Clearly cloud computing is at an emerging stage of it's technology lifecycle, and thus, it would be still difficult to draw a clear picture of how cloud computing will revolutionize the prevailing software ecosystem based on the current scientific knowledge. Hence, I see a need for real-life cases in elucidating the strategic reasons that drive software firms to form a cloud computing ecosystem in preference to the prevailing software ecosystem.

## 1.1 Background and the Scope of the Study

Most of the existing studies focusing on cloud computing have looked at the benefits and features of cloud computing for businesses (Armburst et al. 2010, Géczy et al. 2012, Kambil 2009, McAfee 2011, Mäkilä et al. 2010). A few authors have further studied cloud business models (Ferrante 2006, Ojala 2012, Ojala & Tyrväinen 2011b, Ojala & Tyrväinen 2012). Also, some authors (Beimborn et al. 2011, Chappel 2008) have deepened studies into cloud platforms and it's business models.

From a software ecosystem perspective, the topic is also interesting. There are several studies solely discussing software ecosystems (Bosch 2009, Iansiti & Richards 2006, Jansen et al. 2009a, Messerschmitt & Szyperski 2003).

Besides software ecosystem, a different angle has been taken in a few studies to increase understanding among software supply networks (Brinkkemper et al. 2009, Jansen et al. 2005, Jansen et al. 2009b, Kontio et al. 2005, Siira 2012, Warsta & Seppänen 2008). Also, there are studies about marketing channels and the role of intermediary in the channel (Coughlan et al. 2001, Geersbro & Vedel 2008, McHugh 1999, Niu 2009, Weber 2001). In addition, Möller & Halinen (1999) provided insight into business network management.

Only few studies exist which combines value networks into cloud computing context. Tyrväinen & Selin (2011) studied the sales and marketing models of SaaS. Ojala & Tyrväinen (2011a & 2011b) have studied value networks and its evolution through the product life cycle in the SaaS context using game industry as a business case. Hilkert et al. 2010 provided insight into ‘As a Service –paradigm’ and its implications for the software ecosystem in general. They based their study on transaction cost and intermediary theories. In addition, Beimborn et al. (2011) touched upon PaaS value networks in their general study around cloud platforms.

This research is meant to provide details and insight into a phenomenon where a small amount of information exists. The research method is further elaborated in the chapter 3.

From these considerations, this study contributes to current knowledge in the following ways: (i) it reveals several characteristics of cloud computing business ecosystems from the software vendor’s point of view, (ii) it builds on previous work in relation to cloud computing ecosystem.

In terms of cloud computing deployment models, the scope of the study is limited to public cloud, in which the cloud infrastructure is provisioned for open use by the general public, and it exist on the premises of cloud provider (Mell & Grace 2011). Also, this study does not take into account open source software, and its implications to cloud business and ecosystem.

Moreover, the study is limited to delivery side network. This is regarding to the definition by Brinkkemper et al. (2009): *“The supply part consists of companies that act as suppliers and technology providers to the company of interest. The delivery part is responsible for delivering and deploying a software product or a service to customers.”* In addition, a few ecosystem players are limited outside its scope, for example, public bodies and government.

## 1.2 Research problem and Research Questions

The main purpose of this research is to increase the visibility of the cloud ecosystems and provide an initial framework for reasoning about cloud computing ecosystem in the chosen research scope. Furthermore, the purpose is to study how the particular roles of the involved market players might change due to the increasing diffusion of the cloud computing paradigm.

Secondly, the research discusses the implications of cloud ecosystems to the way companies manages and orchestrates their delivery side network. Also, it seeks to elaborate how software vendors benefit from establishing an ecosystem in cloud computing context.

*RQ1: What special characteristics are involved in cloud computing ecosystem, and how it differs from on-premise software ecosystem?*

- *RQ1.1. What roles are recognized in cloud computing ecosystem?*
- *RQ1.2. How cloud computing vendors benefit from establishing an ecosystem?*
- *RQ1.3. How cloud companies should manage their delivery side network?*

The purpose of this research is to gain familiarity with the phenomenon and acquire new insight into cloud computing ecosystem in order to develop hypotheses, and formulate more precise research problems for further research.

## 1.3 Outline of the Research

The backbone of the research is built on a literature review (chapter 2) that studies cloud computing paradigm and software ecosystems. The purpose of the literature review is to make an introduction to the underlying concepts relevant to the study and built a foundation for studying cloud ecosystem as well as comparing on-premise and cloud computing ecosystems.

Research methodology chapter (3) discusses the approach, methods and research process for the study. Also, it introduces the case company. Abductive approach is used to build cloud computing ecosystem chapter (4) as a result of exploratory research.

Discussion takes place in chapter (5) by demonstrating the main theoretical and managerial implications of the study. Finally, conclusions (chapter 6) summarizes the results of the research, analyses the validity, reliability and limitations of the research, and examines the further research avenues.

# 2 LITERATURE REVIEW

This chapter is the literature review of the research. It is essential to get a comprehensive insight into the underlying theories on cloud computing and software ecosystems before starting the empirical study. First, Chapter 2.1 outlines the cloud computing paradigm. Second, Chapter 2.2 outlines the existing software ecosystem theory.

## 2.1 Cloud Computing Paradigm

Some authors (Kambil 2009, Géczy et al. 2012) present cloud computing and cloud services in conjunction with each other. *"The essential idea behind the cloud-based business model is relatively simple. Organizations could outsource their IT needs to cloud providers. To gain savings the organizations overall outsourcing costs should be lower than their IT investments. Cloud-based providers supply services to multiple organizations, and employ the economy of scale. Thus, they can offer attractive pricing to customers and yet maintain reasonable margins."*

Mell & Grance (2011) defines cloud computing comprehensively a "*a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction."*

Furthermore, Armburst et al. (2010) conceptualizes cloud computing as *"both the applications delivered as services over the Internet and the hardware and systems software in the data centers that provide those services."* Their view is pragmatic in the sense that basically they call data center software and hardware as a cloud. McAfee (2011) presents that some large organizations are planning to build private clouds that they will own and maintain. These are essentially data centers that use many of the clouds' technologies.

Nevertheless, the definition by Kambil (2009) applies best for most of the consumers: *"cloud computing is a way of providing computing services that is dynamically scalable and virtualized. Basically users employ a web browser to access computing services provided remotely by a* *third-party."* Also *"cloud computing as something that incorporates the ideas of software as a service and may also utilize open source software and web 2.0 principles of co-creating content."*

### 2.1.1 Service Deployment Models

When a cloud is made available to private or public use the scholars call it cloud deployment models. Figure 1 illustrates different cloud service deployment models. The three basic cloud computing deployment models found in the literature (Armburst et al. 2010, Mell & Grance 2011, Géxczy et al. 2012) is as follows:

1. *Private Cloud.* Internal data centers of an organization not made available for the public. It may be managed by the organization or a third party, or combination of them, and may exist on premise or off premise. This is the most secure model, but also most expensive one. In this model the information is accessed via internal networks – such as intranet. However, private clouds would not enjoy similar economies of scale the public clouds do.

2. *Public Cloud.* The general public provisions the cloud infrastructure for open use in a pay-as-you-go manner. It may be owned, managed, and operated by a business, academic, or government organization, or some combination of them. It exists on the premises of cloud provider. This is the most insecure model, but the cheapest one since the resources are provided by external providers and accessed over Internet.

3. *Hybrid Cloud.* The cloud infrastructure is a composition of two or more clouds that remain unique entities but are bound together by standardized or proprietary technology that enables data and application portability. The environment is consisting of multiple internal and/or external providers. In addition, critical services and resources are provided internally and accessed via intranet, while non-critical ones are supplied by external providers and accessed over Internet.

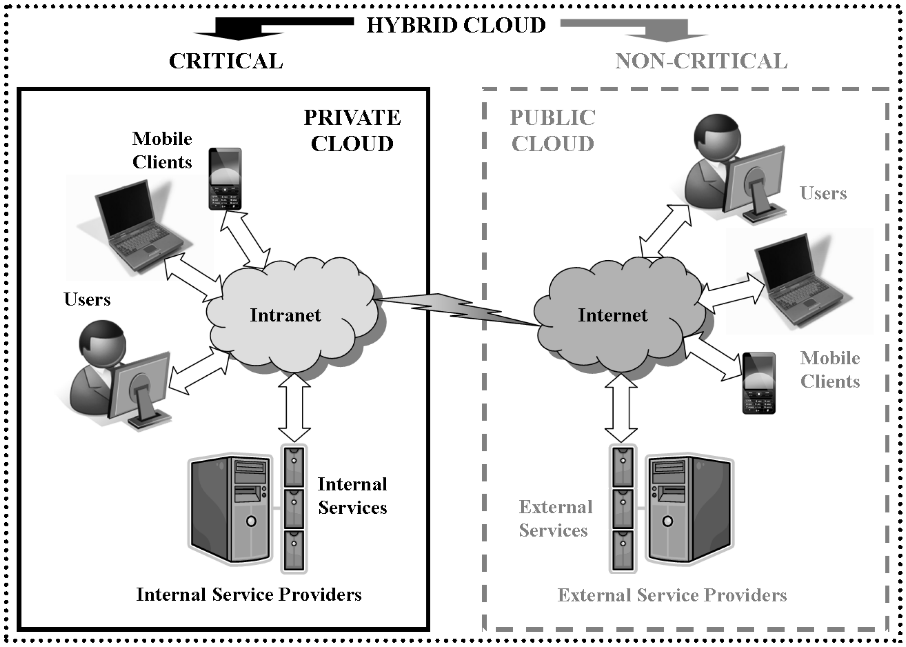


**Figure 1: Illustration of cloud-based models (Géczy et al. 2012)**

Mell & Grance (2011) added also fourth deployment model:

1. *Community Cloud.* The cloud infrastructure is provisioned for exclusive use by a specific community of consumers from a community. It may be owned, managed, and operated by one or more of the organizations in the community or a third party, and it may exist on or off premises.

For the research on hand, the most interesting deployment model is public cloud. It is clearly most feasible avenue of research for a software ecosystem related study.

### 2.1.2 Categories of Cloud Services

In general, literature (McAfee 2011, Mell & Grance 2011, Gézcky et al. 2012) defines cloud computing services used in practice as Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS). However, Armburst et al. (2010) mentioned earlier that accepted definitions vary widely. Moreover, cloud computing is the sum of SaaS and utility computing, but does not include small or medium-sized data centers, even if these rely on virtualization for management (Armburst et al. 2010).

1. Software as a Service is the largest and most mature part of the cloud. It's an application or suite of applications that resides in the cloud instead of on a user's hard drive or in a data center. Billing is usually performed based on the number of licenses and the actual usage of the software. In addition, the customer does not manage or control the underlying cloud infrastructure.

2. Platform as a Service. This is a cloud-based platform that companies can use to develop their custom applications or write software that integrates with existing applications. The consumer does not manage or control the underlying cloud infrastructure, but has control over the deployed applications and possibly configuration settings for the application hosting environment. PaaS environments come equipped with software development technologies like Java, .NET, Python, and Ruby on Rails and allow customers to start writing code quickly. Once the code is ready, the vendor hosts it and makes it widely available. PaaS is currently the smallest segment of the cloud computing market and is often used by established companies looking to outsource a piece of their infrastructure.

3. Infrastructure as a Service (IaaS), is the most basic; it is a server or servers out there in the cloud, or a bunch of storage capacity or bandwidth. Generally, IaaS customers, who are often tech companies, typically have a lot of IT expertise; they want access to computing power but don't want to be responsible for installing or maintaining it.

SaaS is often mixed with ASP service delivery model, but on the other hand, Mäkilä et al. (2010) distinguished that *"a key difference between SaaS and other new on demand models and the more traditional Internet -based deployment models such as ASP, is that the service is to some extent standardized, whereas tailored software providers can use ASP model to deliver the software."* Furthermore, the new on demand services are not limited to providing only software application as a service, but sometimes extend to as far as business process outsourcing. (Mäkilä et al. 2010)

As a software delivery model SaaS can be considered either as an extension or as a replacement to ASP, which is a delivery model that contains hosting, maintenance, and support of software. In both models, SaaS and ASP, the software is accessed through the Internet or other computer network and the vendor charges service fees. (Ojala 2012)

McAfee (2011) provided practical examples of SaaS successes. For instance, one of the earliest SaaS providers was Salesforce.com, which provided an alternative to on-premise CRM systems when it was launched in 2000. More recently, productivity and collaboration software – spreadsheets, word processing programs, and so on – has moved into the cloud with Google Apps, MS Office 365, and other similar offerings. Regarding to Kambil (2009) the success of these applications is grounded on the accessibility to sophisticated software services and data through a simple web browser and an Internet connection.

Few things are similar to each model. First, customers rent them instead of buying them, shifting IT from a capital expense to an operating expense. Second, vendors are responsible for all the maintenance, administration, capacity planning, troubleshooting, and backups. Finally, it's usually fast and easy to get more from the cloud – more storage from and IaaS vendor, the ability to handle more PaaS projects, or more seats for users of a SaaS application. (McAfee 2011)

## CLOUD PLATFORMS

Cloud platforms have become an interesting topic within cloud computing. According to Beimborn et al. (2011*) "PaaS as a stand-alone business model constitutes a step in the evolution towards the service paradigm and will become an important component in the software value chain."* Ried et al. (2009) cited that *"Forrester analysis estimates a market volume of up to 15.2 billion USD for 2016."*

Chou (2011) argues that the platform and ecosystem views of cloud computing represents a new paradigm, and promote a new way of computing. Though SaaS, PaaS and IaaS classifications still have some uses too. They are particularly relevant when trying to understand the general differences and trade-offs between the service delivery models (as defined by NIST), from a layers and levels of abstractions perspective. PaaS often remains invisible to the user as it provides the necessary operating platforms for the virtually provided applications. (Beimborn et al. 2011)

According to Chappel (2008) as 2012 evolves, it is becoming clear that the PaaS model will mature in terms of its ability to quickly onboard developers, and the PaaS platforms that will ultimately gain favor with customers are the ones that will support multiple forms of middleware and application development languages.

According to Beiborn et al. (2011) the PaaS concept has successfully shown to be a service model that can be offered independently, as the Google App Engine of Force.com of Salesforce.com exemplify. Thus, PaaS extends the role model of the SaaS ecosystem to the platform provider as an additional actor. Their definition of PaaS is congruent with McAfee (2011), Mell & Grance (2011) and Gézcky et al. (2012): “PaaS is the provision of a complete platform, i.e., hardware and software, as a service in order to give ISVs the opportunity to develop and to provide SaaS solutions or to integrate them with traditional software applications.

From an economic perspective, the introduction of PaaS as a business model of its own represents a shift in the three roles of the software market. While customer or user still uses the software on demand via the network (as in SaaS), the relation between software developer and software provider changes. (Beimborn et al. 2011, Chappel 2008)

According to Beimborn et al. (2011) two forms of PaaS offers can be distinguished, depending on if they include the component SaaS core application or not. The components form so-called pure PaaS offers such as Google App Engine. Some large software firms also provide platforms, which allow ISVs to develop extensions or add-ons for the software firm’s core application such as Force.com with its core application Salesforce.com. Their study is congruent with Chapelle (2008). Furthermore, many platform providers offer also additional services, e.g. support, quality reviews, certification of applications, monitoring functionalities and market place which supports ISVs’ sales activities, and value-added services such as billing and collection. (Beimborn et al. 2011) Figure 2 presents the PaaS stack, which illustrates not only the core components of PaaS, but also the services PaaS vendors provides to their customers, which usually are SaaS vendors. (Beimborn et al. 2011)

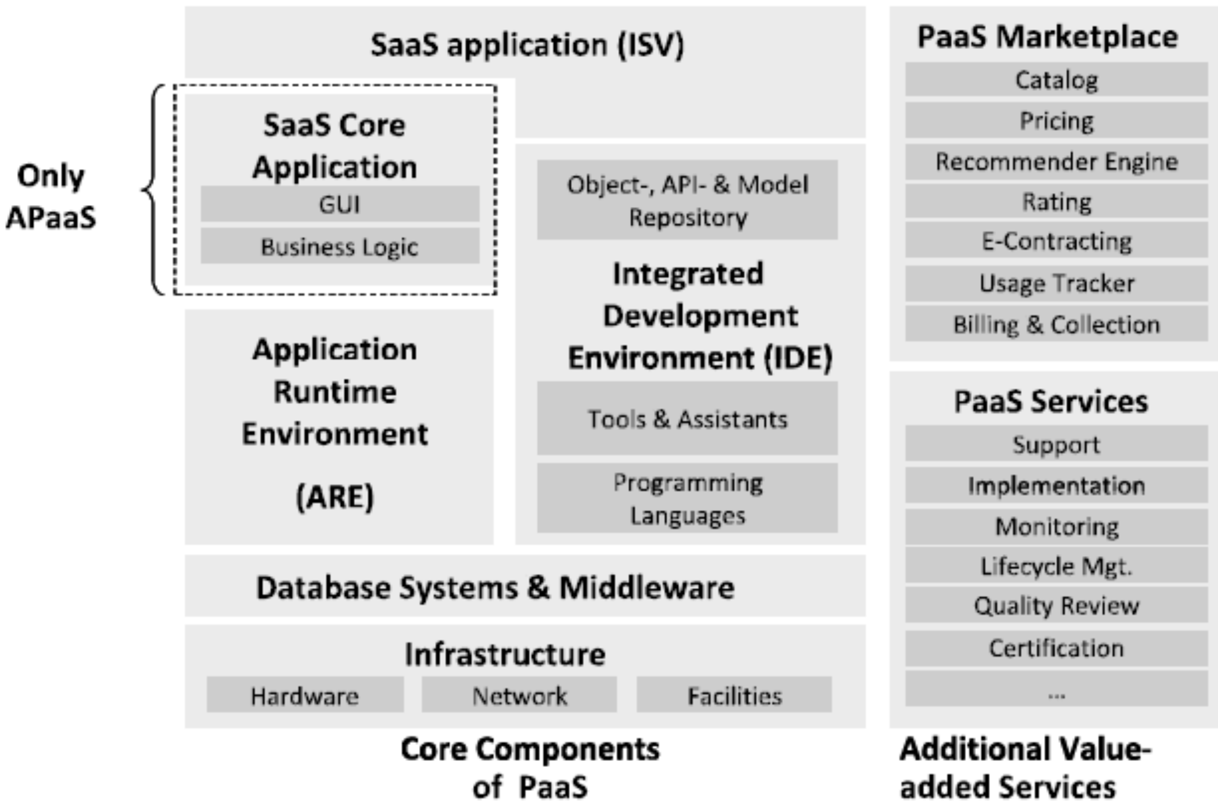


**Figure 2: The PaaS stack (Beimborn et al. 2011)**

Beimborn et al. (2011) distinguishes cloud platforms and typical IaaS offerings. Regarding their definition, cloud platforms are more of a way of computing – a new or different paradigm, whereas IaaS offerings are better aligned towards hosting scenarios. They are different models; with some overlaps, but ideally suited for different user cases. For cloud platforms, ideal use cases are aligned to net-new, or green field development projects that are cloud-optimized. Again, hosting scenarios also work on cloud platforms, but cloud-optimized applications stand to gain more benefits from cloud platforms. Moreover, when building applications using hosting providers (or strictly IaaS) a company needs to incur the engineering efforts to design, implement, and maintain own solutions for storage, data management, security, caching, etc. In cloud platforms, these capabilities are baked into the platform and available as services that are readily accessible. (Beimborn et al. 2001) Table 1 illustrates the differences of different service models from a hosting perspective. The customer manages shaded areas; rest is managed by the cloud computing vendor.

**Table 1: Table of on-premise vs cloud services from a hosting perspective (Beimborn et al. 2011)**

| On-premises | Hosted | Cloud |
|---|---|---|
| Applications | Applications | Applications |
| Runtimes | Runtimes | Runtimes |
| SOA / Integration | SOA / Integration | SOA / Integration |
| Databases | Databases | Databases |
| Server SW | Server SW | Server SW |
| Virtualization | Virtualization | Virtualization |
| Server HW | Server HW | Server HW |
| Storage | Storage | Storage |
| Networking | Networking | Networking |

One aspect inherent in cloud platforms is that cloud platforms enable the dynamic environments that support the construction of ecosystems. Also as the ecosystem grow in size and diversity, the network-effect will contribute to increasingly intelligent and interactive environments, and generate, collectively, tremendous value. (Beimborn et al. 2011)

### 2.1.3 Essential Characteristics

To fully understand the benefits and potential pitfalls of cloud services Mell and Grance (2011) summarize the essential characteristics of cloud computing under five key points. The findings are congruent with the characteristics provided by McAfee (2011).

1. *On-Demand self-service*. A consumer can unilaterally provision computing capabilities, such as server time and network storage, as needed automatically without requiring human interaction with each service provider.
2. *Broad network access*. Capabilities are available over the network and accessed through standard mechanisms with different client platforms such as tablets and mobile phones.

3. *Resource pooling*. Services provider pools capabilities to serve multiple consumers using multi-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand. Different customers share the same underlying resources. Examples of resources include storage, processing, memory and network bandwidth.
4. *Rapid elasticity*. Capabilities can be rapidly scaled in and out (i.e., provisioned and released) at any given time. The supply of capabilities from customer perspective appears to be infinite.
5. *Measured service*. Appropriate metering system is employed and customer's usage of capabilities can be transparently monitored, controlled, and reported.

Mäkilä et al. (2010) further distinguished five different characteristics: 1) Product is used through a web browser, 2) product is not tailor made for each customer, 3) the product does not include software that needs to be installed at the customer's location, 4) the product does not require special integration and installation work, 5) the pricing of the product is based on actual usage of the software. They further pointed that multi-tenancy aspect in SaaS is regarded as critical in many SaaS definitions, but is considered more as a technological choice in SaaS implementation, not a critical feature from business perspective.

## BENEFITS OF THE CLOUD

Cloud computing allows companies to scale resources with ease. As they need more storage or use of an application such as a customer relationship management system, they just pay for more storage or users as they consume more. This is naturally enabled by the economies of scale applied by the provider of cloud services since the services are shared with multiple tenants. This leads also to reliability benefits as shared redundant servers and resources are more cost effective than provisioning backups and security on single company basis. (Kambil 2009)

According to Géczy et al. (2012) principal benefits of cloud-based systems are threefold: relative straightforwardness of deployment, financial flexibility and cost saving, and progressively managed functionality. These are presented in Figure 3.

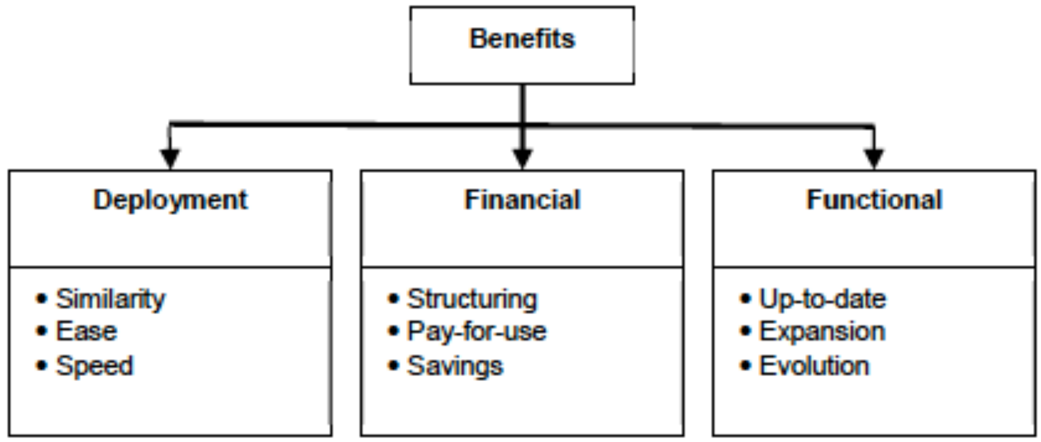


**Figure 3: Three main dimensions related to benefits (Géczy et al. 2012)**

Obviously deployment of cloud services is quite straightforward, easy and fast. At least this would be a key argument for cloud service providers. Additionally, Geczy et al. (ibid.) brought up cloud services in relation with outsourcing: *"deployment of cloud systems and services is similar to outsourcing. With the expertise of outsourcing IT manager should be able to weight problems and benefits associated with cloud services as well."*

Kambil (2009) addressed cost savings of cloud computing under reduced capital investment costs by converting the cost of computing primarily to an operating expense. Geczy et al. (2012) presented that payment for cloud services may be segmented into several installments – depending on agreement with the provider (eg. payments monthly, quarterly, or semiannually). Organizations can spread the costs over longer periods by employing external cloud services, which benefits short-term planning due to easier cost estimations. Also the adoption of cloud-based services may permit initial cost savings. Organizations can reduce costs due to reduction of IT personnel besides costs of hardware and software infrastructure, which is conceptualized as better utilization of IT resources. McAfee (2011) added that the cost savings may occur also by making individuals more productive. This would be gained by easier access to shared information and various collaboration tools.

According to Geczy et al. (2012) functional benefits of cloud services are linked to better-coordinated and centralized management. Although the services may be distributed, there is a dedicated team of IT professionals managing them. Notable benefits include regular actualizations of services in order to keep them up to date, expanding functionality and progressive evolution.

Kambil (2009) argues that for IT departments, cloud computing will mean a rethink of what is done in-house versus in the clouds, because more applications will migrate to the clouds. On the other hand, those companies bound to the wrong infrastructure will have an inherent cost disadvantage.

## CONCERNS OVER THE CLOUD

Does the cloud then pose concerns for companies and possible downsides? Earlier researches such as Kambil (2009) Anthes (2010), McAfee (2011) and Geczy (2012) cited that cloud-based model has both advantages and disadvantages.

Cloud-based providers generally emphasize advantages, such as speed and ease of deployment, while they downplay or hide risks. Anthes (2011) summarizes that security, control and legislative issues are among the most significant risks. Similar views were provided by Geczy et al. (2012), which are illustrated in Figure 4.

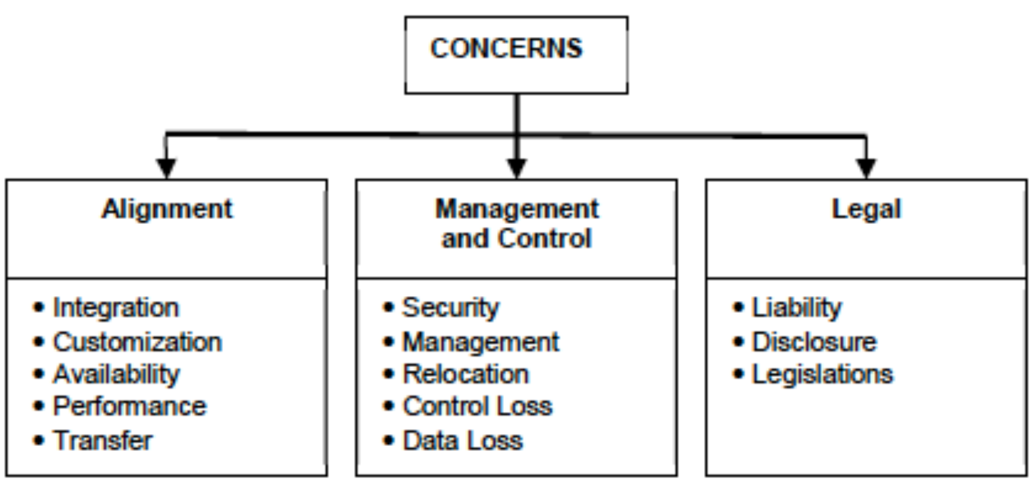


**Figure 4: Three main dimensions related to concerns (Géczy et al. 2012)**

Géczy et al. (2012) brought up the concern of proper alignment. It is important to align organization's functional and operating model with the cloud-based model of utilization of IT resources and services. Misalignments lead to decreased operating efficiency and losses for organizations. Additionally, cloud-based services should easily integrate into information technology architecture of organization, and cloud-based services should be customizable at several levels to accommodate diverse needs. The customizability of cloud services would be a major concern over adapting business critical applications in cloud, because companies need support especially for their business and processes.

Geczy et al. (ibid.) brought also up the issues of IT infrastructure since the network connections and cloud applications need to be highly reliable and fast to support the cloud services use.

Geczy et al. (ibid.) and Kambil (2009) discussed also vendor lock-in. This means that companies migrating data to a cloud hosted by a specific vendor would cause concerns over locking-in doing business with this particular vendor. Also getting rid of certain cloud would cause concerns in terms of how to easily migrate data and services from cloud to cloud if needed.

Also legal aspects play important role in cloud computing. Relative novelty of cloud computing brings a number of legal challenges. The issues of liability, disclosure and legislative differences in various geographical regions are among the major ones to consider. (Géczy et al. 2012)

Clearly moving valuable data and services to outside providers poses essential security risks since transmissions are monitored by several agencies and recorded by third parties. Accessing data and services over the Internet just presents further risks. Hence, cloud-services should be managed properly including data encryption, as well as management of updates and backups. (McAfee 2011, Gezcy et al. 2012)

### 2.1.4 Revenue Models in Cloud

In general, software can be sold using several revenue models, combinations of different models. These models include packaged and server-based licensing, software renting, pay-per-use pricing, effort-based pricing, and revenue sharing with partners, utility-based charging, freemium, advertisement-based models, etc. (Ferrante 2006)

According to Ojala & Tyrväinen (2011b) companies *"can make use of cloud services as a means to address market segments that would have not been profitable if traditional means were used."* The effective delivery of services via the Internet reduces the marginal costs of serving yet another customer, and makes it possible to target large numbers of customers who are willing to pay a small price for the services, especially in consumer markets. They argue that cloud services will be best suited to large consumer markets and similar professional markets. (Ojala & Tyrväinen 2011b)

Ojala (2012) summarized different revenue models in cloud computing (especially in SaaS) to be based on the actual usage of the software over the Internet (pay-per-use), or on software rental. Pay-per-use involves charging the customer only for the metered usage of the software, irrespective of the overall period for which the software is used. In software rental, the customer pays a negotiated subscription fee for a certain time period. Ojala & Tyrväinen (2012) added that a SaaS vendor could also make a traditional software license available, or make it possible to rent the software over a private cloud, if a customer have, for example, data security concerns in a public cloud.

Ojala (2012) argued, *"software providers may increase profitability and expand their customer base by providing (1) a traditional license for large customers who make extensive use of the software in their core business, (2) a rental model for mid-class users, and (3) a pay-per-use model for occasional users."*

Ojala (2012) suggested that software renting has an advantage of making cost estimation possible, and thus, providing a trade-off between traditional licensing and the pay-per-use model for customers. Furthermore, software renting is the only choice if it is critical to have a fully evaluated cost structure for IT expenses, since in this case there will be no hidden costs, and the amount of usage will not affect the price of the software. It further makes it possible to purchase the software without special budgeting or the approval of top management. Also, software rental – as well as pay-per-use model - would protect the vendor against software piracy. (Ojala 2012)

On the other hand, if the customer prefers ease of use, then pay-per-use will be the easiest way. Moreover, all activities can be conducted online, and the customer will not need to invest in separate IT infrastructure. (Ojala 2012)

## 2.2 Software Ecosystems

In a commercial ecosystem the actors are business, suppliers and customers, the factors are goods and services and the transactions include financial transactions, but also information and knowledge sharing, inquiries, pre- and post-sales contacts, etc. On the other hand, social ecosystems consist of users, their social connections and the exchanges of various forms of information. (Bosch 2009)

Business networks are defined as combination of nodes that are connected between each other by threads. In a business network, nodes are companies and threads are business relationships between companies. (Håkansson & Ford 2002) However, in software business, software vendors no longer function as independent units that can deliver separate products, but have become dependent on other software vendors for vital software components and infrastructure, such as operating systems, libraries, component stores, and platforms. This leads to software vendors resorting to virtual integration through alliances to establish networks of influence and interoperability. These networks are called Software Ecosystems. (Jansen et al. 2009a)

### 2.2.1 Business Ecosystems

Moore (1996) suggests that the term 'industry' should be replaced with the term business ecosystem, since nowadays you cannot divide economic activities under specific industries. Business ecosystems are based on core capabilities that are exploited in order to produce the core product. In addition to the core product, a customer *"a total experience"* which includes a variety of complementary offers. (Moore 1996)

Peltoniemi & Vuori (2005) considers business ecosystem *"to be a dynamic structure which consists of an interconnected population of organizations. These organizations can be small* *firms, large corporations, universities, research centers, public sector organizations, and other parties which influence the system."* Furthermore, they define business ecosystem to contain a population of organizations and being self-sustaining meaning that no government interventions would be needed to survive in local or global markets.

Peltoniemi & Vuori (2005) also defines that *"business ecosystem develops through self-organization, emergence and co-evolution, which help it to acquire adaptability."* Also they note that *"in a business ecosystem there is both competition and cooperation present simultaneously."*

According to Moore (1996), a business ecosystem includes customers, lead producers, competitors and other stakeholders. The key to business ecosystems is leadership companies, "the keystone species", who have strong influence over the co-evolutionary processes.

Iansiti & Levien (2004) define keystones as companies which serve as the enablers and which have a great impact on the whole system. However, they constitute a small number of the system. They also present three other roles that organizations can take in business ecosystems. Niche players, on the other hand, make up the largest mass of the business ecosystem. Dominators and hub landlords are the kind of organizations, which attract resources from the system but do not function reciprocally.

A company's choice of ecosystem strategy is governed primarily by the kind of company it is or aims to be. But the choice also can be affected by the business context in which it operates: the general level of turbulence and the complexity of its relationships with others in the ecosystem. (Figure 5)

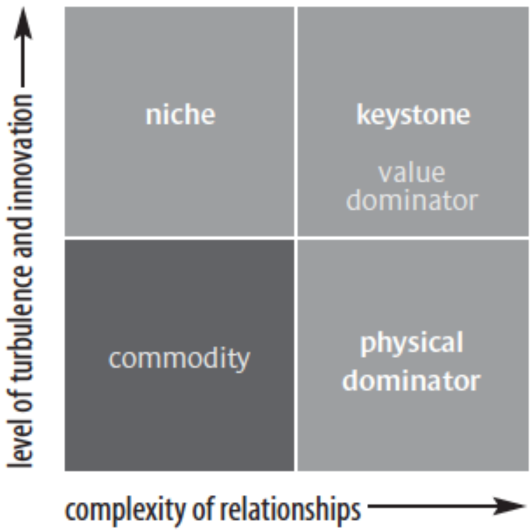


**Figure 5: Company's choice of ecosystem strategy (Iansiti & Levien 2004)**

In a keystone strategy, a keystone organization creates and shares value with the rest of the ecosystem. It is responsible for ecosystem orchestration which defines the arrangement, coordination and management of actors and networks. (Iansiti & Levien 2004)

Niche players develop specialized capabilities that differentiate themselves from other companies in the ecosystem. They have or can develop unique capabilities while leveraging services provided by the keystones in their ecosystem. Niche players collectively create value and capture much of the value they create. (Iansiti & Levien 2004)

ECOSYSTEM HEALTH

For an ecosystem to function effectively each domain in it that is critical to the delivery of a product or service should be healthy; weakness in any domain can undermine the performance of the whole. A healthy ecosystem is productive meaning that a network is capable of consistently transforming technology and other raw materials of innovation into lower costs and new products. (Iansiti & Levien 2004) It also describes the activeness of the ecosystem, i.e. how much business is created, how much value is added and how many players are joining. (Jensen et al. 2009) According to Iansiti & Levien (2004) the simplest way to measure the productivity of an ecosystem is to calculate the return on invested capital.

Another characteristic of a healthy ecosystem is its robustness. This refers to whether the business ecosystem is capable of surviving disruptions such as unforeseen technological change. This can be measured by survival rates of ecosystem members either over time, or relative to comparable ecosystems. (Iansiti & Levien 2004)

Also one measurement of health status is the capability of the ecosystem to increase diversity through the creation of valuable new functions or niches, or the capability of increasing the number of new products or product options or businesses. Although a healthy ecosystem creates new niches, it does not necessarily mean that the old niches persist. Decreased diversity in some areas of an ecosystem might enable the creation of niches in other areas. (Iansiti & Levien 2004)

### 2.2.2 Software Ecosystems

According to Iansiti & Richards (2006) IT ecosystem is *"a network of organizations that drives the delivery of information technology products and services."* It is characterized by large number of participants who depend on each other for their mutual effectiveness. Hence, the performance of individual firms depends much on the performance of other firms and products in the ecosystem. They also introduce concept of *"collective health of the setting"* to analyze the performance of a business ecosystem focusing on the IT ecosystem.

Jansen et al. (2009a) defines software ecosystem as *"a set of businesses functioning as a unit and interacting with a shared market for software and services, together with the relationships among them"*. On the other hand, Bosch (2009) presents concept of 'software ecosystem' as an extension to intra-organizational software product lines: *"The scope of a software product line typically evolves because it receives broader adoption within the company."*

Bosch (2009) and Jansen et al. (2009b) brought up the concept of 'software platform' in the software ecosystem context. The relationships in the ecosystem are often under-pinned by a common technological platform or market and operate through the exchange of information and resources (Jansen et al. 2009). According to Bosch (2009) the software platform – the product line architecture and shared components – can be made available outside the organization, and thus, make a transition towards software ecosystem.

According to Hilkert et al. (2010) the term ecosystem refers to the fact that the platform provider together with vendors of complementary applications and services can be described as a sort of “ecosystem” in terms of a “biocoenosis” including the surrounding environment. They suggest that a specific characteristic of software ecosystems’ core products is that customers derive added value only if the core product is extended with functions that are outside the core competencies of the particular core platform provider and that can be delivered by ISVs, instead. Hence, participants of ecosystems commonly benefit from their commitment and on the other hand their commitment is also necessary for the long-term survival of the system (Hilkert et al. 2010).

According to Bosch (2009) software ecosystems *“consists of the set of software solutions that enable, support and automate the activities and transactions by the actors in the associated social or business ecosystem and the organizations that provide these solutions.”* Also he states that a software ecosystem is also a commercial ecosystem, and hence the goods and services are the software solutions and services that enable, provide support for or automate activities and transactions.

Bosch (2009) argues that there are at least two reasons why companies move towards software ecosystems. First, especially for web service companies it is important to build a large customer base as quickly as possible, therefore, a company may utilize an ecosystem to collaborate in R&D effort that offers and acceptable return on investment. Secondly, a company may facilitate mass customization possibilities by extending the product (platform) with externally developed components or applications.

Generally, a company may look to build a software ecosystem where external and internal developers can materially extend the initial offering to better serve the needs to small customer segments or even, in the case of enterprise solutions, individual customers. In addition, external developers may build data analysis solutions that serve a small segment of customers, but use the much larger data set provided by the social ecosystem as a whole. (Bosch 2009)

Bosch (2009) listed reasons why the current trend in software business is towards ecosystems.:

- Increase value of the core offering to existing users
- Increase attractiveness for new users
- Increase ‘stickiness’ of the application platform, i.e. it is harder to change
- Accelerate innovation through open innovation in the ecosystem
- Collaborate with partners in the ecosystem to share cost of innovation
- Platformize functionality developed by partners in the ecosystem

Jansen et al. (2009a) discussed ‘external’ and ‘internal views’ of software ecosystems. The external view concentrates on issues that limit the scope of software ecosystems. It can be, for instance, market-oriented meaning that it is centered on one specific market such as the ERP or CAD market, or centered on mid-sized companies within a certain field. Furthermore, a software ecosystem can be technology-based or focused on one platform. The internal view of a software ecosystem specifies an ecosystem’s business opportunities and threads. They define the possible influence ecosystem members have in changing the behavior of the software ecosystem. In both cases ecosystem members are the main point of interest. (Jensen et al. 2009)

Organizations that define how a software ecosystem acts and develops itself provide another perspective of a software ecosystem. An outsider is interested in past and current customers of a software ecosystem and its connections to other ecosystems. (Jensen et al. 2009)

## SOFTWARE ECOSYSTEM TAXONOMY

Bosch (2009) presented software ecosystem taxonomy in which he categorized software ecosystems under three abstraction levels: operating system, application, and end-user programming. The second dimension presents the evolution of the computing industry in terms of the dominant hardware platform, i.e. desktop, web and mobile. (Table 2)

**Table 2: Software ecosystem taxonomy (adapted from Bosch 2009)**

| | | | |
|---|---|---|---|
| **End-user programming** | MS Excel, Mathematica | Yahoo! Pipes, Google mashup editor | None so far |
| **Application** | MS Office | | None so far |
| **Operating system** | MS Windows, Linux Apple OS X | Google AppEngine, Yahoo developer, Coghead | Nokia S60, Android, Apple iOS |
| **Category / Platform** | **Desktop** | **Web** | **Mobile** |

Software ecosystems organized around an application can be viewed as opposite to the operating system -centric ecosystems. This category is domain -specific and often starts from an application that achieves success in the market place without the support of an ecosystem around it. Initial success creates preferably a large set of customers and healthy financial foundation for any company succeeding in the domain. (Bosch & Bosch-Sjitsema 2011)

The success generates large amount of specific requests that the company is not able to satisfy due to its limited R&D resources and limitations in the business model. Typically a company starts to open up the application through provisioning of APIs, and the application turns into a domain-specific platform that 3rd party developers can extend to build extensions to other applications. Assuming the company transitions successfully from an application to a platform approach, the creation of the software ecosystems provides the foundation for a second period of growth. (Bosch 2009)

Bosch (2009) noted the emerging trend in the Web 2.0 Software-as-a-Service area in which many companies are explicitly driving a software ecosystem strategy as soon as they have engaged a sufficiently large group of customers. These companies, for example, SalesForce.com, eBay and Facebook, started by building a successful application with significant customer adoption and subsequently opened up their application for third party developers. Moreover, he argued that no application-centric ecosystem has been established on the mobile computing platform.

SOFTWARE ECOSYSTEM INSIDE AND OUTSIDE PERSPECTIVE

Hilkert et al. (2010) differentiate two views on the ecosystem: the relationship between the platform provider and providers of complementary extensions (ISVs) as inside perspective and the relationship between customers and the CRM as a whole as outside perspective. (Figure 6)

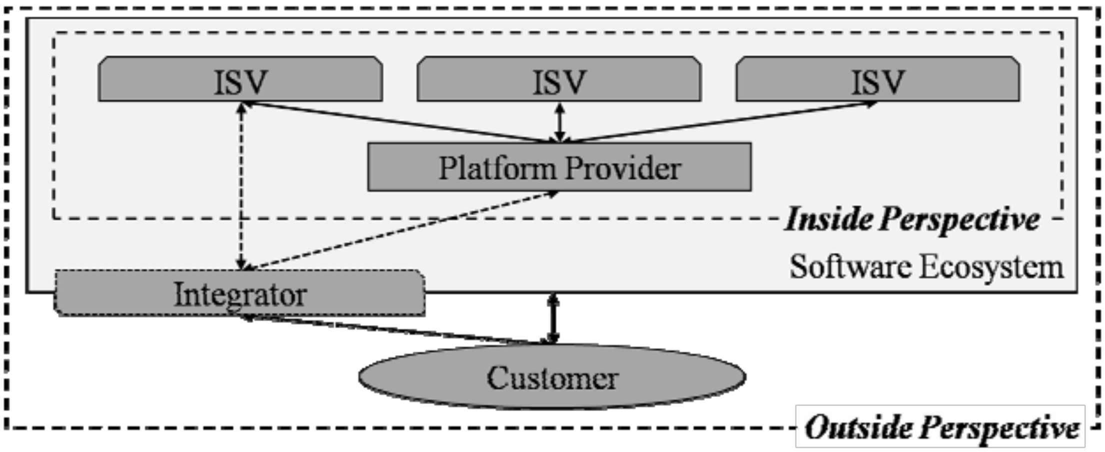


**Figure 6: Inside and outside perspective of a software ecosystem (Hilkert et al. 2010)**

A key aspect when considering the relationship between the platform and ISVs, is to find the optimal coordination form of this relationship. Hilkert et al. (2010) They based their analyze on the inside perspective on the transaction cost theory. In terms of outside perspective, the relevant question particularly is to what extent intermediaries are needed to support the relationship between customers and the overall system.

According to Hilkert et al. (2010) integrators, which adapt software solutions to the individual needs of customers and support the integration into their processes, represent typical examples of intermediaries in the software industry. The central functions of intermediaries in electronic markets are (1) to supply the market participants with information, (2) to organize the composition of the individual solution, (3) to build trust between the market participants, and (4) to offer additional services like handling of payments or financing. (Hilkert et al. 2010)

### 2.2.3 Software Supply Networks

Kontio et al. (2005) categorized software companies based on software company's business and product types. They divide software business into either product businesses or service businesses. Hence, according to their definition, software products can be tailored products, productized products, or something between these two ends of the spectrum.

Product licensors are companies that focus on developing and selling highly productized software products. Product integrators also have highly productized products, but they also include services as part of their product offering. Services can include, for example, end-user training or maintenance work. Solution consultants have products with a low degree of productization which require additional customer-specific tailoring. The productization degree of a product tailor's product is low. Their revenue is based on product licenses as well as on product tailoring and customer-specific projects. (Kontio et al. 2005)

Kontio et al. (2005) divided software developers' offerings to tailored offering and productized offering. This is based on how well a product can be duplicated without customer-specific work. The division between service-based business and product-based business is on the basis of how much of the company's revenue is purely from product licenses. The business if the product licensors is clearly a software product business. Solution consultants are also a software product business because it is based on products that may not be standardized and therefore need customer-specific tailoring work. (Kontio et al. 2005)

SOFTWARE SUPPLY NETWORKS

Messerschmitt & Szyperski (2003) provided insight into understanding software supply industry. As an example, an end-user organization may undertake the creation, provisioning, and operation of an application on its own behalf, although it would invariably incorporate software products and tools from software suppliers. On the other hand, different companies may undertake all these functions. The actual organization influences how effectively the user is served, as well as efficiency and costs.

Messerschmitt & Szyperski (2003) discussed the concept of software value chain. They define software value chain as: "*the software value chain captures the major functions that must be brought together to put a working software application in the hands of users*". Jansen et al. (2007) extended the value chain concept to value networks, because the focus of value chains is on one product, whereas software supply network (SSN) address networks of software systems that interact to provide software services.

According to Jansen et al. (2009b) SSN's strategic focus is narrower than the focus of a software ecosystem. Management of networks concerns, for example, who the software vendor's immediate buyers and suppliers are and how to increase the strength of relationships with them. A network can consist of several levels of buyers or suppliers.

In general, software supply networks consist of product context, which defines the software service operations and related software, hardware and service products needed for delivering the software service. The other part of the network is the supply network. These supply networks define all participants in the network, the connections between these participants, and the flows describing the type of product that is traded across these connections. (Jansen et al. 2007)

Brinkkemper et al. (2009) divided SSN into supply and delivery sides. The supply part consist of companies that act as suppliers to the company of interest. The delivery part of a SSN is responsible for delivering and deploying a software product or a service to customers. The break down is based on the position or role of the company of interest. The delivery network of a SSN consists of channels. The simplest type is a direct channel where a customer purchases a software product directly from a software vendor. In an indirect channel, a customer does not have any contact with a vendor, but instead purchases the product from an intermediary. An intermediary can be reseller, agent, or value-added partner. A supply vendor may always use a channel type that is a mixture of both direct and indirect channels.

Brinkkemper et al. (2009) further name three main types of software distribution channels when they conducted research to define a method for describing product and business models for the software product industry. The main channel types are direct channels, indirect channels, and a combination of these.

Resellers and agents are typically used when selling products that remain unchanged through the distribution process. Intermediaries take their own share from the actual retail price of a product. In a value added partner or reseller mode, the channel intermediary creates a new product by combining the software vendor's product with other products from other suppliers. The combined product is then distributed to the customer. A software vendor selects the direct/indirect channel combination if it wants to sell more products with the help of intermediaries. In this mode, the software vendor sells directly to certain customers and uses indirect distribution channels with other customers. (Brinkkemper et al. 2009)

Brinkkemper et al. (2009) identify the following indirect channel subtypes: reseller, agent and reseller, and value added partner or reseller. In a channel, an intermediary can be a supplier's distributor, a buyer's provider, or trader-coordinator-integrator.

### 2.2.4 Framework of Value Network in the Software Industry

Messerschmitt & Szyperski (2003) provided a framework for partitioning of businesses in the software industry value network. The framework consisted originally of eight different actors. Warsta & Seppänen (2008) added new business functions, different types of partners and developers. They also found new roles for consultants. They added a new value network between Application Software Developers, ASD, and Infrastructure Software Developers, ISD, and end-customers. Also they divided the system and infrastructure integrator function into channel and system integrator functions. Figure 7 represents their view. Siira (2012) grouped the business functions as Partners, Suppliers, Intermediaries and Consultants.

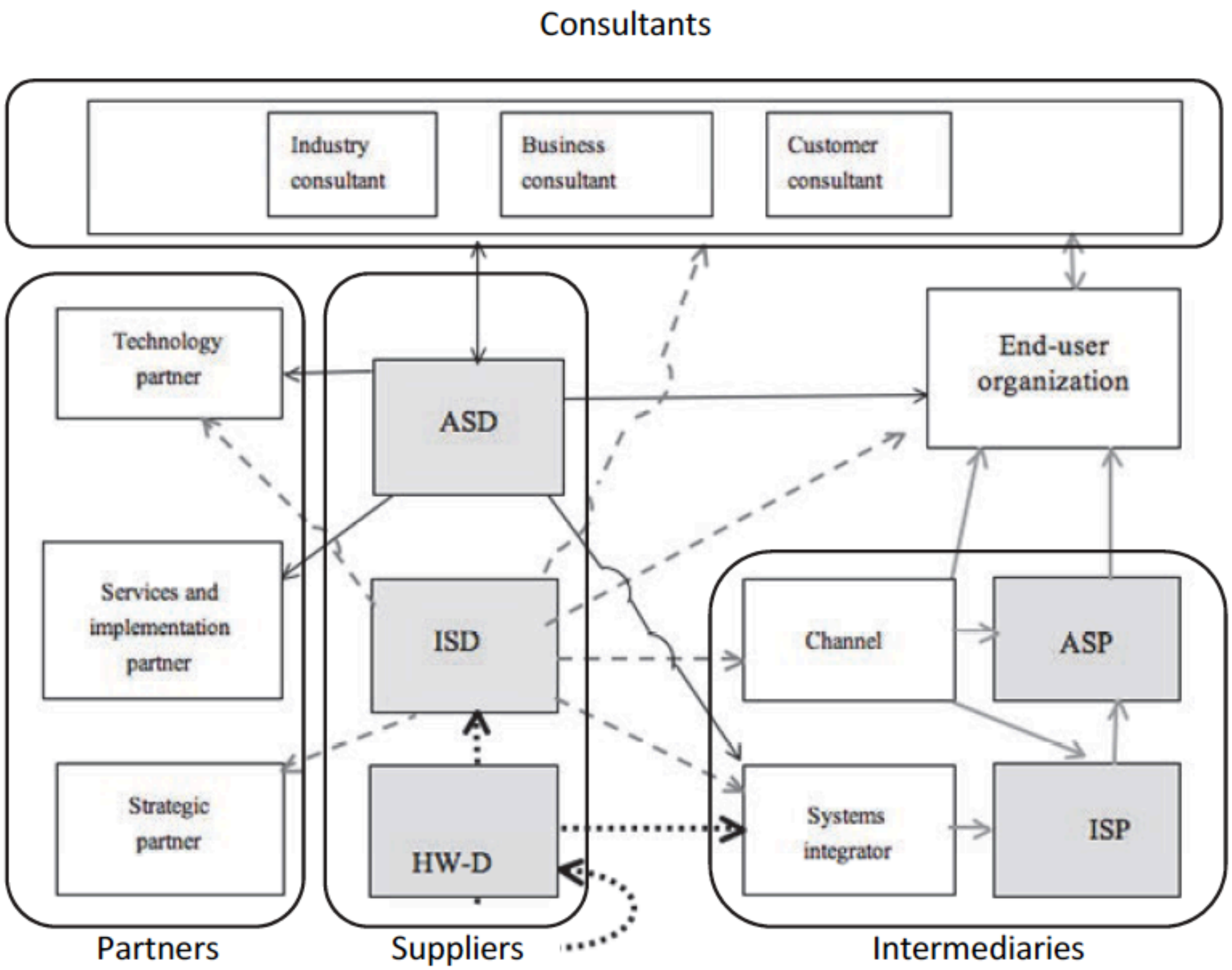


**Figure 7: Conceptual framework for value networks in software industry (Siira 2012, adapted from Warsta & Seppänen 2008)**

Key players of software value chains perform activities that are needed to deliver a working solution to a customer. ASDs and ISDs are both key players and software developers. The ASD develops the application, maximizing market share by attempting to meet the needs of multiple end-user organizations, and emphasizing core competencies like technical and project management skills in software development. (Messerschmitt & Szyperski 2003)

SUPPLIERS

According to Jansen et al. (2009b), at the developer level an organizational entity designs, builds, and releases software functionality within a software ecosystem. Furthermore, a software developer concentrates on decisions regarding its products and services. On the other hand, they try to differentiate between software development and software supply. Different delivery methods for a software exists, for example, product along with a service or embedded in a hardware product.

The end-users for infrastructure software are both application developers and operators. The ISD must be cognizant of the requirements imposed by a wide range of applications and the needs of application developers. This supplier benefits from economies of scale in studying only a representative set of applications. Infrastructure software that attracts many applications offers more value to its end-users, a form of indirect network effects. (Messerschmitt & Szyperski 2003)

The difference between the software products of these two actors is that the software product of the ASD (e.g., application software) fulfills detailed requirements of various end user groups, but the software product of the ISD (e.g., infrastructure software) is a service platform for different types of software applications. An ASD must take into consideration and understand the implications of the application for the end user's business processes and organization structure. ISDs have the same challenge as ASDs. An ISD must understand a variety of different types of applications and their needs to be able to develop infrastructure software suitable for several different types of applications. (Messerschmitt & Szyperski 2003)

Warsta & Seppänen (2008) identified HW-Ds in the framework. They argue that HW-D firms belong originally to the ecosystem where they have an important role in overall information and communication technologies and in creating value. They especially have an important role in the ISD business but they can also act as a system integrator in the ecosystem.

## CONSULTANTS

The industry consultant analyzes and conveys the needs of a vertical segment (e.g., financial industry) or horizontal business function common to all businesses (e.g., accounting), and how they can be expressed in application software features and capabilities. (Messerschmitt & Szyperski 2003)

Business consultant's role is to understand specific end-user context. Often ASDs provide configuration options and leave flexibility to mix and match modules to end-users. In a given end-user environment, different compositions of applications may meet specific needs. Making use of these options is an important component of provisioning, one that is closely tied to the needs, processes, and structure of the end-user organization. An important aspect of provisioning is thus making adaptations for the end-user organization and training its workers. (Messerschmitt & Szyperski 2003)

Messerschmitt & Szyperski (2003) concluded that a system integration emphasizes the technical aspects, and business consulting emphasizes the organizational and needs issues. The industry consultant focuses on the needs of all firms, and the business consultant focuses on adapting applications for use in particular firms.

## INTERMEDIARIES

Software suppliers try to find the most suitable partners for their business. The partner candidate must commit to the software supplier's product in order to market and sell it effectively. Their current customer base should have the potential for sales of the supplier's product. Candidates should know the market idiosyncrasies well as well as be able to cover the geographical markets and technical requirements when considering sales and implementation activities. (McHugh 1999)

A software supplier expects commitment and sales from its partners. On the other hand, partners expect successful business to be created by the software supplier's product. Contracting parties agree about the level of commissions, which may be connected to sales targets. The software supplier may require that a certain number of personnel and a specific budget amount would be committed to the sales and marketing activities related to its product. Negative aspects of partner agreements are the penalties for not achieving targets and the terms for dissolving a partnership agreement. A times, there must be agreement about the terms of exclusively. (McHugh 1999)

According to McHugh (1999) a good partnership relationship requires active attention from both sides. A channel partner needs adequate training, share of markets, and immediate marketing and technical support to be successful in its business. If a software developer has a large partnership network, it may classify the partners into different classes or tiers depending on such attributes as size of the partner or its various capabilities. (McHugh 1999)

However, if a software supplier wants to keep control of some of the sales activities, it may lead to conflicts with contracting parties when both parties expect to be involved in a specific sale. In these situations, the sale can be managed as a joint activity or parties may agree that the software supplier itself concentrate on bigger customers, or on certain vertical markets or industries, and the rest of the markets will be left to its partners. (McHugh 1999)

In general, the role of the intermediary in a marketing channel is to add value and reduce costs in the channel. From a customer's perspective, channels are required to help customers find suitable products or services. Intermediaries build an assortment of products and services from different suppliers so that their product offering is attractive to customers. They also make products and services available to customers at a certain place and time so that they are obtainable by customers. (Coughlan et al. 2001)

From the supplier's perspective, intermediaries ensure that products and services are reaching the right kind of customer segments. The role of the intermediary is to make marketing channel transactions routine in order to increase the efficiency of the channel. Without intermediaries, a supplier needs to interact with every potential customer, which increases the costs of the marketing channel. (Coughlan et al. 2001)

TYPES OF INTERMEDIARIES

The system integrator specializes in provisioning. This role takes responsibility for acquiring software from application and infrastructure suppliers (in the latter case, usually more than one), makes all this software work together and with the supporting infrastructure equipment, and installs and tests the software. The value added by the system integrator is the emergent capabilities arising from this integration. In the course of interoperability testing, required modifications to modules are sometimes identified, and normally it is the original supplier who implements any such modifications. In addition, there is often a need to create custom modules to integrate with acquired modules, or even to aid in the composition of those modules, so some implementation may be required. The important role of the SI in making the application and infrastructure work together is the primary argument for grouping the provisioning of application and infrastructure. (Messerschmitt & Szyperski 2003)

Messerschmitt & Szyperski (2003) also brought up independent software vendors, ISVs, who acquire applications from software companies rather than develop them internally, and creating new business this way. They specialize in making or selling software, designed for mass or niche markets. Specialized products generally offer higher productivity to organizations than more generalized software such as basic spreadsheet or database packages.

The ASP provisions and operates an application, offering it for use over the network. The ASP can be viewed in two complementary ways. It decomposes provisioning and operation from use, or it allows the end-user organization to outsource provisioning and operation. It is also viewed as a different way to sell software: instead of licensing software to the end-user organization to provision and operate, the software is licensed to an intermediary who manages the provisioning and operation. The software supplier may become an ASP itself, in which case it becomes a service provider with its own internal application software development. The ASP model is often described as selling software by rental rather than licensing, but its essential business feature is outsourcing provisioning and operation. (Messerschmitt & Szyperski 2003)

Messerschmitt & Szyperski (2003) assumed that the ASP operates a portion of the infrastructure (data center) and hence is also and infrastructure service provider. Nevertheless, the ASP licenses and operates the application, and the ISP purchases or licenses and operates the hardware and software infrastructure (computers, storage, network, operating system). The primary argument for separating application and infrastructure operations is economies of scale in sharing a common infrastructure over multiple applications. (Messerschmitt & Szyperski 2003)

## VALUE-ADDED RESELLERS

Kotler (1997) presented that a value-added reseller, VAR, in the IT industry mainly customizes the computer hardware and software for individual clients or customer segments and earns a price premium in the process. VARs include normally strategic VARs such as sales partners and value-added resellers, and box-moving VARs, which are sales distributors or sales agencies (Niu 2009). Brinkkemper et al. (2009) distinguish VAR and Value-added partner, VAP, who adds services to a product instead of adding products to a software supplier's product.

The value proposition for VAR is mainly acceptable profit margins and sales opportunities that can be created by the software supplier's product. The VAR require strong marketing and sales support from the software supplier, and preferably, a strong brand name. (Niu 2009)

The main advantages of using VARs come from supply chain management, for example, extended market coverage, specialization, customer contacts, and lower costs. Also good marketing knowledge is seen as an advantage, as it reduces selling costs and risks. Moreover, the possibility of increasing sales in certain business segments and selling skills are also seen as advantages. In general, VARs add value to the supplier company's product and service to end customers. (Niu 2009)

From the end-customer's point of view, the benefits of using VARs come, for example, from one-stop shopping, responsive service levels, reduced service and maintenance costs, and improved cultural and communication links with a VAR. This requires a VAR to understand the customer needs and requirements to provide the right kind of information about their products and features. (Niu 2009)

Nonetheless, there is always room for opportunistic behavior and the possibility that intermediaries will extract rather than add value. In some cases, the middleman's profit is viewed as a disadvantage, because suppliers consider intermediaries as channel parasites rather than marketing assets. They fear poor market management, inadequate communication, and that the intermediary's objectives may conflict with theirs. Most importantly, a software supplier may feel that they lose control to external entities and customers. (Niu 2009)

Siira (2012) summarized definitions of VARs as intermediaries that may (1) act as sales partners, (2) integrate a complete solution from hardware and software components, (3) provide solution implementation, (4) customization services, (5) complete their own software development, (6) offer consulting services, (7) act as authorized representatives for end-user companies, (8) offer software applications and related hardware hosting services, and (9) offer various types of training.

### 2.2.5 Network Management

Möller & Halinen (1999) categorize network management into four interrelated levels to manage the complexity of industry networks. The first management level is "industries as networks", where industries are described as networks to understand companies and their behavior. The second management level is "managing focal nets and network positions – firm in a network". Its purpose is to understand the company's position in the network. Furthermore, the focal net consist of those actors that management values as relevant and are inside the company's view. Möller & Halinen (1999)

Third management level is "managing relationship portfolios". At this level, accompany makes decisions about which activities it executes internally and which it will execute externally using other network actors. From the management viewpoint, relationships should be managed as portfolios because different relationships require different actions to ensure profitability. Möller & Halinen (1999)

The fourth network management level is "managing exchange relationships", which highlights a company's ability to create, manage, and conclude important relationships. There is also a need to evaluate the future value of a relationship. Möller & Halinen (1999) Business relationship portfolio should consist of different types of business relationships; some should be long-term, some shorter-term, and some could even be ad hoc types of relationships (Low 1997)

A business relationship portfolio is under continuous change. Some existing relations are put on hold or even terminated and new relationships are established. There is also an on-going learnig process regarding to relations. (Low 1997, from Siira 2012)

According to Möller & Halinen (1999) network management requires certain capabilities. A Network visioning capability includes management skills and competencies that are needed in creating valid views of networks and their potential evolution. Network management capability refers to the ability to mobilize and coordinate the resources and activities of other actors in the network. This capability is needed especially in value creation networks such as supplier, customer, and R&D networks. At the first level of network management, special attention should be paid to value activities that add value to network actors, especially to end customers. The portfolio management capability includes both analytical aspects and organizational aspects. (Möller & Halinen 1999)

# 3 RESEARCH METHODOLOGY

Research in business and management focus on a topic that is of relevance to one or more of the business management disciplines. Myers (2008) lists accounting and finance, commercial law, economics, human resource management, logistics and supply chain management, organizational behavior and organizational development, information systems, management strategy and international business, marketing, and operations management as areas that belong under business management disciplines. This research focuses on the disciplines of management strategy, international business, marketing, and information systems.

According to Myers (2008) there are several proposed paradigm categorizations for qualitative research. It is categorized to positivist, interpretative and critical research. A positive research attempts to test a theory and in that way increase the understanding of the theory. Interpretive research assumes that access to reality is only through social constructions, and attempts to understand phenomenon through the meanings that people assign to them. Critical research assumes that social reality is historically constituted and that it is produced and reproduced by people. It performs critique of the prevailing social situation, but can also suggest improvements. (Myers 2008) This research falls into the interpretive category, because it tries to help to understand the meanings and intentions of the organizations being studied. Also, the aim is to make generalizations that are bound with the research context.

This chapter gives the reasoning for selecting research approach as well as research method and data collection methods for the study. Additionally, empirical data analysis is briefly described. Also it presents an outline for the research process.

## 3.1 Research Approach

According to Myers (2008) qualitative research methods are designed to help researchers to understand people, what people say and do, and the social and cultural context within which people live. Qualitative research studies real situations, not artificial ones. To conduct qualitative research, a researcher must actively engage with people in real organizations. Moreover, qualitative research can be both rigorous and relevant research at the same time. (Myers 2008)

In general, qualitative research approach is best if a researcher wants to study a particular subject in depth. It is good for exploratory research when the particular topic is new and not much previously published research exists on the topic. It is also ideal for studying social, cultural, and political aspects of people and organizations. A major disadvantage of qualitative research is that it is often difficult to generalize over a larger population. (Myers 2008)

This research studies software ecosystem in the context of cloud computing. The study utilizes various sources such as scientific articles, white papers, conference papers, Internet sources and empirical research. Therefore, abductive approach combining theoretical and empirical knowledge suits this research well.

Furthermore, there are studies about software and business ecosystems and value networks as well as about cloud computing paradigm. However, rather few studies exist combining these two topics to study cloud computing ecosystems. The qualitative research approach was selected because the topic is rather new, and because it is important to explore the subject in depth.

## ABDUCTIVE APPROACH

According to Dubois & Gadde (2002) systematic combining is a process where theoretical framework, empirical fieldwork, and case analysis evolve simultaneously, and it is particularly useful for development of new theories. They further discuss systematic combining in terms of two processes: (1) matching theory and reality, and (2) dealing with direction and redirection. Moreover, these two processes are affected by four factors: what is going on in reality, available in theories, the case that gradually evolves, and the analytical framework.

Dubois & Gadde (2012) argue that in systematic combining the confrontation of empirical world and theory is more or less continuous throughout the research process. Also, it is closer to an inductive than a deductive approach, because the continuous interplay between theory and empirical observation is stressed more heavily than in 'grounded theory' where theory is systematically generated from data. (Dubois & Gadde 2012)

The abductive approach is to be seen as different from a mixture of deductive and inductive approaches. An abductive approach is fruitful if the researcher's objective is to discover new things – other variables and other relationships. (Dubois & Gadde 2012)

Dubois & Gadde (2012) conclude that the main characteristic of this approach is a continuous movement between an empirical world and a model world. They further present that during the research issues and analytical framework are successively reoriented when they are confronted with the empirical world. Figure 8 illustrates the abductive research process.

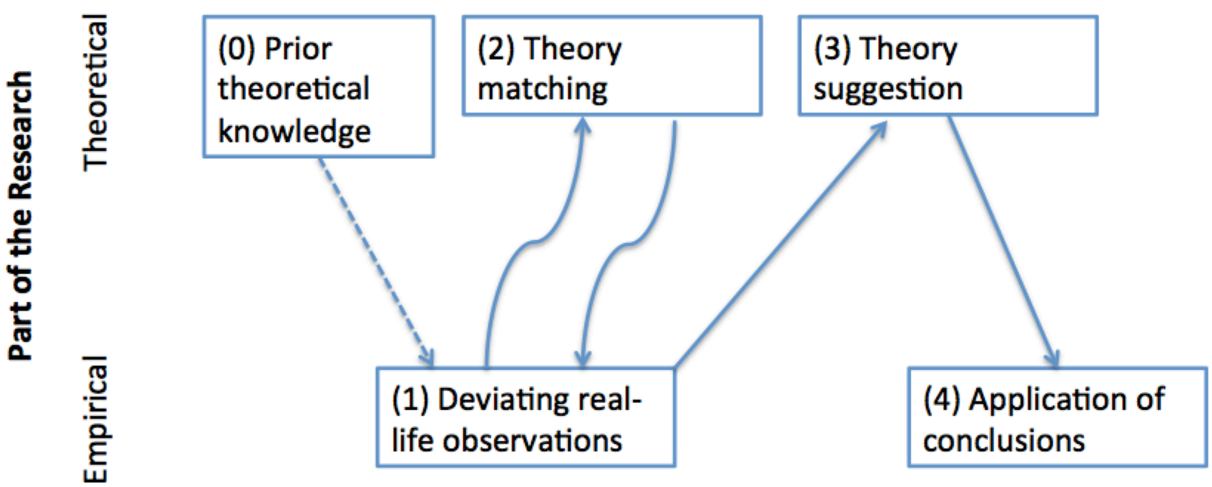


**Figure 8: Abductive research process (adapted from Dubois & Gadde 2012)**

This study follows abductive approach with systematically combining of the theoretical framework consisting of cloud computing and software ecosystem theories with empirical results and further researches over cloud computing ecosystem related theories. Nevertheless, the aim is not to develop new theory, but to explore the topic further and to generate a comprehensive view of the topic. Furthermore, It is expected that the theory on the field is not very comprehensive yet, because the phenomenon is rather new and not studied extensively by scholars yet. The purpose is therefore to complement existing literature with findings of the empirical study and other sources such as Internet sources.

## 3.2 Research Method

Hirsjärvi & Hurme (2010) suggest that the research problem defines which research method should be used. Myers (2008) defines a research method as a strategy of enquiry, a way of finding empirical data about the world. Qualitative research methods were developed in the social sciences to enable researchers to study social and cultural phenomena, whereas quantitative research methods were originally developed in the natural sciences to study natural phenomena.

Action research and case study research are examples of qualitative research methods. Nevertheless, the aim of this research is not to create organizational change and simultaneously study the process as action research does. Case study research is used to establish empirical evidence to convince peers of the applicability of research. (Myers 2008) The research at hand aims at contributing to knowledge about cloud computing ecosystems.

CASE STUDY

According to Hirsjärvi & Hurme (2010) case study is a research method that focuses on one, or at maximum, a few objects. Also, they cite that case study is especially applicable when the research focuses on special cases and when a phenomenon cannot be studied outside the context in which it occurs.

Yin (2009) defines the scope of a case study as being *"an empirical inquiry that investigates a contemporary phenomena within its real-life context especially when the boundaries between phenomenon and context are not clearly evident".* Case study relies on multiple sources of evidence and benefits from prior development of theoretical proposition to guide data and analysis. (Yin 2009)

Myers (2008) argues that case study research does not normally involve participant observation or fieldwork, but most of the empirical evidence in business case study comes from interviews and documents. In the business discipline, case study uses empirical evidence from real people in contemporary real-life organizations. The specific topics could vary from current marketing practices to the implementation of ERP systems in the field of information systems. (Myers 2008)

Case studies in business are usually restricted to studies of one or more business organizations, which is an important identifying feature of case studies in business disciplines (Myers 2008). According to Yin (2009) case studies can involve single or multiple cases and several levels of analysis.

A multiple case study is considered more compelling and the overall study is therefore regarded as more robust. (Yin 2009) Nevertheless, this study utilizes single case study method, because it enables the creation of a deeper view of the phenomenon. For utilizing the study among all the service delivery models of cloud computing and their ecosystem several research methods are applied.

Yin (2009) categorizes case studies in three groups. (1) *Exploratory case studies* are used to explore a new field of research when the exact research question is not clear. They often serve as motivation, define research design and hypotheses; (2) *descriptive case studies* try to obtain information on the particular features of an issue. A phenomenon is described in detail and investigated in its natural setting; (3) *explanatory case studies* are suitable for causal studies. They study an event or setting and its interrelationships in depth.

This research is exploring the new field of cloud computing ecosystems through a multiple case-study serving as a motivation and research design for further study. Hence, this research could be categorized as exploratory case study. The purpose of this research is to gain familiarity, and acquire new insight into cloud computing ecosystem, and thus, the exploratory study come in handy. Furthermore, exploratory research is helpful in formulating relevant hypothesis for more further research.

The empirical evidence of this research is gathered by studying cloud computing ecosystems in different cloud categories through one major company on the field. Interviewing methods are applied to analyze the business case. The case company engages in all the delivery models of cloud computing consisting of SaaS, PaaS and IaaS. In this research, SaaS and Cloud Platforms (PaaS) are taken into a deeper examination. There was not much information available on the IaaS delivery model, and thus, it is left outside the scope of the empirical study.

## INTRODUCTION TO THE CASE COMPANY

Microsoft Corporation is engaged in developing, licensing and supporting a range of software products and services. The company also designs and sells hardware, and delivers online advertising to the customer. It operates in five segments: Windows & Windows Live, Server and Tools, Online Services, Microsoft Business, and Entertainment and Devices. The company's products include operating systems for PCs, servers, phones, and other intelligent devices; server applications for distributed computing environments; productivity application; business solution applications; desktop and server management tools. Microsoft had approximately 94,000 employees in 2011 and the company's annual turnover was $73 billion. (Microsoft 2012)

Figure 9 draws Microsoft's business cloud offerings. Microsoft has two main cloud businesses: SaaS software and PaaS platforms. Also they run their own data centers, and thus, are capable to deliver IaaS services as well. In this research the focus is on the public cloud. MS Office 365 and MS Dynamics CRM represents SaaS model, and Windows Azure PaaS model.

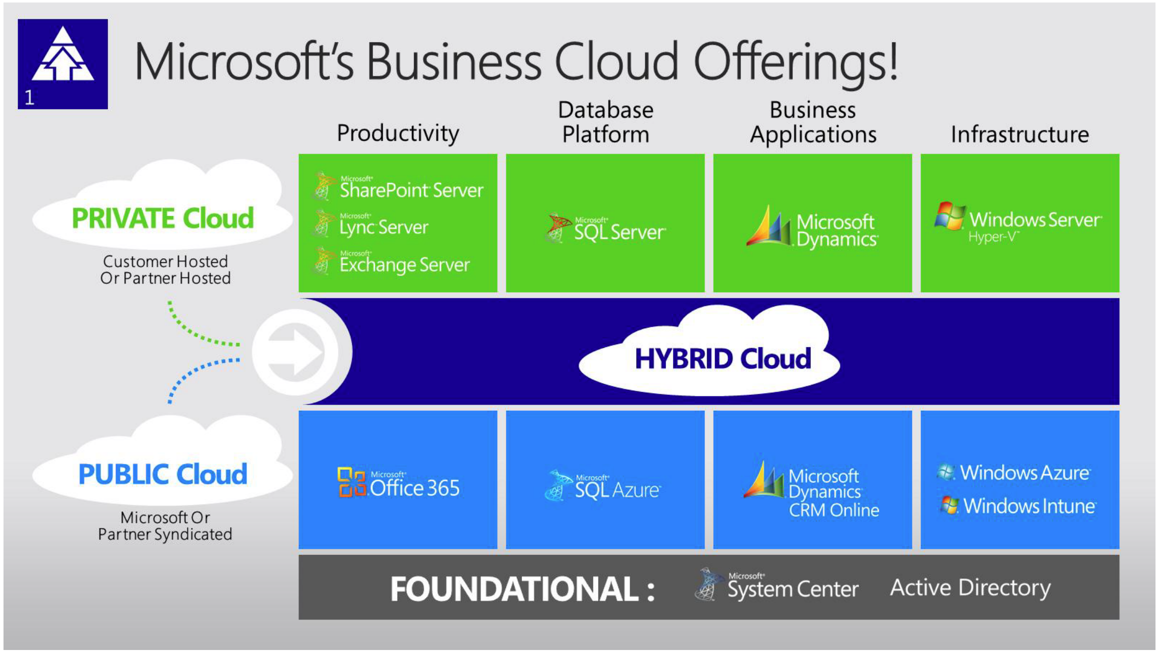


**Figure 9: Microsoft's business cloud offering (Microsoft 2012)**

In general, Microsoft has long been a partner-centric company and has often led the industry with innovations in its partner programs. According to IDC study in 2009 companies within the Microsoft ecosystem employed 6.1 million people and IT-using firms employed 8.8 million in-house IT professionals who work with Microsoft software or products based on it. Solution providers in the Microsoft ecosystem invested nearly $180 billion in product design, testing, marketing, and delivery and brought in $537 billion in revenues, In fact, every dollar made by Microsoft in 2009, the ecosystem made $8.70. The software and services subset made $4.43. (Microsoft 2012).

Microsoft partners include companies that sell PCs, servers, storage and smart handheld devices running Microsoft software; software vendors that write applications that run on Microsoft platforms; resellers that sell and distribute these products, and service firms that install and manage Microsoft –based solutions, train customers and businesses on Microsoft products, and service customers for their own applications. On the other hand, many companies do combinations of these functions. Furthermore, the ecosystem is growing; in 2009 it generated $537 billion in revenues, and in 2010 $580 billion. (Microsoft 2012)

Mäkinen (2012) provided more insight into Microsoft ecosystem in his presentation in Helsinki University of Technology. Figure 10 illustrates Microsoft's ecosystem according to the lectures. This illustration takes into account both consumer (B2C) as well as commercial (B2B) businesses. Also, both on-premise and cloud software delivery models are visible in the figure. Nevertheless, the empirical research studies more about the differences of cloud services ecosystem compared with on-premise as an initial situation.

IDC (2009) compartmentalized different partners in Microsoft ecosystem into:

- Product-oriented partners (e.g., ISV, IHV)
- Service-oriented partners (e.g., SI, Hoster)
- Value-added partners (e.g., VAR)
- Logistics-oriented partners (e.g., Large account reseller)
- Retail logistics partners (e.g., Large retail electronics store)

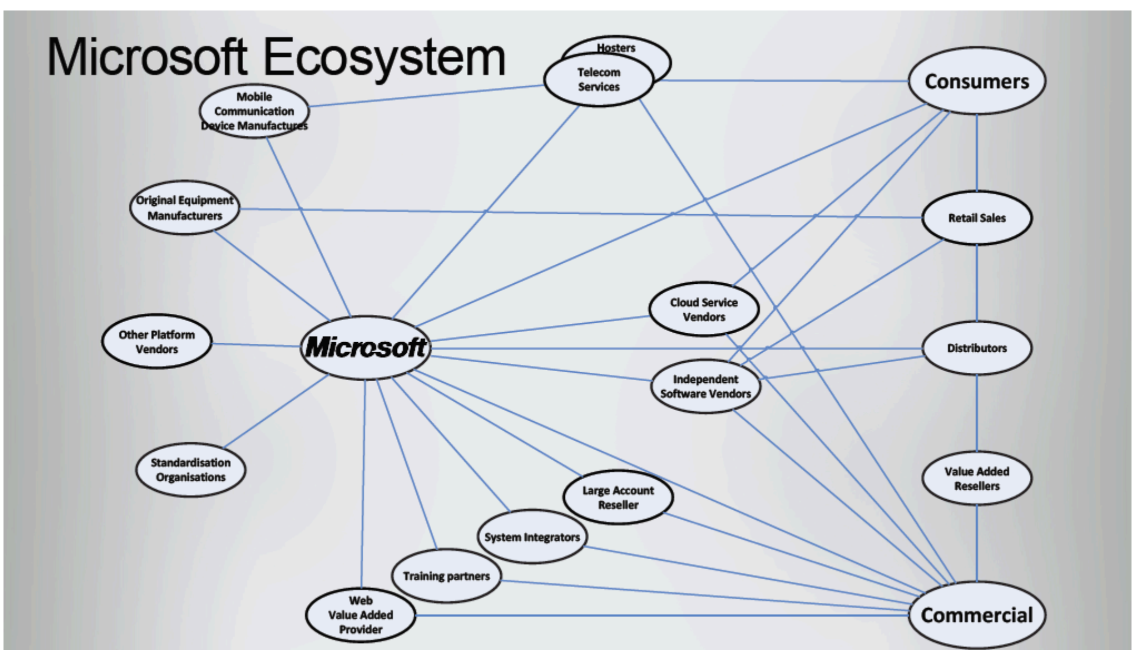


**Figure 10: Microsoft's ecosystem (Mäkinen 2012)**

The relevant ecosystem partners for on-premise business, especially for commercial (B2B) customers, are: product-oriented partners, service-oriented partners and value-added partners.

## 3.3 Research Process

According to Yin (2009) a case process consists of three steps: (1) define and design, (2) prepare, collect, and analyze, and (3) analyze and conclude. In this research, first, the research problem was defined in Chapter 1, the literature review was conducted in Chapter 2. The “prepare, collect, and analyze” step is conducted in parallel in Chapter 4, because this research utilizes abductive research approach. The last step “analyze and conclude” is performed in the Chapters 5 and 6.

EMPIRICAL DATA COLLECTION

The choice of one or more data collection techniques depends on the research problem, research method, and the availability of the data. Most of the empirical evidence in business case study research comes from interviews and documents. (Myers 2008) The empirical data of this paper is obtained from Internet sources, prevailing academic theory and from interviews. In this research the aim is to explore the concept of cloud computing ecosystem. Therefore, the Internet would be valuable source for the study, because the topic is rather new, not much research exists yet, and due to the nature of cloud computing, the Internet is the place where most of the discussion will take place. Apart from Internet sources this research uses interviews as a data collection method.

Hirsjärvi & Hurme (2010) divide interviews to structured, semi-structured and open-ended interviews. The chosen method in this study was qualitative semi-structured interview. It is more flexible than structured interview, and allows new questions to be brought up during the interview as a result of what the interviewee says Hirsjärvi & Hurme (2010). The specific topics explored during the interviews were thought in advance, and were handed over to interviewed persons in the meeting invitation.

Two director-level persons from the case company were interviewed for this research. These persons represent regional area cloud computing and platform management. The purpose of the interviews was to provide real-life business insight into the cloud computing ecosystem.

Also, cloud computing professionals from various other institutes were interviewed. The purpose of the interviews was to provide understanding into the cloud ecosystem basis. Among the interviewed persons were scholars from Aalto University school of Business and school of Technology, as well as from a non-profit organization focusing on bringing together research programmes and businesses. All interviews took place in November – December 2012, and they were face-to-face interviews in Finnish or English at the interviewees' premises.

Interviews that are cited in the research:

- Director A, Microsoft, Espoo, 07.12.2012.
- Director B, Microsoft, Espoo, 10.11.2012.

Interviews conducted, but not cited in the research:

- Scholar, Aalto University School of Technology, Espoo, 09.11.2012.
- Scholar, Aalto University School of Technology, Espoo, 10.11.2012.
- Director, Non-Profit Organization, Espoo, 10.12.2012.
- Consultant, IT Services Company, Helsinki, 12.11.2012.
- Consultant, SW Company, Helsinki, 10.12.2012.

# 4 CLOUD COMPUTING ECOSYSTEM

Chou (2011) argues the popular models (e.g. SaaS, PaaS, IaaS) are irrelevant, because they simply are services that can be consumed, and these services can span the entire spectrum of IT capabilities. Consistent with Chou (2011), Hickey (2011) suggested that the ecosystem is more important than the services themselves, therefore, enterprise and cloud users should focus their attention on an everything-as-a-cloud service ecosystem that draws from various contributors.

Hickey (2011) suggest that *"whether it is software, application, web services, disaster recovery, analytics or other components available in the cloud, a successful cloud play requires an ecosystem of partners and collaboration to tie services together and make an environment work.* Hickey's view is congruent with CloudTimes (2011). According to them *"the technology ecosystem – the industry's entire value chain, including software vendors, hardware OEMs, service providers, distributors, resellers, and, and retailers – will operate very differently from the way it has in the past."*

> Microsoft director A cited: "*It would be evitable that companies with an existing ecosystem around software products and companies would need to change for cloud services to serve its purposes well. On the other hand, companies starting to build their business around cloud would be in different position."*

CloudTimes (2011) argue that the transition to a cloud-centric ecosystem depend on a multitude of factors. They present four factors influencing how quickly the cloud is adopted:

1. The level of customization and integration required to provide enterprises with the cloud-based software they need.
2. The extent to which security, privacy, and auditability issues are resolved in public clouds, and across different verticals.
3. The degree to which consumers – as employees – succeed in actively shaping demand for business applications and related tools and devices.
4. The extent to which new aggregation opportunities open up at the application (SaaS) and platform (PaaS) levels, and the speed with which players move to capture these new

> opportunities – becoming, in effect, the new distributors for the cloud-based technology ecosystem.

CloudTimes (2011) further argue that the formation of cloud ecosystem will depend on the pace at which these trends emerge. For example, the dominating cloud computing model such as public, private, or hybrid cloud and the role of consumers in cloud market would all play role in the future of the ecosystem.

One important aspect is the Internet. However, Murphy (2010) argues that thinking the Internet as an only channel for web services is narrow-minded view that can significantly stagnate. *"There are industries and market segments where people making the purchasing decisions do not spend their time searching the Internet for the best solution. In these cases they turn to trusted advisors for recommendations."*

> Microsoft director B pointed out that *"Cloud services are web services and eventually their distribution channel is the Internet. However, being in the Internet does not guarantee a working business model."*

This would, of course, depend on the business, and thus, this chapter tries to elaborate cloud based ecosystems closer as well as paint a picture of ecosystems built on different cloud service deployment models. Moreover, this chapter represents the empirical study of the paper on hand. It follows abductive research approach, and thus, it is based on a group of findings from various sources. It goes back and forth between existing theory and empirical evidence in order to generate the most likely cultivated explanation.

## 4.1 Cloud Computing Ecosystem Characteristics

Hilkert et al. (2010) provided insight into cloud ecosystems in general by studying the ecosystems of two companies providing CRM software. They argue that unlike on-premise software, ecosystems based on the "as a service" -paradigm are characterized by the fact that the software is no longer sold to the customer as a product but operated on the infrastructure of the suppliers, and thus, provided as a service.

Hilkert et al. (2010) expects the task profile of platform providers to change. In addition to changes, which are directly determined by the as-a-service -paradigm, such as the development of an own multi-tenant server infrastructure or the implementation of a service-based pricing model, providers will most likely have to fundamentally rethink the character of their relationship with customers, integrators and ISVs.

For the user, the shift towards services can be viewed as outsourcing the IT management activities related to maintaining an information system. The user leases software instead of buying licenses, and simply uses external services. For the vendor, it means a highly automated software product business with effective network delivery. It also involves operating as a service business, requiring efforts in the management of customer relations. (Ojala & Tyrväinen 2011b)

The analysis (Hilkert et al. 2010) reveals that besides the informational function, which is largely undertaken by the platform provider itself, the function of building trust will gain further importance. They present a possible scenario for the change in the specific role of the integrators, which would be that in addition to traditional integration services, trust building services such as customized security consulting will become increasingly important in as-a-service -ecosystem. Moreover, they present an example of the necessary of trust: SalesForce.com had to react on customer demands for more transparency and now provides permanently updated data on safety and the system status of the infrastructure on their publicly available portal trust.salesforce.com.

According to Hilkert et al. (2010) the customers of as-a-service -based solutions should find a wider variety of extensions at lower prices. In addition, upfront costs for the integration and configuration of the software solutions will rather decrease, because customers become less reliant on integrators. As a result, they assume that integrators undertake more confidence-building functions in as-a-service -ecosystems, because their function of customizing and integrating the software solution becomes less relevant.

When customers on on-premise solutions were tied to providers because of extensive expected switching costs, this lock-in is much lower. Therefore, it can be assumed that as-a-service - platform providers will increasingly invest in customer loyalty. (Hilkert et al. 2010)

## CLOUD ECOSYSTEM VALUE

According to Hickey (2011) to provide value, the cloud needs to be a collection of various services from various providers, and the traditional model needs to be forgotten. A cloud ecosystem must require little or no capital investment, reduce expenses and offer unlimited capacity.

Gorti (2012) listed a few benefits of cloud ecosystem:

1. To increase value of the software to customers, and thus, to increase the lifetime value of the customer.
2. Prospective customers will perceive solutions stronger with the ecosystem
3. Ecosystem is natural brand builder as everyone who is part of the ecosystem is trying to make the software provider successful.

Schuller (2007) views are on common ground with Gorti (2012). They also add that, especially SaaS ecosystems create a synergistic effect and positive sum game for end user. He also cites that the concept of the ecosystem allows for the exploitation of its participants to the benefit of the end user.

Ojala & Tyrväinen (2011b) studied cloud ecosystem (value network) evolution. They argue that the cooperation in value network did not merely give financial benefits, but also knowledge and intangible benefits. In the case they studied, the actual revenue came through the network operators (intermediaries). In addition, the value in the network benefited not only the customers (end-users) but also other actors in the network.

Ojala & Tyrväinen (2011b) presented also the possibility of important indirect relationships in the value network. In their study, the case company’s relationships with its customers demonstrate indirect relationships in which the value does not come directly, but through the partners in the network. However, this indirect connection was also one of the most important, as the entire revenue stream comes from the end-users.

Hurvitz et al. (2012) presents that the ecosystem helps to reallocate some of the customers large value gain back to the vendor. When a vendor deploys an ecosystem and populates it with value-added partners, it is providing the customer more value while also making it more difficult for the customer to leave in events of teetering dissatisfaction. Nevertheless, the ecosystem can be considered as a win-win, as long as the customer is aware that it will affect their replacement mobility. (Hurvitz et al. 2012) Figure 11 illustrates the ecosystem effects to customer replacement mobility scenario in SaaS.

According to Schuller (2007) the on on-premise model greatly reduces a customer’s replacement mobility which would generally correlate to a reduced customer flight risk for the vendor. Regarding to their explanation, replacement mobility is the product of having substitute options coupled with the ability to leave the current software choice. On the other hand, flight risk is the risk of a SaaS provider losing a customer due to the customers’ replacement mobility. A reduced flight risk means that even though the customer dislikes the product, they would probably continue to invest in it by purchasing small upgrades, support, and customizations from the vendor. (Schuller 2007)

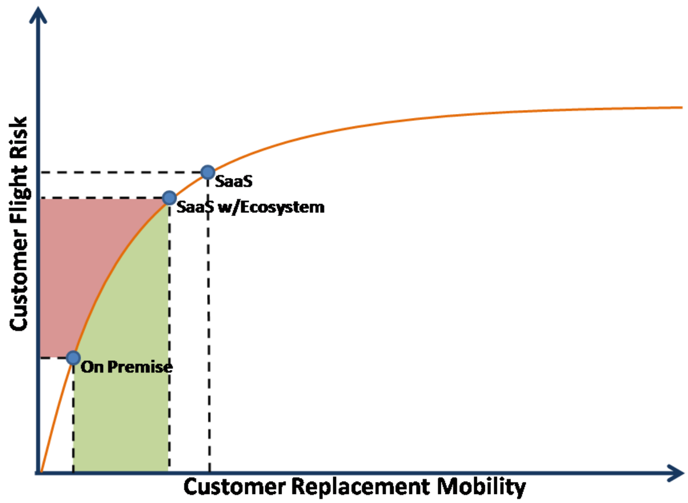


**Figure 11: Customer replacement mobility illustration in SaaS ecosystem (Schuller 2007)**

In a SaaS scenario the customer replacement mobility is greater, because if a customer can access their data, the cost of switching from one vendor to a substitute is much less pronounced than in the on-premise model. (Schuller 2007) In Figure 8, the area on the left side of the curve represents the value loss for the vendor when contrasting with the on-premise model. The right area represents the value gain for the customer.

Schuller (2007) argues that an ecosystem helps to reallocate some of the customers large value gain back to the vendor. When a vendor deploys an ecosystem and populates it with VARs, it is providing the customer more value while also making it more difficult for the customer to leave in events of teetering dissatisfaction. In the case of customer replacement, the customer would not only just need to find a substitute SaaS service, but also an ecosystem deriving equal value. (Schuller 2007)

Mishra (2012) brought up also a concern over cloud ecosystems. The issue of security in a cloud environment will be valid even in partner ecosystems. After all, it is not just about the opportunity that cloud service providers have at hand – it is also about their reputation that is at risk.

### 4.1.1 Cloud Ecosystem Composition

According to CloudTimes (2011) the technology related ecosystems have long depended on a series of tight relationships among a number of fundamental groups along the value chain, for instance, ISVs, OEMs, SIs, distributors, LARs, and VARs, and retailers. Traditionally, ISVs develop and customize software for large enterprises, small and midsized businesses, and consumers. Further downstream are the various distributors, which sell or resell, integrate, and customize software and hardware for the ecosystem. (CloudTimes 2011)

Dubey & Wagle (2010) agree that in the cloud delivery model, partnerships are likely to change. They argue that some competitors may become partners if their interests align on a common platform. Just as likely, some intermediaries may find themselves cut out of a direct relationship with the developer and the customer unless they can find a way to add value. (Dubey & Wagle 2010)

CloudTimes (2011) argue that three changes will occur into traditional partner ecosystem when the ecosystem evolves to a cloud-based world. First, the role of traditional IT delivery players will very likely decline. Second, the value of customization and integration will likely decline, especially in the SMB market. Finally, certain delivery and selling assets will likely increase value. (CloudTimes 2011)

According to CloudTimes (2011) the new ecosystem offers plenty of opportunities to create new sources of value, and many different types of players are converging on the cloud. Nonetheless, players must create their own vision of how the space will evolve and how they can shape the outcomes to their advantage. Figure 12 presents the composition of generic cloud computing ecosystem.

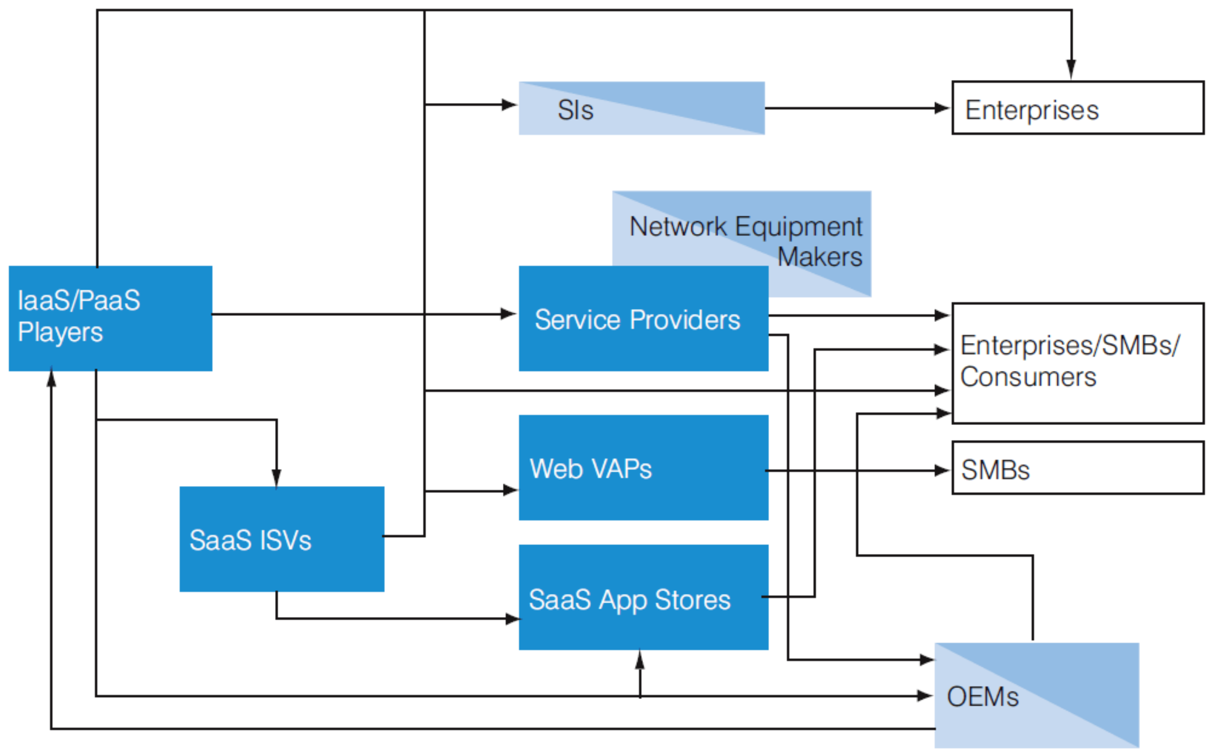


**Figure 12: Illustration of cloud computing ecosystem (CloudTimes 2011)**

The figure consists of partners of a IaaS/PaaS/SaaS vendors such as SIs, Service providers, VAPs, SaaS app store, and OEMs. It further outlines network equipment makers as ecosystem participant, providing solutions to service providers. It distinguishes a few end-customer types: enterprises, consumers, and SMBs depending on the channel mentioned to reach the particular type.

CloudTimes (2011) presents a list of players who will occupy the new ecosystem – including old and new players. (Table 3) This table represents comprehensively different roles in the ecosystem, but it does not distinguish between hardware and software.

**Table 3: Players in the new cloud computing ecosystem (CloudTimes 2011)**

| Player (Partner) | Definition |
|---|---|
| **Web and Cloud Masters** | End-to-end IaaS through SaaS players with huge data centers |
| **Virtualization and Automation Software Specialists** | PaaS –focused players partnering broadly, seeking to set standards |
| **Enterprise Software Specialists** | Similar to cloud masters, but focused on enterprise suites |
| **Pure-Play ISVs** | Broad swath of SaaS ISVs vying for pieces of cloud market |
| **Integrated Giants** | SIs and outsourcing powerhouses with asset-heavy offers across IaaS, PaaS, and SaaS |
| **Asset-Light Integrators** | Already strong in outsourcing; partnering for IaaS; making asset-light belts |
| **Service Providers** | Role evolving, with many going asset-heavy and exploiting reach and cloud-relevant assets |
| **Equipment Makers** | Computing, PC, and handset/device OEMs seeking to exploit device proliferation; network equipment players looking to enable NaaS services and play selectively in PaaS |
| **Web VAPs** | Fragmented, but could leverage strength in Web services into cloud |
| **Aggregators** | Potential new class of SaaS and PaaS players, including SaaS app stores |

Mishra (2012) added that the partners in the ecosystem combine to provide not just cloud technology support, but also services like sales enablement, demand generation, joint marketing events, and go-to-market services. Moreover, partners may also bundle and cross-sell each other's offerings. For instance, a technology vendor may sell the services of a systems integrator. It may use its own channel for this purpose. Also, apart from using or selling each other's products the partners might also go in for a revenue sharing arrangement for the product or service that's delivered as a whole to the customer. (Mishra 2012)

Mishra (2012) brought up the accountability towards customers. One of the partners becomes the single point of accountability and is responsible for quality of service and support for the customer. This means that partners are also liable for the performance issues of the products or services from other partners despite the fact that several heterogeneous service and technology providers come together to participate in a partner ecosystem. (Mishra 2012)

### 4.1.2 Evolution of Cloud Ecosystem

According to Ojala & Tyrväinen (2011b) when a firm enters the market of launches new product, it is important to assess the potential partners who might benefit from the product, and what these benefits might be – in other words to consider how a firm's product or service might create value for the partner's product portfolio. Also they cite that in that way, the firm can motivate its partners in the network to act in pursuit of a common goal. In their study, the cloud service provider firm motivated its value-adding partners to act as a marketing channel towards the network operators; this was done by offering new services that expanded the mediators' product portfolio and made it more attractive for the network operators. (Ojala & Tyrväinen 2011b)

Ojala & Tyrväinen (2011b) studied also the evolution of a partner ecosystem in cloud computing. According their research, when a firm develops its product further, there may be a need for new partners, and/or earlier partners may become unnecessary ones from its network. In their research, the firm entered the market by using partners who provided access to the network operators. Initially, the channel to the end-users was via portals, which provided complementary services. In this market position the case firm itself acted as additional market channel for the game licensors. (Ojala & Tyrväinen 2011b)

When the case company gained stronger position and was able to provide a full product that satisfied the requirements of the network operator's, it was able to simplify entire value network and to make it more efficient. The changes in the case company's value network were based mainly on transformations in the market environment, and product development. However, the company was still dependent on the network operators that provide services to end-users. Nevertheless, they were able to get access to resources controlled by other firms; it acquired a position in the value network such that its product played an important role and gave added value to the network operator's existing product portfolio. (Ojala & Tyrväinen 2011b)

## 4.2 Software-as-a-Service Ecosystem

In general, SaaS applications transform multiple seller-buyer relationships into a single subscription SaaS service, obtained from a provider who orchestrates the underlying network. The network takes care of activities related to, for example, upgrading software versions and to subscribing computing capacity on-demand from an infrastructure vendor. (Ojala & Tyrväinen 2011b)

According to Tyrväinen & Selin (2011) the main sales channel in SaaS is direct personal sales supported with Internet -based marketing communication. They further cite that this would be applicable when the potential number of users is high. Nonetheless, in their study, Internet as such was not much used as a sales channel.

Gorti (2012) suggests that for several SaaS products, traditional reselling models do not work. This is because of the low monthly price of the software, and thus, reselling commissions may not make economic sense. Furthermore, the marketing and sales costs of SaaS company are so high as a percent of revenues that a whole range of traditional, global software distribution and reselling channel are unviable for several SaaS companies. (Gorti 2012) This is similar view as Tyrväinen & Selin (2011) presented. Regarding their study, marketing and sales costs in SaaS may easily exceed the revenue for the first year, and thus, the key performance indicators for customer relationship management would be customer lifetime value and churn rate.

Dubey & Wagle (2007) argued that the compensation structure, for both internal sales and channel partners, will need to change. Additionally, commissions will have to be based on ongoing customer usage and revenue rather than on the sale of large up-front licenses.

SAAS ECOSYSTEM COMPOSITION

Murphy (2010) argues that SaaS companies need to stop thinking like software companies, and think more like they are part of a supply chain. The intermediary might sell the product to the end-customer, but the SaaS vendor still controls their use of the system. Furthermore, *"SaaS vendors attempting to fit their subscription revenue model into traditional channel relationship* *are having a hard time attracting intermediaries with purely financial incentives."* (Murphy 2010) This would cause SaaS companies to rethink their incentive structure to compensate and motivate – not only their own people, but also their channel partners.

> "*The main channels for Microsoft SaaS based services are value-added partners and syndication partners. Both channels offer complementary coverage into markets. Also there is prepaid channel for pay-as-you-go service and of course direct sales via the Internet" (Director A, 07.12.2012)*

Figure 13 draws Microsoft's SaaS delivery side partner network in both enterprise and consumer markets.

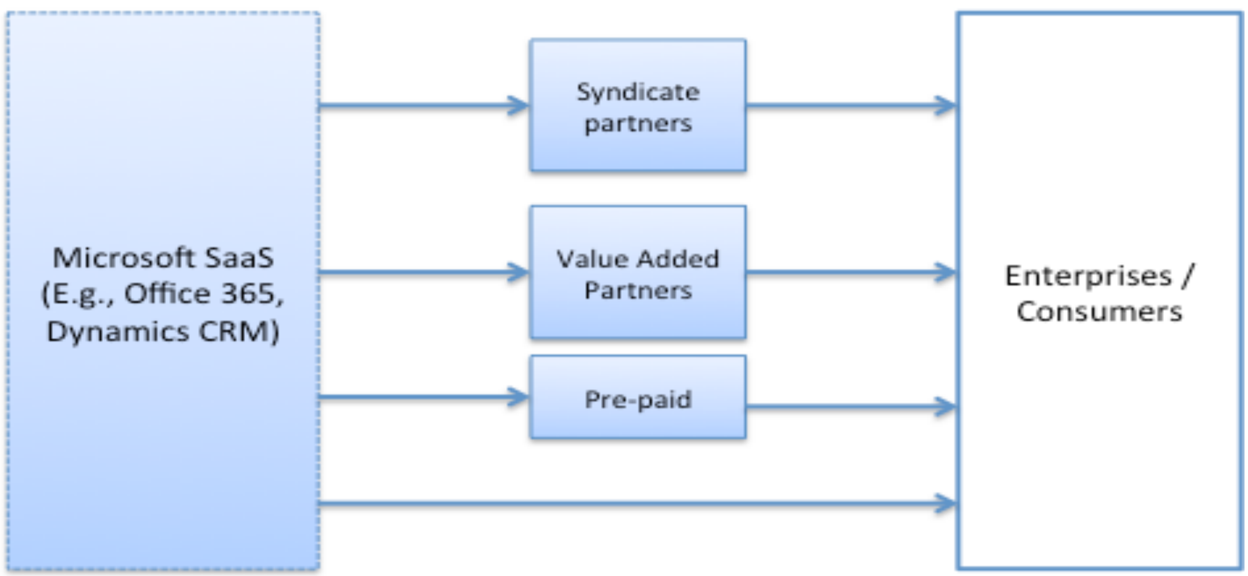


**Figure 13: Microsoft's SaaS channels**

Syndication partners consist of telecommunication companies and hosting partners, which have a large coverage into small- and midsize businesses. The syndication partners are partners that own the billing relationship with the end customer. But for the majority of partners, Microsoft is doing the billing itself. The customers will be billed by Microsoft and the partners will receive their quarterly payments from Microsoft on active seats. This billing method applies for Microsoft Office 365 deals. (Bekker 2011)

Syndication helps Microsoft to address concerns of one major group of committed partners that have broad enough market reach to potentially result in some massive market share growth. The purpose of syndication partners is to include Office 365 with services such as Web hosting, broadband, security, finance solutions and mobile services. Prepaid channel for Office 365 is mainly used for retail channel to push Microsoft's app suite. (Bekker 2011)

> *"Revenue streams can come from partner program and community fees and increased product revenue due to positive network effects. Product revenue from the ecosystem can come from reselling products or from service fees or from license fees. Software partners can also help increase license revenue from customers by promoting the software vendor's solution in a new market of industry." (Director B, 10.11.2012)*

Furthermore, Mallaya (2010) distinguished three different roles in SaaS value network:

- *Agent*: qualifies and refers a new customers to the cloud vendor
- *Reseller*: provides Tier-1 support, training, delivers white-labeled software configured to a particular vertical
- *SI or ISV*: defines business process flows, customizes and integrates with other legacy and SaaS applications, using the SaaS platform. Extending the SaaS application to deliver value-added offerings.

Mallaya's (2010) views apply mainly in business applications where end-user training and business process adaptation is needed. According to Microsoft director A, similar roles apply in the case of SaaS based MS Dynamics CRM.

## PARTNERS' NEW ROLE

Established integrators could offer additional services, like legal counseling services, involving aspects of individual forms of contracts and the potential risks, which could arise from the global distribution of the IT infrastructure. In doing so, integrators could use their reputation to convince those customers, who are still critical for as-a-service –solutions especially because of security concerns. However, ISVs that could rely on their contractually protected position within the ecosystem so far are likely to face greater competition in as-a-service -ecosystems. (Hilkert et al. 2010)

Hilkert et al. (2010) suggest that moving away from a small number of partners bound by contracts towards a market-organized ecosystem will make it inevitable for platform providers to develop new skills in the management and orchestration of ecosystems.

> "*Valued added partners take a portion of service fees, but would not rely only on them. They concentrate mainly on value added services such as buying services, contract management, service management, multiple vendors management, and consulting, for example, helping with updates, business processes, etc." (Director A, 07.12.2012)*

According to Mallaya (2010) the total amount of channel work for a cloud-based system versus an on-premise one for complex ERP software is roughly the same: *"the difference is that in on-premise case, there is a lot of the low-value, low-margin work, such as hardware and software installs, upgrades, patching, tuning databases, etc. In the SaaS model, all of that work is eliminated, the margins on the remaining work is much higher and the channel can now focus their efforts on even higher value activities such as business process re-engineering, multi-system integration, reporting, dashboards, etc."*

Mallaya cited, the value proposition of channel partners in cloud computing ecosystem could be higher. Microsoft director agreed with this, and added how customers see the value.

> *"The value proposition for channel partners towards customers is that the customers could, for example, (1) increase revenue opportunities by streamlining processes and improving productivity, (2) integrate more easily with other systems, and (3) make better decisions by getting high quality information out of their systems." (Director A, 07.12.2012)*

Mallaya (2010) presents that partners should bring in high-level business, for example, accounting and finance expertise as well as vertical industry domain expertise to provide value for the customers. Also, they pose a challenge to cloud companies, because they would need to align their distribution strategies with the type of product they are selling in terms of availability of local expertise. These are congruent with the findings of Murphy (2010)

In the case Mallaya (2010) presented, the right partners were people who have accounting knowledge, not the typical technology based SIs. The case company selected partners who can also bring technology, development and deep integration skills with Web services knowledge. Many of the cloud computing partners had technical skills, but not ERP or vertical expertise, while many of the traditional ERP partners had terrific vertical and ERP experience, but not yet much in terms of web services. (Mallaya 2010) This view is congruent with Microsoft director's interview:

> *"Because, especially, SaaS products are highly standardized, value-added partners have better possibilities to add value to the delivery. For example, by (1) localization; in the case of same service applies for UK, Finland and India, the partner may provide country localizations. (2) Industry specialization; often industry characteristics are similar in the different parts of the world, and thus, by specializing the partner may globalize itself." (Director A, 07.12.2012)*

Another way to increase revenue is through vertical integration, by offering additional value-added services such as outsourced solutions, where partners manage cloud-based IT infrastructure on behalf of customers. The cloud offers partners the opportunity to expand their traditional IT managed and outsourced services (such as backup and disaster recovery) to include cloud-specific managed services. (Mallaya 2010)

Furthermore, traditionally channels value added service has also been acting as a risk buffer. Some channels exist solely to absorb risk, like wholesalers and investment banks. Enterprise SaaS and software channel partner invest in sales, service and support capacity in advance, absorbing the risk of fluctuating demand. On the other hand, the channel can absorb risk from either direction. (York 2010)

## CHOOSING PARTNERS

Generally, channel partners add value by finishing the unfinished work that the vendor and customers start, but for business reasons can't complete. They simplify and speed up adoption by shouldering tasks that they can do better, cheaper and faster. The greater the gap between software, especially SaaS, vendor's service and customers' ultimate needs, the greater the value delivered by the channel partner and the greater the channel opportunity. (York 2010)

York (2010) further listed few key considerations for a SaaS channel strategy:

1. Primary channel is the Web; if you can't sell the product on the Web, either you should not be in SaaS business, or it is not really SaaS.
2. If you cannot sell it on the Web, how can you expect the channel to sell it?
3. Channels rely on market pull; you sell, they deliver.
4. Think outside the VARs; non-traditional channels are where it is.

The views by York (2011) are congruent with Microsoft director's views:

> *"an important sales channel in SaaS is the Web. Customer acquisition costs should remain low in SaaS. However, it is not a matter of low total cost of ownership software, but selling a subscription software." (Director A, 07.12.2012)*

Furthermore, customer segment such as size or type of the business defines whether company's own sales force or channel partner is used to reach the customer. This would require right type of partner as well. In SaaS business a significant factor's are, for example, the corresponding service, product's readiness, and automation level of the sales process. (Director A, 07.12.2012)

Murphy (2010) argues that in traditional software the channel partners had to have some level of technical expertise, but SaaS would significantly expand the type of company that could fill the role. It is up to the vendor to fully understand the role of intermediaries in their market and how to leverage the existing relationships those 3rd party companies have with their target end customers. The companies that have traditionally done business through traditional channels, and who are moving into SaaS are also having problems figuring out the appropriate way to leverage those relationships. (Murphy 2010) Furthermore, Microsoft director added which partners are misaligned in cloud ecosystem.

> "*Technology-centric VARs and SIs have the most trouble with cloud services – especially with SaaS. They are misaligned with the vendors at the business model level and there is little or no technology to manage." (Director A, 07.12.2012)*

PARTNER MOTIVATION

In cloud service business majority of costs occur up-front whereas profits come over a long term. The costs compared to on premise packaged software business are more or less equal, but services portion is emphasized in cloud computing. The cost structure generates a contradiction between software vendor's cost structure and partners' expectations, because partners would need to invest heavily in sales and marketing up-front to generate business. Therefore, software vendors should apply up-front partner commission structure to cover partners' sales and marketing fixed costs besides a percentage share of pay-per-use fees. Further incentives can be applied when, for instance, getting new revenue streams opened with new customers. (Director A, 07.12.2012)

The lifetime value aspect is congruent with York (2010b): the only difference between SaaS sales compensation and sales compensation for software or other product is that the vendor should pay based on the lifetime value of the deal instead of the unit price of the product. However, lifetime value may appear to be an overly complex metric, because it is a proportionate to recurring revenue. Moreover, in SaaS with a recurring revenue stream, the value of the deal is not as clear cut as the price of a software license. The true value of a subscription deal is the present value of the future cash flows, which amounts to summing up all the recurring revenue over time, taking into account churn, and discounting it by cost of capital.

York (2010b) presents a few calculations for SaaS compensation plans:

- SaaS commission % = target commission at quota / quota in recurring revenue
- SaaS quota = target # of deals x avg. deal value in recurring revenue
- SaaS sales compensation = commission % x actual sales in recurring revenue

From which recurring revenue can be measured monthly, quarterly, or annually, because the sales commission percentage scales accordingly. Once a time frame for recurring revenue is chosen for calculating the commission percentage, it is critical to stick with the same recurring revenue time-frame throughout the SaaS sales compensation plan.

Further incentives can be applied when partners are able to make fixed period contracts of cloud services. (Director A, 07.12.2012) However, York (2010b) argues that regardless of the duration of the fixed contracts the baseline commission should be the same, because in a simplified form happy customers tend to renew their contracts, and the recurring annual revenue is same in one year and three years contract. Also, implicitly the difference in value is the cost of capital typically even 5-20% depending on the source of funding. This implies that the best approach is to pay commissions up-front based on the recurring revenue, and then apply some penalties on short-term contracts. (York 2010b)

## NETWORK EFFECT

Hurvitz (2011) presents that when SaaS vendors become well-established brands in the market they attract an ecosystem. For example, a SaaS vendor with thousands of paying customers opens up its programming interfaces to other ISVs. These vendors create software that sits on top of the infrastructure of the SaaS vendor. Therefore, they only need to write their industry-specific code. They don't worry about middleware or business process services or other complex programming. In addition, they can market their software through SaaS vendor's portal or through partners' direct sales force. This has become a standard model used by SaaS vendors to build their brand and power in the market. (Hurvitz 2011)

In terms of company valuation, Murphy (2010) argues that a large user base could raise the valuation. With a niche B2B SaaS product, this large user base is likely not going to matter as much as the number of paying customers, unless that glut of users is adding value to the business. (Murphy 2010)

According to Murphy (2010) a large pool of users can be quite valuable and lead to more revenue. For example, a SaaS vendor can:

- Up-sell to get them pay to use the system or to buy more
- Sell information on how they use the system
- Expose their eyeballs to advertisers
- Learn from their behavior and sell that intelligence to industry
- Learn from their behavior and leverage that in product management
- Build a community from those users and customers

- Leverage network effect data to secure better terms with suppliers on behalf of customers

Moreover, vendors, users, customers and partners all should benefit from the network-centricity of SaaS through network effect data, collective intelligence, and a true ecosystem of users, partners and integrated 3rd parties to an extent not possible with non-SaaS business architectures. (Murphy 2010)

According to Murphy (2010) SaaS provides end-customers with the benefits of interconnectivity with 3rd party applications and data services. Also, due to its collaborative nature as a single-instance and multi-tenant applications, SaaS can be seen in everything from collaboration across customer accounts to more open forums accessible from within the application to share data with the rest of the users or customers (York 2010).

One way vendors can leverage a large number of users in a Freemium model is to help create ‘value pull’ when intermediaries such as VARs, SIs or distributors are involved in the buying process. It is often up to a vendor to create interest with the end customer. (Murphy 2010, York 2010) This would preferably make the end customer pull the intermediary to deliver it. Also, the key in value pull situation is “try before you buy”, not necessarily freemium. (Murphy 2010)

## 4.3 Platform-as-a-Service Ecosystem

Chou (2012) suggest that the cloud ecosystem view takes the cloud platform view one step further, and includes partners and third parties that enable their services to participate in an ecosystem. Further, the platform with the largest and most diverse ecosystem gets to ride the paradigm shift and enjoy a dominant position for that particular generation (Chou 2012).

According to Beimborn et al. (2011) the PaaS ecosystem consists of three groups of actors: the PaaS provider, the ISVs, and the SaaS customer. In the case of aPaaS (application based PaaS), a software firm offers a core application usually SaaS. In order to increase scope of this product, the firm also provides a platform which enables ISVs to develop add-ons for the core application. Second group consist of ISVs who deploy and develop applications or add-ons for the core application aPaaS on the PaaS platform. In the third group, customers receive the application developed by the ISVs as SaaS service from the platform provided by the PaaS provider. (Beimborn et al. 2011) Figure 14 illustrates the typical interaction model between the parties involved in an aPaaS scenario.

However, from a contractual perspective, the PaaS scenario can imply that the customer has to engage in multiple contractual arrangements with different parties, which PaaS provider try to reduce. (Beimborn et al. 2011)

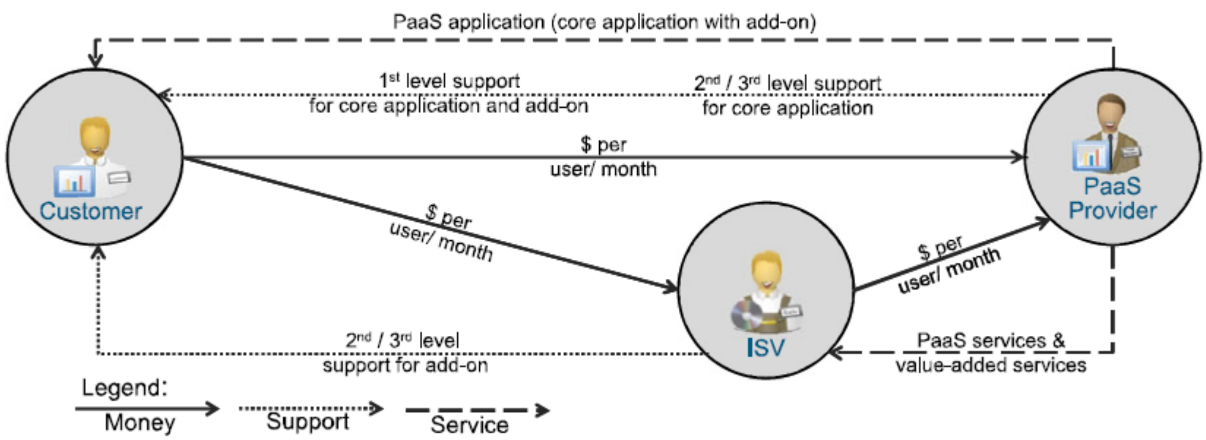


**Figure 14: Flows of money and services in the PaaS scenario (Beimborn et al. 2011)**

Beimborn et al. (2011) argue that the aPaaS provider operates the platform and, based on this, provides both the core application, and the add-ons, developed by the ISV, to the customer. They suggest that normally the provider will receive a proportional share of the ISV's revenue.

On the other hand, in a pure PaaS scenario the platform provider will normally charge fees for additional services, for example, for certifying the application /add-ons. The customer pays the fees directly to both the ISV and the aPaaS provider. In this case, the latter will provide the complete support for the core application and the first-level support for the add-on. This way the provider will become the first contact for the customer. Normally, in case of incident, the PaaS provider will first identify the source of the problem and then, if necessary, involve the ISV to provide support as well. (Beimborn et al. 2011) This view is congruent with Microsoft director.

*"Microsoft builds services around PaaS to make the ecosystem more interesting for partners. For example, configuration, billing trials, images, etc." (Director A, 07.12.2012)*

For traditional vendors, the essential things are a broad platform that allows them to supplement and enhance their applications, and to decide which platform is used in the licensed model. Platforms for SaaS are similar in that they require vendors to establish a set of application programming interfaces (APIs) and standards for data exchange among applications. However, platform partners in the SaaS model can also build onto the back-end infrastructure of applications, where the billing, metering, provisioning, and advertising functions may reside. This approach can reduce development costs for partners, but it may also increase costs for the platform provider. (Dubey & Wagle 2007) In the cloud platform (PaaS) scenario, Microsoft's ecosystem is similar to the view of Beimborn et al. (2011). Channels are either direct or via ISVs.

## PARTNERS' NEW ROLE

Hilkert et al. (2010) suggest that moving away from a small number of partners bound by contracts towards a market-organized ecosystem will make it inevitable for platform providers to develop new skills in the management and orchestration of ecosystems.

According to Beimborn et al. (2011) in PaaS model, each of the actors pursues their own interests. They argue that in terms of development, marketing, and sales, the platform services provide substantial cost saving potentials for the ISVs, e.g., by using standardized certification and marketing processes of the platform. Hence, ISVs might gain access to a previously closed market of potential customers. They also cite that PaaS can be seen as special configuration of the software value chain which offers the potential to create a sustainable win-win situation for all relevant stakeholders. On the other hand, the usage-based fees for the PaaS services allow a market entry with low startup costs. (Beimborn et al. 2011)

With shared services, the ISVs run the risk of giving up strategic areas of control within their value chain to the platform provider. ISVs might get locked into the platform due to proprietary standards, which are common on platforms. Therefore, ISVs need to develop and maintain their applications on multiple, competing platforms. This method is called "multi-homing". (Beimborn et al. 2011)

Furthermore, from the user perspective, the software acquisition and operations model changes from a software license and in-house operations model to an external operations and usage fee model. The usage fee can either be a usage based or a usage independent fee. (Beimborn et al. 2011). These findings are congruent with the cloud services revenue models by Ojala 2012.

Beimborn et al. (2011) present a potential risk for PaaS providers. Due to the virtualization of the service provisioning, safeguarding the infrastructure and technical operations of the application is part of the PaaS provider's duties. Also they suggest that service availability is the largest hurdle for cloud computing. Thus, the user should agree with ISVs and ISVs with PaaS provider on certain SLA, which contractually regulates the service availability, their protection, and possible consequences in case of non-compliance (Armburst 2010, Beimborn et al. 2011).

According to Beimborn et al. (2011) the economic aspects for the platform depend on the PaaS model. Whereas pure PaaS mainly aims at transforming existing idle capacities and fixed costs into earnings or on generating revenue by renting out resources, aPaaS provider is primarily interested in increasing the attractiveness and marketability of the core application.

## NETWORK EFFECT

Beimborn et al. (2011) brought up the existence of network effect in PaaS. They point out that a platform will only be attractive for an ISV if it can expect many users. This again will only be the case if many ISVs are active on the platform, i.e. an ISV's decision in favor of a certain platform depends on the behavior of other ISVs.

To reach a critical mass of positive decisions among the group of relevant ISVs, the platform provider has to develop adequate marketing strategies. Therefore, it needs to create expectations about whether a sufficient number of users can be acquired. Consequently, the success of the platform depends on multiple market sides, whose decisions are determined by the behavior of both the same and the other side. (Beimborn et al. 2011)

# 5 DISCUSSION

The discussion chapter stands for a walkthrough of the key findings in the empirical research. First chapter 5.1. evaluates the theoretical implications, and chapter 5.2. discusses the more practical managerial implications of the key findings.

## 5.1 Theoretical Implications

This chapter evaluates the key findings of the research from a theoretical perspective. Main theories applied in this paper were presented in the chapter 2. These were cloud computing paradigm and software ecosystem.

The findings of this research brought additional insight into the framework of eight different actors presented by Messerschmitt & Szyperski (2003), and which was extended by Warsta & Seppänen (2008) and by Siira (2012). In this study, the intermediary companies on the delivery side were changed to correspond the cloud computing context. Consultants were supposed to remain the same, and also, suppliers were divided into PaaS/IaaS vendors and SaaS vendors. Intermediaries in cloud computing ecosystem were found to include SIs, Service providers, VAPs and SaaS app stores, as well as OEMs. From these, SIs work only with enterprise customers, whereas rest of the intermediaries work with both enterprises and consumers.

Furthermore, this research provided additional insight into software ecosystem studies (Bosch 2009, Iansiti & Richards 2006, Jansen et al. 2009a), because it revealed some new characteristics of cloud delivery model software ecosystems, which could be understood as a sub-topic of software ecosystem.

Not only discussed the research at hand cloud computing ecosystem characteristics, but also benefits of such an ecosystem. This contributed to the research by Bosch (2009) who discussed reasons why the current recent in software business has been towards ecosystems. Also, empirical research brought up network-effect related peculiarities. However, these were not elaborated in the theoretical part of the research.

Nonetheless, the research at hand did not bring additional insight into ecosystem health and ecosystem strategy related theories (Iansiti & Levien 2004) that were elaborated in the theoretical background.

According to Hilkert et al. (2010) integrators, which adapt software solutions to the individual needs of customers and support the integration into their processes, represent typical examples of intermediaries in the software industry. This study added multiple ways that partners add value on top of software vendor’s offering in cloud computing ecosystem.

The theory (Ferrante 2006, Ojala 2012, Ojala & Tyrväinen 2011b and 2012) presented revenue models in cloud computing. The research brought additional insight into revenue models used in SaaS and PaaS networks as well as into network partners’ value proposition.

This research utilized abductive approach as the research approach, and combined various sources in data collection. The empirical interviews conducted during the research either validated or added new insight into the existing theory. For example, the studies, which combined value networks into cloud computing context (Ojala & Tyrväinen 2011a & 2011b; Tyrväinen & Selin 2011) supplemented by empirical evidence in Microsoft’s context.

Moreover, two previous researches (Beimborn et al. 2011; Hilkert et al. 2010) presented characteristics and composition of SaaS and PaaS networks. The empirical data from Microsoft interviews contributed in to these studies. Also, empirical data gathered from Internet sources painted clearer picture of cloud computing ecosystem composition.

Lastly, this research brought practical insight into ecosystem managing partners by revealing characteristics of partner management in cloud computing context. The former studies on this topic, which was complemented, included Ojala & Tyrväinen (2011a), and Möller & Halinen (1999).

## 5.2 Managerial Implications

This chapter discusses the key findings of the research from more practical viewpoint. This chapter outlines few practical proposals for practitioners of cloud computing ecosystem. In general, for the practitioners, this research helps to comprehensively understand the role of ecosystem in cloud computing. Also it helps to understand how to approach the construction of an ecosystem in cloud business.

The study clearly showed that ecosystem is in the heart of cloud computing business. Secondly, cloud changes the way the prevailing software ecosystem operates. Further, it was clear that companies need to adapt into the new paradigm when entering into the cloud age.

For participants of the ecosystem this paper proposes that the value proposition which worked in on-premise world need to be fine-tuned to meet the needs set for partners in the ecosystem. For customers the cloud can bring new opportunities. For example, it facilitates customers to source "pieces" for total solution or architecture from where they can get them the most suitable way.

*"As cloud adoption grows, the traditional technology ecosystem is facing disruption – but few players in the ecosystem are fully prepared. The disruption will increase opportunities for many players, including web and cloud masters like Amazon.com and Google, as well as telecom operators and other service providers."* (CloudTimes 2011)

As cited already in the literature review, the cloud presents a high-volume and high-velocity business. In cloud business, the end customer's investment expenses would be funded through capital rather than operating budgets, with no dependence on infrastructure. Cloud further shifts the focus from infrastructure and inventory into sales and marketing, as well as from large up-front investments into recurring revenue streams. These all does not only influence the basis of software business when shifting into cloud, but also generates a need to re-think the ecosystem.

Especially in SaaS companies need to stop thinking like software vendors, and think more like they are part of a supply chain. In this case, the intermediary might sell the product to the end-customer, but the SaaS vendor still controls their use of the system.

Figure 15 illustrates the findings of this research regarding to cloud computing ecosystem composition. The same picture applies for both SaaS and PaaS cases despite the fact that PaaS downstream ecosystem is more straightforward. PaaS ecosystem consists of three groups of actors: the PaaS provider, the ISVs, and the SaaS customer. However, from a contractual perspective, the PaaS scenario can imply that the customer has to engage in multiple contractual arrangements with different parties, which PaaS provider try to reduce.

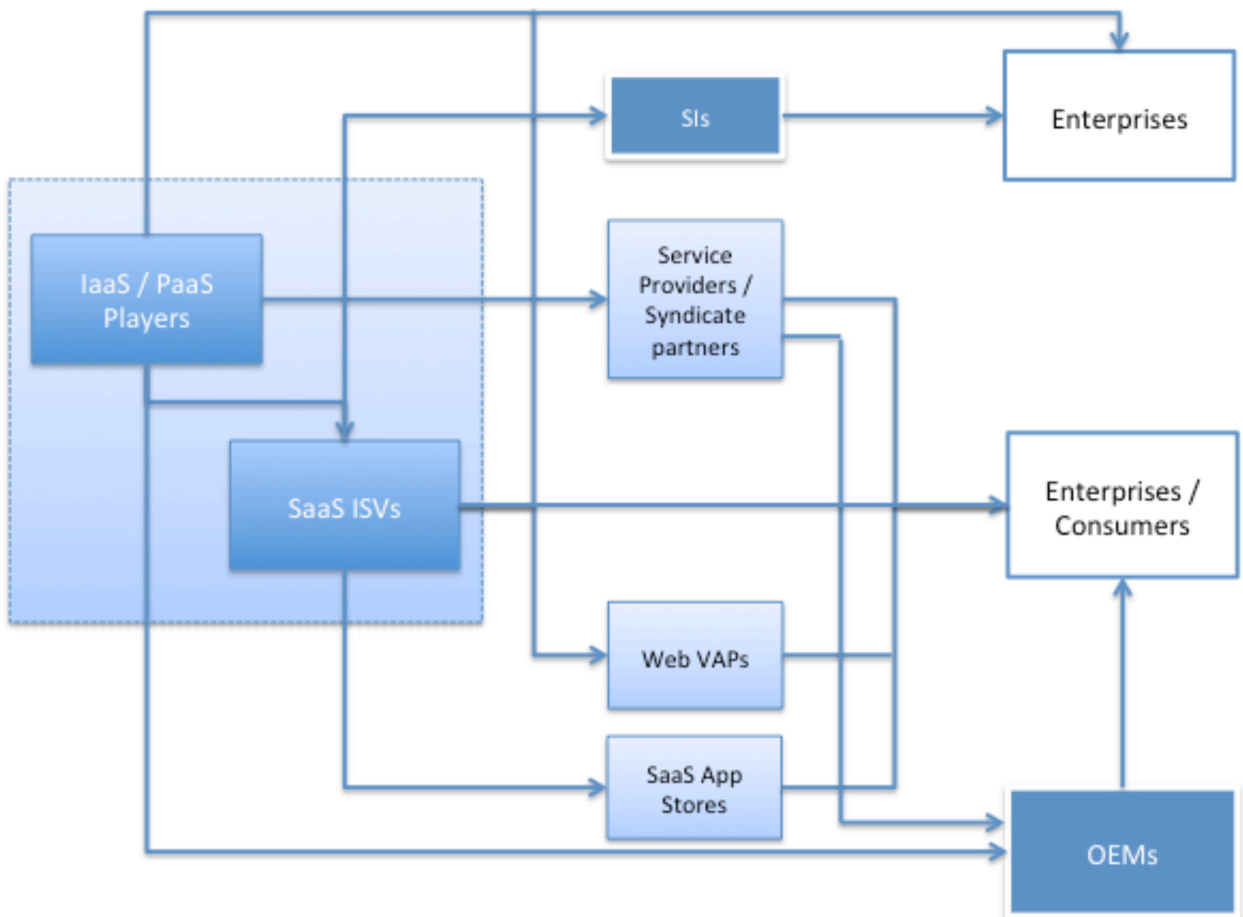


**Figure 15: Cloud computing ecosystem composition**

This view implies that traditional partners such as ISVs, OEMs, SIs, distributors, LARs, and VARs are not necessarily needed with cloud based business models. Nevertheless, the composition of the ecosystem is not unambiguous, and the role of existing partners could also change, or there could be a need for new skills and services in the ecosystem.

The results of this research did not distinguish particularly on the customer organization size between enterprises or small and medium size businesses. However, during the interview at Microsoft the issue was brought up as sales channel differentiator. For example, the right sales channel for approaching small enterprises in cloud business would be VAPs or direct Internet channel. This is especially important when the volume is high, but revenues small, which causes a need to keep direct sales costs low. On the other hand, larger customers require more personal service from the software vendor, as well as larger projects requires system integrators, etc.

From the managerial perspective, this research indicated several tasks for partners in the ecosystem. These include not only cloud technology support, but also value-added services such as sales enablement and go-to-market services, as well as bundling and cross-selling other partners services. One possibility is to establish revenue sharing arrangements for the end customer deliveries. Despite the fact, that ecosystem works together with customers; single point of accountability towards customers would be needed. Marketing and sales costs in SaaS may easily exceed the revenue for the first year, and thus, the key performance indicators for customer management would be customer lifetime value and churn rate.

Revenue streams can come from partner program and community fees and increased product revenue due to positive network effects. Product revenue from the ecosystem can come from reselling products or from service fees or from license fees. Software partners can also help increase license revenue from customers by promoting the software vendor's solution in a new market of industry.

Generally, the total amount of work for partners for in a cloud-based system versus an on-premise is roughly the same, at least in business applications. The difference is that in on-premise case, there is a lot of the low-value work such as hardware and software installs, tuning databases, etc. In the SaaS model, all of that work is eliminated, the margins on the remaining work is much higher and the channel can now focus their efforts on even higher value activities such as business process re-engineering, multi-system integration, reporting, dashboards, etc.

In essence, the right partners were companies who have business such as accounting and finance expertise - not the typical technology based SIs. Furthermore, right partners could bring in technology, development and deep integration skills with Web service knowledge.

Cloud platform enables ISVs to develop add-ons for the core application. In PaaS delivery model it is also possible that ISVs develop SaaS service from the platform provided by the PaaS provider. In both cases, the provider receives a proportional share of the ISV's revenue. For the ISVs, the platform services provide substantial cost saving potential, e.g. by using standardized certification and marketing processes of the platform. Basically, ISVs develop and maintain their applications on multiple, competing platforms. This helps ISVs to avoid lock-in into a platform, i.e., risk of giving up control in their value chain.

In the cloud platform case some competitors may become partners if their interest aligns on a common platform. On the other hand, some intermediaries may find themselves cut out of a direct relationship with the developer and the customer unless they can find a way to add value.

The findings imply that the importance of system integrators that primarily undertake the task of integrating solutions and configuring the software would rather decrease, because the software vendor itself would handle majority of this work. Yet established integrators could offer additional services, like legal counseling services, involving aspects of individual forms of contracts and the potential risks, which could arise from the global distribution of the IT-infrastructure. In doing so, integrators could use their reputation to convince those customer, who are still critical for cloud services especially because of security concerns.

To benefit from the cloud business partners must generate value-added services to complement cloud solutions. In general, a partner should provide customization, integration, training, business process consulting, and other services on top of software vendor's cloud offering to add value for the end customer. This research further indicates that partners should bring in business expertise, for example, finance and accounting expertise as well as vertical domain expertise to provide value for the customers.

Cloud platform providers, whose role in the on-premise ecosystem is production of the core software, will need to take the task of supplying the ecosystem with end customer information.

Furthermore, they will need to rethink the character of their relationship with customers, integrators and ISVs; hence, they need increasingly invest in customer loyalty.

In cloud service business majority of costs occur up-front whereas profits come over a long term. The cost structure generates a contradiction between software vendor's cost structure and partners' expectations, because partners would need to invest heavily in sales and marketing up-front to generate business. Therefore, software vendors should apply up-front partner commission structure to cover partners' sales and marketing fixed costs besides a percentage share of pay-per-use fees.

Moreover, in SaaS with a recurring revenue stream, the value of the deal is not as clear cut as the price of a software license. The true value of a subscription deal is the present value of the future cash flows, which amounts to summing up all the recurring revenue over time, taking into account churn, and discounting it by cost of capital.

The findings indicate that some large software firms also provide platforms, which allow ISVs to develop extensions or add-ons for the software firm's core application. Hence, platform providers should also offer additional services to support ISVs' sales activities and value-added services.

One important topic was also the compensation structure. This would need to change, because commissions will have to be based on ongoing customer usage and revenue rather than on the sale of large up-front licenses. However, especially VARs would be exposed to large investments in sales and marketing, and thus, the partner compensation should take this into account as well.

From an economic perspective, the relation between software developer and software provider changes, but customer still uses the software on demand on the Internet. In the end, PaaS extends the model of SaaS ecosystem to the platform provider as an additional actor.

As cited earlier in the research, cloud business is high-volume and high-velocity business. Consequently, a large user base increases the business opportunities and value of the software company. For example, if a cloud vendor have thousands of paying customers, and opens up its programming interfaces to other ISVs, these partners can create software and services that sits on top of the cloud vendor's offering. In addition cloud computing vendor can market their software through partner's direct sales force.

Cloud platforms will only be attractive for an ISV if it can expect many users. Moreover, this will need many ISVs being active on the platform, because ISVs decisions depend on the behavior of other ISVs. To reach a critical mass of positive decisions among the group of relevant ISVs, the platform provider has to develop adequate marketing strategies to create a value pull from the end customers. For platform providers, movement towards market-organized ecosystem would cause the providers to develop new skills in the management and orchestration of ecosystems. This would enable cloud platform providers to increasingly become orchestrators of their platform ecosystem.

# 6 CONCLUSIONS

The research concludes by answering the research questions based on the findings of the research. Also, the reliability and validity of the study are discussed. Yet the research has certain limitations that are presented. Also several topics were brought up during the research process for future avenues of research.

## 6.1 Answers to Research Questions

*RQ1: What special characteristics are involved in cloud computing ecosystem, and how it differs from on-premise software ecosystem?*

As cited in the research, the technology ecosystem – the industry's entire value chain, including software vendors, hardware OEMs, service providers, distributors, resellers, and retailers – will operate very differently from the way it does in the on-premise world. In the on-premise situation relationship between different participants was emphasized. This included ISVs, OEMs, SIs, distributors, LARs, VARs, and retailers.

In general, a significant change in the roles is expected in cloud computing context. According to the findings cloud computing ecosystem is characterized by two fundamentals: 1) a customer of cloud services would find a wider variety of extensions at lower prices, and 2) up-front costs for the integration and configuration of the software solutions will decrease.

The findings clearly reveal that the task of building trust and managing customer relationships becomes more important for the partners. Therefore, partners should address confidence issues by becoming trusted third party companies in the ecosystem.

In terms of network management, the software/platform vendor may utilize different partners in producing different services for the end solution for the customer. This enables companies specialization to certain capabilities. Consequently, partners with different competences could complement the focal company's skills.

*RQ1.1. What roles are recognized in the cloud ecosystem?*

Cloud represents a significant opportunity to the ecosystem, but it also requires partners to change the way they sell, finance, and manage their businesses. On the other hand, this requires the software vendor to choose partners according to these characteristics, or work with existing partners to transform their business model to match the requirements set by cloud computing.

Furthermore, the value proposition for channel partners towards customers is that the customers could, for example, (1) increase revenue opportunities by streamlining processes and improving productivity, (2) integrate more easily with other systems, and (3) make better decisions by getting high quality information out of their systems.

To summarize, partners (especially VARs) in cloud computing ecosystem can include companies that (1) specialize in cloud-based solutions, (2) focus on specialized solutions, (3) offer managed services including outsourcing. Also, they can (4) offer services on top of software or platform.

*RQ1.2. How cloud computing vendors benefit from establishing an ecosystem?*

This research brought up several benefits enabled by a large user base. These include, for example, selling information on the usage, opening doors for 3rd party advertisers, gathering intelligence from the customer behavior and leveraging that in industry marketing or R&D, and building communities. Not only benefit network-centricity of SaaS customers and vendors, but also ecosystem partners. For them the catch would be software vendor's well-established brand besides the potential customer base.

To summarize, the major benefits of establishing an ecosystem are:

1. To increase the life-time value of the software to customers
2. To help the customers to perceive solutions stronger with the ecosystem.
3. Ecosystem is a natural brand builder
4. Ecosystem (especially network effect) allows for utilization of its participants

Furthermore, besides providing customers and partners more value, ecosystem makes it more difficult for the customer to leave the cloud service. Customer flight risk especially in SaaS is significant, but with ecosystem on place, the customer would not only need to find a substitute SaaS service, but also an ecosystem deriving equal value.

*RQ1.3. How cloud companies should manage their delivery side network?*

The research at hand revealed that when a firm enters the market or launches new product, it is important to assess potential partners who might benefit from the product. Based on this, the firm can motivate its partners to pursuit common goal, for example, acting as a marketing channel. Nevertheless, when the firm develops their product further, there might be a need for new partners and skills.

In terms of partner management, cloud delivery model, especially in SaaS and PaaS, may create contradictions between software vendor's cost structure and partner's expectations. Hence, software vendors should apply up-front commission structure besides a share of pay-per-use fees. The underlying principle is to pay partners based on the lifetime value of the deal instead of unit price of the product.

Further, this research provided calculation principles into SaaS compensation plans. Eventually, the study implied that the best approach is to pay commissions up-front based on the recurring recurring revenue with some impact of contract durations.

## 6.2 Reliability and Validity of the Research

The study was built on theoretical background, which guided empirical research and data collection such as the themes of semi-structured interviews within the case company. Because the nature of abductive research, new themes and observations came into the open during the research.

Nevertheless, abductive research is not deductively valid; conclusions are not inevitably the result of premises, but they could be false even though all the presented premises were true. In general, conclusions are “good enough” in practice. (Dubois & Gadde 2002)

This research applied case study as its research method. In general, a case study lacks reliability and validity. According to Yin (1994) one basic test to define the validity and reliability is via four aspects of the qualitative study: construct validity, internal validity, external validity, and reliability.

*Construct validity* refers to the quality of conceptualization of the relevant concept. This research used multiple sources of evidence. Also, different angles towards the phenomenon were formulated by studying cloud computing ecosystem from SaaS and PaaS angles.

*Internal validity* refers to the causal as opposed to spurious relationships between variables and results. This research lacks internal validity, because it did not involve, for example, logical models to ensure the establishment of causal relationships. Also, the research framework was not unambiguous due to abductive research approach.

*External validity* refers to the extent to which the finding can be generalized to a certain entity. Sufficient statistical generalization is not available for case studies.

*Reliability* demands that a study is without random error, meaning that it can be repeated with the same results. Due to abductive approach this research lacks clarification of research procedures and replication through a case study database. However, notes from the interviews are stored, and the results could be repeated from the same database.

## 6.3 Limitations of the Research

The purpose of the research was to gain familiarity with a phenomenon and acquire new insight into cloud computing ecosystem in order to develop hypotheses, and formulate more precise research problems for the further research. Given the nature of exploratory study, the results of this research are not useful for decision-making as such. However, they can provide significant insight into a given situation.

Yin (2009) argues that commonly case study limits the possibilities of generalizing the results of the research. This research was a multiple-case study, but included only one business case. This prevented cross-unit analysis, which is necessary for feature for generalization theories.

The research was conducted in Finland, but given the nature of cloud computing, it could be generalized in global context. Another issue that may have limited the plausibility of the research was that only two representatives from a large global company were included in the research. Large, global software companies play a big role in the cloud computing context and deserve more attention. On the other hand, cloud computing enables new vendors and smaller companies to enter the market, and thus, more diverse studies are needed.

## 6.4 Suggestions for Further Research

In the further work, the research could be broadened to take into account different participants in the ecosystem. The research at hand was limited to the software/platform vendor's viewpoint. Furthermore, taking bigger and more diversified sample in terms of focal company size, location, and business, into research would widen the results.

Because this study was exploratory in nature, all the research questions would need more study for generalization purposes. Therefore, roles of different actors in the cloud ecosystem as well as cloud ecosystem characteristics could be studied from different angles. These could involve different theoretical approaches such as transaction cost or intermediary theory as well as resource-based view from different viewpoints in the ecosystem.

Another avenues for further research include, for example, studying in more detail cloud computing business network management and network strategies. This leads to the evolution of the network during time depending on multitude of factors. Furthermore, ecosystem strategies and concept of ecosystem health was brought up in the literature review.

One interesting topic which was brought up during the research is also cloud brokers. Future study could try to elaborate the nature and business models the broker companies. Also, this research passed briefly the effects of open source into cloud ecosystem. Open SaaS, PaaS and IaaS support the openness of open source software, and thus, enable end users to avoid vendor-lock-in in most of the cases. Open source software solutions would definitely bring its own characteristics in cloud business and ecosystem.

Broadening the scope to IaaS would be interesting avenue of research. In some cases the roles of IaaS and SaaS vendors may be difficult to understand, for example, between Amazon Web Services and Dropbox. Moreover, studying cloud platforms in more detail would provide additional insight into the phenomenon. For example, platform ‘multi-homing’ was brought up in the empirical study. On the other hand, one should bear in mind that currently cloud computing and services develop on a rapid speed, and thus, the information gotten today may be old tomorrow.

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