How to support transformation from on-premise products to SaaS?

Position paper for future research

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Abstract. This paper reviews academic knowledge for software-intensive business firms' approaches to support transition from on-premise solutions to SaaS. The aim is to increase preunderstanding for future research and review the transformation's impact on business models. The study is restricted to the small and medium-sized software vendors. In addition, embedded software vendors are excluded from the research. In preliminary unsystematic literature review, several business model specifications and canvases used to address the transformation were identified. Firstly, a few of the papers were concentrating on huge software-intensive companies like Oracle, Siebel etc. and comparing their business models. Secondly, other studies were analyzing technology changes as well as threats and the lifecycle of technology. Thirdly, researches were analyzing SaaS platforms like (Microsoft's) Azure or (Amazon's) AWS. The review shows that few works focused on how the smaller enterprise software companies did the transfer, which covers for example personnel, product portfolio, distribution network, market segmentation and revenue model or why they have not even started. This study shows that there is lack of studies addressing this issue and propose further research on the issues, which would benefit small- and medium-sized software-intensive firms.

Keywords: Cloud Computing, Software-as-a-Service, business model in software business, from on-premise to Software-as-a-Service, Software-intensive business.

1 Introduction

Cloud computing and Software-as-a-Service (SaaS) paradigm have gained remarkable popularity in the software industry. According to NIST [37] definition, cloud computing refers *to "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".* There are several different service models inside the cloud computing paradigm; however, most often used are IaaS (Infrastructure-as-a-Service), PaaS (Platform-as-a-Service), and SaaS (Software-as-a-Service). SaaS refers to "*[…] capability provided to the consumer is to use the provider's applications running on a cloud infrastructure"* [37].

For a customer as well as a software vendor, cloud computing and SaaS solutions offer clear benefits. On one hand, a customer will be using the same software version as everyone else. Consequently, there will be less bugs, less maintenance, faster product development for the customer etc. The negative point is that there are no or only a few alternatives to adjust or tailor the software to fit specific customer needs.

On the other hand, the vendor has just one main version to develop, update and keep updated compared to an on-premise alternative, where there may be two versions under support and one new version under development. The positive impact of these all is the improved speed of product development and cost savings because of less concurrent work. The negative impact is, firstly, minor customer requirement coverage. Secondly, this may need increased attention to product management and product marketing. If there is a lack of those activities, it may lead the customer choosing another vendor.

Due to the rising popularity of SaaS solutions, several software companies have changed their business model from selling on-premise products to providing cloud-based solutions. As a notable example, for instance Microsoft has transformed its Office tools from on-premise installed products towards SaaS-like solutions with the new Office 365 service. In addition, it is likely that there are plenty of companies, which are planning of following the same path.

However, the transformation process from offering an on-premise installed product to a solution offered as a service in a cloud is not straightforward. In top of technical challenges, this kind of a transformation process naturally creates change pressures to the company itself and its business model. For example, how an organization, which previous on-premise software product has generated income with both license and support sales, should manage changes in the cash flow when a new SaaS version generates stable, yet in the beginning smaller, revenue stream?

This position paper focuses to study what do academic literature report of this kind of transformation processes. Our focus is specifically on the changes in the business model as well as in the financing of a software-intensive vendor. The aim of the paper is to create a starting point for further studies in this area as well as propose some lines of research. This position paper uses unstructured literature review method [23] to collect relevant primary studies for the starting point. Based on the findings of the literature review, we discuss on potential areas for future work.

The digital transformation impacts the whole industrial world. Because the digital transformation will be everywhere, there will be a risk open the limitations too much towards generic digital disruption. For this paper, we restrict our attention to software-intensive companies, and especially small and mid-size software vendors. The target group is enterprise software vendors and non-software companies have leaved out. The rationality is that large software vendors might have enough knowledge, capital and resources to manage the transition whereas small- and mid-size enterprises might not have capital required nor enough human resources for a new project. Furthermore, we exclude embedded software vendors as their main revenue flow often does not come from selling software licenses. That is, the transition might not create similar changes to their business model.

The remaining of this paper is organized as follows. Section 2 gives an overview of cloud computing research and defines the complex concept of business models. Section

3 presents finding from the literature review regarding different cloud business models and business model elements. The fourth section discusses about the directions of further research and the final section concludes the study.

2 Background

2.1 Cloud computing

The paradigm shift, from on-premise software solutions toward SaaS solutions, seems to be reality nowadays. The SaaS trend seems to be a *de facto* standard or at least approaching the *de facto* on consumer software solutions. [38] On enterprise business software, the picture is not yet the same as in the consumer software.

Marston [33] pointed out two fundamental classification dimensions approaching to study cloud computing: *i)* business issues, and *ii)* technology issues.

However, as this study focuses on the business issues, the issues belonging into the technical perspective will be excluded for keeping the target clear and tight. Therefore, for example issues belonging in the following areas will be excluded from the research:

1. Software product development;
2. Core technologies like virtualization, multitenancy and web services;
3. Software product modulization, product structures and product modules; and
4. Software development methodologies

The consumer software, like mobile phone software, are today more or less platforms where different vendors are producing their applets. Consumers are paying monthly fee or limited purchase price and at the same time, the software vendor pays a fee to the platform owner.

In business software, above mentioned operation model is similar, for example, like SAP has, called SAP EcoHub an online solution partner marketplace. There a single software vendor has a possibility put their software (applet) for purchase by end user. Remarkable is that is only possible for SAP end users who are running it in SaaS format, not on-premise SAP product owners. Other big actors in the field, like Microsoft and Oracle have similar concepts. Of course, for example, SAP is investing huge amounts of resources to go towards SaaS, but it will take several years until the whole on-premise product is rewritten.

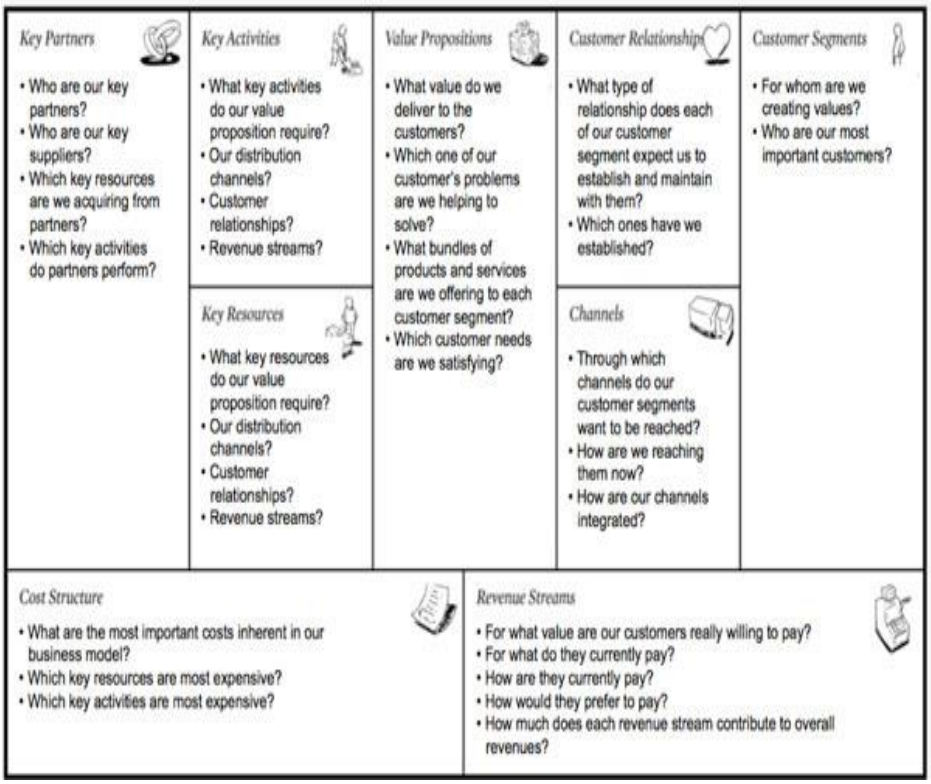
The headache with smaller software firms differs a lot. They have existing product, existing customer base and no platform. The question how jump into SaaS world, might be a question of dead or life. Roughly, based on author's over 20 years' experience of software industry and empirical research, the companies planning to promote a new SaaS product to a market, may be divided into four categories:

1. The first ones have started with something very new without legacy systems headache.
2. The second ones have fight with existing customers with their on-premise installations as well as at the same time try to develop modern cloud-based solutions with new functionalities.

3. The third type of company believes that the momentum is not right to convert the business model because of huge existing cash flow.
4. The fourth have not even started to consider the threats of market change.

In the remaining of this work, we will take a look how academic literature guides the companies belonging into the first two groups.

Fig. 1. Osterwalder and Pigneur's business model canvas [32]



2.2 Business model

A business model is an important concept for this study. As it's seen in the Figure 1 the business model consists of several factors. Later it will be other descriptions of business model like Table 1 and Table 2. Whenever a business transformation is under discussion, it will always lead to a new business model. On practical level, for example the following question will raise: The firstly what the new revenue model shall be? Secondly, is there a need for a new kind of partnering? Thirdly, what are the products and services in offered portfolio? Fourthly, what are the key resources, do those already exists or will it be the starting point to find right resources first?

Osterwalder and Pigneur's [32] presented a framework for analyzing business model and the changes in business model. Their model is nowadays widely known as the Business Model Canvas. While Osterwalder and Pigneur's canvas is not the only one, it is

the most well-known in both academia as well as industrial world. The canvas is presented in Figure 1. In the Business Model Canvas, there are nine factors which all must be analyzed separately and compared to today's status versus future status. After individual factor analysis, the results should be crosschecked.

Osterwarlder and Pigneur's model is not the only one. Juntunen [21] have analyzed different authors and their opinion of business model elements. Juntunen's summarization of the main work on business models is presented in Table 3. It is noteworthy that there are several different works aiming to define the business model and there are different numbers of components from which a business model has been defined from. Furthermore, most of these works have been published in the during a relatively short time period: during 1998–2002.

Furthermore, Da Silva et al. [14] has characterized business models and its elements in five categories. The elements, which they identified to belong in a business model logic, are presented in Table 2. Da Silva's approach differs somewhat from the other approaches, yet there are common elements such as value proposition and earning logic. It is easily possible to see all shown frameworks for business models vary from each other as well all has its own logic.

Table 1. Business model elements (adapted from [21]).

Authors	**Business model elements**	**Number of elements**
Timmers (1998)	Product/service information flow architecture, business actors and roles, actor benefits, revenue sources, and marketing strategy	5
Chesbrough & Rosenbaum (2000)	Value proposition, target markets, internal value chain structure, cost structure and profit model, value network, and competitive strategy	6
Hamel (2001)	Core strategy, strategic resources, value network, and customer Interface	4
Amit & Zott (2001)	Transaction content, transaction structure, and transaction governance	3
Weill & Vitale (2001)	Strategic objectives, value proposition, revenue sources, success factors, channels, core competencies, customer segments, and IT infrastructure	8
Rayport & Jaworski (2001)	Value cluster, market space offering, resource system, and financial model	4
Afuah & Tucci (2001)	Customer value, scope, price revenue, connected activities, implementation, capabilities, and sustainability	8
Dubosson-Torbay, Osterwalder & Pigneur (2002)	Products, customer relationship, infrastructure and network of partners, and financial aspects	4

Table 2. Elements that reflect the business model logic (adapted from [14]).

Element	Logic
Customer value proposition	Understanding and creating products and services that meet customers' needs and help them fulfil their goals.
Earning logic	Designing a revenue model leading towards a sustainable business.
Value network	Designing value-added relationships with partners that represent the extended enterprise of the organization.
Resources and capabilities	Leveraging and repurposing existing or acquiring new resources and capabilities to create products and services of value to customers and generate consequent revenue.
Strategic decisions	Decisions aimed at creating a sustainable competitive advantage.

Luoma [28] pointed out that the determination which IT company is service firm, which is product firm, may be complex. There might be a product firm whose revenue just 20% are license sales and the rest 80% of revenue are services like designing, implementing or operation.

The term product or service company is still unclear and requires deeper research. The most important factor may be is there a common model how those companies behave. Rather often companies have either product or service operations in place. The most of companies have both operations. When investigating the transfer of business model change from on-premise to SaaS it must be sure are people talking about product or service company.

For example, if the company A turnover split is:

- 20% license sales
- 40% consultancy sales
- 40% maintenance

Compared to company B:

- 60% license sales
- 40% services.

The operational business structure will vary remarkable depending the level of product / service allocation

3 Results

Cloud computing start to be common nowadays. A lot of research work has done to justify what is cloud computing. However, the main target in this research is to review what is known on enterprise software firms and how the business model has changed by moving from on-premise to SaaS business model.

For this study, an unstructured literature review [23] was selected as the method. The justification was that the authors were unaware whether there would be enough primary studies for a full-scale systematic literature review. Therefore, a lightweight unsystematic literature review was used to map the current status of the field for further analyses. Based on this unstructured review, a systematic literature review could be implemented later, and the findings of this study can be used as a control group for the review.

The unsystematic literature review was performed so that the authors searched primary articles with different keywords and their combinations. The used keywords included e.g., *cloud computing*, *SaaS*, *business model*, *transformation*, *change*. The searches were done with, e.g., Google Scholar, IEEE Xplorer, ACM Portal and ScienceDirect publication databases.

Articles which were found relevant for this study was selected and read through. If a primary study referred to another primary study, that was not included into, the other primary was acquired and included into the review. We included also other than research articles (e.g., reviews in magazines) if they were finding to belong in the target group. The final set of selected articles are [1-10, 12-22, 24-30, 35-36].

By doing unstructured literature analysis, it was found that there are several alternative approaches to narrow the business model in this context. One fact was already now rising: The business model will be the most important factor if the transfer will be successful or not.

In the following, we will review the literature what was found in the unstructured review. For example, Boilat and Legner [3] has done a research of Enterprise software and cloud computing. They summarized existing research in a table (c.f. Table 1). Their findings were noticeable: *"From multiple case studies covering traditional and pure cloud providers, we find that moving from on-premise software to cloud services affects all business model components, that is, the customer value proposition, resource base, value configuration, and financial flows"* [3]. However, it is worthy to note that their study did not explicitly focus on how to carry out transformation from an on-promise setting to a SaaS solution. Yet, their findings emphasize the importance of business model in understanding the cloud computing paradigm shift in software-intensive businesses.

In addition, existing research divides SaaS environments into subclasses. One alternative for dividing SaaS solutions is based user involvements as Luoma et al [29] have done. They have found three classifications:

- Enterprise SaaS
- Pure play SaaS
- Self-Service SaaS

All those three classifications they have analyzed by financial, resource-base and customer-facing elements. Boilat and Legner [3] used the same division and classified business model element according to these (c.f. Table 3).

Regarding more general business-oriented research on cloud computing and SaaS, there are many studies. Thus, SaaS has started to be commodity. For example, a widely known model how to analyze different factors in cloud computing is a Cloud Cube Model from the Jericho Forum [20]. It has developed targeting to understand different factors around the cloud operations. Cloud Cube Model is illustrated in Figure 2.

Cloud Cube Model has been further analyzed and developed by Chang [7]. Their specialty was identifying different sorts of business types and strengths and weaknesses of each business types in cloud computing. Chang [7] classified cloud computing business models and found eight business types:

1. Service Provider and Service Orientation,
2. Support and Service contracts,
3. In-House Private Clouds,
4. All-in-One Enterprise Clouds,
5. One-Stop Resources and Services,
6. Government Funding,
7. Venture Capitals, and
8. Entertainment and Social Networking.

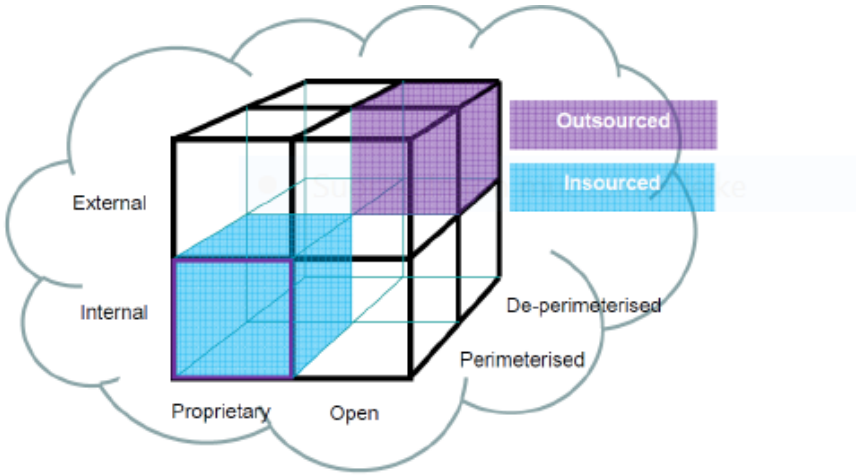


Fig. 2. Cloud Cube Model [20]

Table 3. Existing research on enterprise software and cloud computing (adapted from [3]).

Authors	**Focus**	**Customer perspective**	**Vendor Per-spective**
Benlian et al. (2009)	SaaS adoption by firms	X	
Choudhary (20079	Switch from perpetual software licensing to SaaS and its impact on software quality	(X)	X
Ellahi et al. (2011)	Cloud deployment models, issues of moving enterprise applications to the cloud, and the market evolution for enterprise cloud computing	X	
Janssen & Joha (2011)	SaaS doption in public sectors (ministries, public agencies, municipalities)	X	
Katzan (2009)	Cloud computing from a business and architecture perspective	X	X
Khajeh-Hosseini et al. (2010)	Research challenges for cloud computing from an enterprise or organizational perspective	X	X
Liao (2010)	SaaS business model for enterprise software	X	X
Luoma et al. (2012)	ASP and SaaS firms' business models	X	X
Leimeister et al. (2010)	Actors, roles, and business aspects of cloud	X	(X)
Loebbecke et al. (2012)	Practical case of cloud computing assessment	X	
Mangiuc (2011)	Challenges and risks of moving applications to the cloud	X	
Marston et al. (2010)	Overview of cloud computing; SWOT analysis from a business perspective	X	(X)

Table 4. SaaS solutions classification (adapted from [29]).

Element group	Element	Enterprise SaaS	Pure play SaaS	Self-service SaaS
Customer-facing elements	Value proposition	A mass-customized but complex application that also requires support services	Horizontal, standardized web-native application	A very simple application that is easy to adopt
	Customer segments	Larger enterprises and their IT managers and top executives	SMEs, middle management and end users	Adopted first by end users and individual consumers, then SMEs
	Customer relationship	High-touch, trust-enchanting customer relationships with tailored contracts	Less human contact in deployment required than traditionally, owing a simpler applications	Fully automated self-service; as little interaction with the customer as possible
	Channels	Perform personal sales and employ channel partners	Sales channel is push-oriented, and SaaS firms engage in inbound, high-pressure sales	Outbound and viral marketing used to attract customers to the vendor's homepage. Landing page critical in turning prospects into customers.
Resource-base and value configuration elements	Key resources and activities	Possess domain expertise and utilize an ecosystem of companies as a resource	Both domain expertise (to include best practices into the application) and application development capabilities	Close to zero marginal costs
	Key partners	User partners to deliver value-adding applications and services	IT service providers for infrastructure and support services	N/A
Financial elements	Revenue streams	Vendors charge an entry fee, recurring fees, and services fees	Small entry fee and a recurring fee	Use of freemium model, ad-based revenues or small recurring fees
	Cost structures	Have varying marginal costs, owing to the long sales cycles and required support	Initial development costs may be high, but firms aim for minimal marginal costs	N/A

In a business model transformation, personnel are one of the most critical factors. In computing world and all high-tech industry, there is huge lack of competent people [39]. A business model change to adopt into the requirements of a modern business world is necessary for a company, eventually. At least in Scandinavian, software-intensive firms are not able to change all resources and at same time and start a new product development project with fresh resources. Personnel is a big part of success. Thus far, only Sultan [36] addressed organizational culture in a cloud computing setting. Yet, their focus is on the organizations and their culture, not guiding how to manage transformation as a software-intensive firm.

Transformation from on-premise to SaaS moves the business logic from product business to service business. Cusumano's recent work [12, 13] covers that area; however, he does not give practical guidelines for companies, but instead focus on market-level discussion. Da Silva [14] has analyzed the impact of disruptive technologies to business model comparing Siebel and Sales Force as well as Amazon and Sales Force. It is worthy to note that those companies are huge compared to target firms in this position paper.

Finally, Juntunen [21] has looked the transformation issue by using dynamic capability view and Chesbourgh [9] is more concentrating on innovations in business model. Marston [30] has a business perspective approach for the subject. However, also these studies do not focus on giving practical guidelines for a software-intensive firm.

4 Discussion

The aim of this position paper was to review the current knowledge of academic literature on guiding small and medium-sized software-intensive businesses for transforming their business model from on-premise products to SaaS solutions. In the unstructured literature research, it was found that there are several investigations and research results comparing companies, their status in cloud development and their product portfolios. Mainly the studies in the extant literature have been focused huge companies like Oracle and SAP.

However, there seems to be lack of research to comparing companies how they have done the technology and business model transformation from on-premise to SaaS business. Specifically, there is a lack of studies how smaller firms have achieved the goal. While it is possible that there is such research available; however, there are lack of understanding to support the companies in this kind of transformation and this requires do more detailed research.

Thus, this position paper requires further research concentrating on small and midsize software companies, who are on their way to transfer their on-premise product range to SaaS software. The main goal of this kind of research should be to answer to the following questions:

- How software-intensive firms have handled the transformation and what has been the lessons learned?
- What are the required steps in transformation?
- What has been the critical factors in business model transformation?

- What guidelines could research give to companies that are planning of transforming their product offering and business model?
- How a software-intensive business can satisfy simultaneously both its current customer base, with on-premise installations, as well as the new customers, with wishes for new functionalities in a SaaS solution?

Based on the unstructured literature analysis there are few main limitations that should be acknowledged in the research. Firstly, what is the impact of product / service allocation in business model and business model transformation for a software-intensive business? Secondly, what is the impact of company size for this kind of a transformation? Thirdly, what is the impact of life cycle status, is the company well established or a start up, to the transformation?

The continuation of this literature research will be to find out candidate companies and then for example, analyze their cloud computing business models and do the classification like Chang [7].

5 Conclusion

This study focused on searching what the extant knowledge reports on transforming a business model of a software-intensive business from an on-premise product to a SaaS solution. Considering the researched material, there were several studies reporting differences caused by an adaptation of a cloud computing-bases business model. However, most of the review work focused on large-sized companies, which have resources to manage the transformation. On the contrary, there are not much reported on small and medium-sized companies.

Limitations of the paper are lacking systematic literature review and other methodology. Ecosystems business model should need more attention timely and rigour academic literature.

With the studied reference literature, this study has shown that there is a need to research how to support a small or midsize enterprise software company, which is planning to change the business model from on-premise to a SaaS business model.

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