

WHAT DO WE KNOW ABOUT BUSINESS MODELS IN SOFTWARE COMPANIES? - A SYSTEMATIC MAPPING STUDY

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ABSTRACT

The concept of business model has been mentioned in the scientific research from 1970 onwards. The weight of business model research has increased since mid 90's, especially after the burst of the dot-com bubble. Business model itself is positioned between business strategy and business processes concepts and it is an abstraction of firm's business logic. Business model describes firm's basic value propositions, revenue streams, customers and key resources. In this article we present a systematic mapping study of the research on software business models; how the concept is applied in literature and what kind of empirical studies have been conducted. We found out that the business model concept is not well-defined in the context of software business. The definitions of business models include varying relations to other similar concepts, like revenue model, business logic and business process. Another finding was that there is very little, if any, research done deep in the industry level to show how firms utilize business modeling and how they see the concept itself. These issues require further research.

KEYWORDS

Business model, software business, success factor, systematic mapping study

1. INTRODUCTION

Software companies, like any others, are doing business by providing value to their customers. As technology itself has no value (Chesbrough, 2007; Luoma et al., 2012), companies need to be able to create and capture value through an effective business model. The concept of business model captures how company functions and create value (Wirtz et al., 2010) and it describes, for example, company's value proposition, its activities, customer relationship,

revenue model and resources (Osterwalder, 2010; Valtakoski and Rönkkö, 2010) and it is a critical thing to the success in the digital world (Johnson et al., 2008; Schief and Buxmann, 2012). Business models are required when establishing new companies, but also when existing companies are expanding to an unknown market territory (Johnson et al., 2008) or when one wants to learn and implement successful concept of another business area (Waldner et al., 2011). Companies can even go with different business models during their life-cycle.

As start-ups are discussed at present in public debate, we wanted to study how software business models are studied and how the actual concept of business model is defined and how we could in the future support start-ups in their business development. We found out in the early stages of the study that the extent of research on this topic is limited and, for example, although business models in general have been studied and literature reviews exists (e.g. Zott et al., 2011), no systematic literature reviews or mapping studies have been conducted regarding business models in the software industry. This systematic mapping study analyzes existing literature on software business models, builds a systematic map and gives an overview of the topic to establish a solid base for future research.

2. RESEARCH PROCESS

The research process followed the guidelines given by Kitchenham and Charters (2007), Engström and Runeson (2011) and Petersen et al. (2008). The aim of a systematic mapping study is to identify a research gap and, as Petersen et al. (2008) advice, to classify and map the found articles. Petersen et al. (2008) suggested the systematic mapping study to follow the process presented in Figure 1.

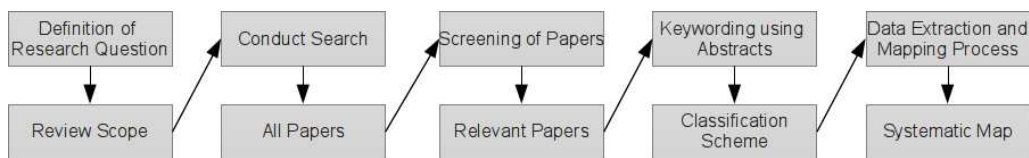


Figure 1. The Systematic Mapping Process (Petersen et al., 2008)

The process starts with the definition of research questions and based on them the search keywords are created and the actual search conducted from selected databases, journals or conferences. After that articles that do not meet the research question are filtered out. Articles are classified based on keywords found mainly from the abstract. Based on the data extracted from the articles, a systematic map with, for example, figures and tables is built to illustrate the results. (Petersen et al., 2008)

The main motivation for this systematic mapping study is to get insight on how widely business models of software companies have been studied and from what point of view. We have also noted that in literature (Chen and Wang, 2010; Hienerth et al., 2011) success factors have been discussed in such an extent that we decided to use them as a part of the research questions as they can help the management of a company, for example, to monitor business (Soini et al., 2006).

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Based on these reasons the following research questions were set:

- RQ1: *How has the use of business models in software business been studied?*
- RQ2: *What kind of relationships are there between success factors and business models of software companies according to the literature?*

We used the following six scientific databases: ACM DL, IEEEExplore, Science Direct, SpringerLink, EBSCO, and ABI/Inform. These databases gave a very representative and relevant set of articles related to software business models. They include both engineering and business-related perspectives to the published research.

We used the following selection criteria for the articles: 1) the article has to be software business related, 2) the article has to be peer-reviewed, 3) the article has to be written in English, and 4) the article has to be available in full text (not only abstracts).

All the selections were done by the first author of this paper and the first three searches were conducted between 2012-11-15 and 2013-02-15. The fourth search round was done in September 2013.

3. SEARCH

The actual search was started by deciding the search keywords. Searching Google scholar with keywords *software business model* reveals over 2 million results, but only 317 for "*software business model*" (notice quotation marks). This led us to select a search phrase with quotation marks because they can produce a more accurate set of search results from the databases that can be checked quickly. It was also possible to experiment with different keywords and then find a better combination for the next search round.

The results of the first search provided only 114 papers (see Table 1). Their title, abstract and keywords were analyzed and only 12 papers were considered as relevant. The rejected papers did not discuss software business, were too technical or otherwise they were not relevant to the research questions.

The second search was then done with the search phrase *software business "success factors"* in title, abstract, or keywords and it produced 88 results (see Table 1), but only 3 of them were considered as relevant after reading the title, abstract and keywords. The rejected articles covered topics like health care, management and technical enterprise resource planning implementation and these were not seen as relevant. We considered this as a step back and decided to continue by developing the first search criteria.

The third search phrase was formulated as *software "business model"*. The search was done from title and abstract. The keywords part was dropped out as not all papers had author based keywords or they were not available in the database. This search produced the widest range of articles (see Table 1). 29 out of 375 were considered as relevant, based on the title and abstract.

After these three search rounds we thought that the increasing computer/mobile game industry might give us an additional point of view. Thus we replaced the term *software* with the term *game* and used *game "business model"* search phrase in the fourth search round. This round was also search from title and abstract, except in SpringerLink where we could only utilize the search from title as the search engine had been slightly modified. The fourth round was also challenging as quite a few good-sounding articles were available only behind a paywall. Six out of 115 articles (see Table 1) were considered worth complete reading.

Table 1. Results with search keywords round 1 (R1) "*software business model*" from all fields, (R2) *software business "success factors"* from title-abstract-keywords, (R3) *software "business model"* from title-abstract and (R4) *game "business model"* from title-abstract

	ACM DL	IEEEXplore	Science Direct	SpringerLink	EBSCO	ABI/Inform	Σ
(R1) Accepted / Found	1/9	4/23	1/16	4/40	1/15	1/11	12/114
(R2) Accepted / Found	0/9	1/32	2/25	0/2	0/2	0/18	3/88
(R3) Accepted / Found	4/31	16/199	6/75	1/11	0/15	2/44	29/375
(R4) Accepted / Found	1/12	2/33	2/14	0/16	1/30	0/10	6/115
Σ	6/61	23/287	11/130	5/69	2/62	3/83	50/692

Table 2 shows how the searches produced overlapping results. In the end we had 44 unique relevant papers in the set.

Table 2. Matrix showing the overlapping of the three different searches

Search number	1	2	3	4
1	12	0	5	0
2	0	3	1	0
3	5	1	29	0
4	0	0	0	6

After these searches 692 titles and abstracts were read and 44 papers were selected to be read through entirely. These 44 papers were categorized as listed in the Table 3.

Table 3. Data collected in the articles used in this study

	Accepted	Not accepted	Σ
Data collected from industry	18	2	20
Data gathered indirectly	5	3	8
No data	9	7	16
Σ	32	12	44

32 of the papers read entirely were accepted. Most of these papers include some empirical part with new data collected from industry or from the publicly available information.

Not all the articles were accepted in our study. The reasons for rejection of an article are listed in the Table 4. 12 out of 44 articles were considered as not useful in this study.

Table 4. Rejected articles

Reason	Number of articles
Not related to business models or software industry	6
Not relevant to this study	6

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Half of the rejected papers were rejected because they were not related to software business models. Business modeling may also be related to more technical areas, such as database design or requirements engineering, but we did not see these areas relevant. The second half of the rejections were done because papers were considered not suitable as, for example, the article described a study that was still in progress, the article was too shallow, or the article was not relevant to the our research questions.

Five out of 44 papers were written before year 2000 (see Fig. 2). The publication year was not limited by any criteria. Publication years of the papers indicate the same that was mentioned by Lai et al. (2006), Zott et al. (2011) and Wirtz et al. (2010): most of the research around business models has been carried out after the burst of the dot-com bubble. In this sense we are studying a subject that is quite new as a research topic.

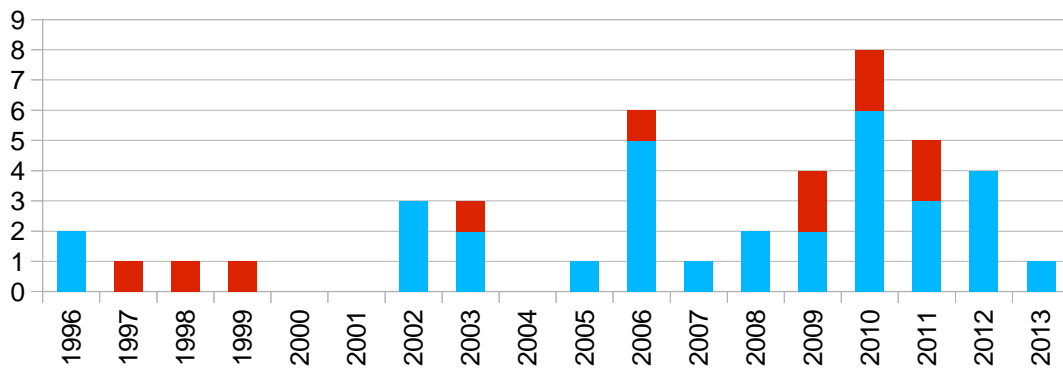


Figure 2. Accepted and rejected papers per year. Light blue indicates accepted and dark red equals rejected paper

10 articles out of 32 accepted ones had authors with a Finnish origin. This was rather surprising as they cover circa 31% of our accepted papers. The business model concept has been studied widely across the globe (Morris et al., 2005; Zott et al., 2011), but our research seem to indicate that software has drawn the attention of Finnish researchers.

4. FINDINGS

The articles found had topics varying from success factors and globalization to modeling with UML and to the transition from a software product to a service. None of the articles were systematic literature reviews or mapping studies, which leads us to argue that, according to our knowledge; this is the first systematic mapping study on software business models. The following table (Table 5) includes all the accepted articles and gives their basic information.

Table 5. Accepted articles

Main issues studied	Research method	Data collected	Type	Reference
Characteristics of business models	Constructive research	No	Conference article	(Asfoura et al., 2008)
Success factors in Austrian software business	Empirical survey	From industry	Journal article	(Bemroider, 2002)
Open source business models and industry's view towards openness	Empirical survey	From industry	Journal article	(Bonaccorsi et al., 2006)
Business model elements and success factors	Delphi study	From industry	Journal article	(Chen and Wang, 2010)
How two application service provide (ASP) companies failed to differentiate their products and services	Multiple case study	From industry	Conference article	(Desai et al., 2003)
Exploring the open source and proprietary software and presenting "both source" business model	Exploration and constructive research	No	Journal article	(Hemphill 2006)
User-centric business and its success factors	Multiple case study	From industry	Journal article	(Hienerth et al., 2011)
E-content price modeling	Discussion paper	No	Journal article	(Jagannathan and Almeroth, 2002)
Links between business models, strategy and processes are critical to competitiveness	Empirical survey	From industry	Conference article	(Kontio et al., 2005)
Software business research and software innovation	Discussion paper	No	Conference article	(Käkölä, 2002)
Business model driven pattern	Constructive research	No	Conference article	(Li and Mou, 2010)
Discussion of SaaS from both business and technical point of view	Discussion paper	No	Conference article	(Liao, 2010)
Clustering software-as-a-service (SaaS) and application service provider (ASP) firms based on business model elements	Cluster analysis	From industry	Conference article	(Luoma et al., 2012)
Investigation of the role of open source in the business models of two companies.	Multiple case study	Only from official company statements and published economy literature	Conference article	(Munga et al., 2009)
Categorization of critical risk factors	Case study	From industry	Conference article	(Nahar et al., 2012)
Finnish software companies' business models and entry models	Multiple case study	From industry	Journal article	(Ojala and Tyrväinen, 2006)
Transition from software product to service	Case study	From industry	Conference article	(Olsen, 2006)
Article discusses open source and proprietary software and proposes a model to evaluate the profiting	Discussion paper	No	Journal article	(Pykäläinen, 2007)

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conditions				
Investigation of relationship between a firm's capability to react to industry wide trends and its service business model	Empirical survey	From industry	Conference article	(Rajala and Westerlund, 2012)
How Chinese gaming companies have developed their business models	Multiple case study	From industry	Conference article	(Ren and Hardwick, 2008)
Globalizing US firms to foreign countries	Empirical survey	From industry	Journal article	(Roberts and Senturia, 1996)
Discussion whether or not software business is its own research discipline	Discussion paper	No	Conference article	(Rönkkö et al., 2010)
Revenue logic of software companies on strategic level	Exploratory study	From industry	Journal article	(Sainio and Marjakoski, 2009)
Built a business model framework and confirmed it with 10 software companies	Constructive research	For validation only	Conference article	(Schief and Buxmann, 2012)
Top management views on monitoring internal success factors	Empirical survey	From industry	Conference article	(Soini et al., 2006)
Re-engineering software from old version to new one	Experiment	From the implemented project	Conference article	(Tsangaris et al., 1996)
Using UML for business modeling	Constructive research	No	Conference article	(Tyndale-Biscoe et al., 2002)
Business models in Finnish software industry, why others succeed better than others	Cluster analysis	From industry	Conference article	(Valtakoski and Rönkkö, 2010)
How to implement cross-industry innovations	Case study	For validation only	Conference article	(Waldner et al., 2011)
Designing a framework to support the design of business models	Constructive research	From industry	Conference article	(Weiner and Weisbecker, 2011)
"4C" Internet business model typology to be used while utilizing business models	Constructive research	From industry	Journal article	(Wirtz et al., 2010)
How to calculate revenues in free-to-play games	Constructive research	For validation only	Journal article	(Wu et al., 2013)

The most surprising finding was how the concept of business model has yet not been defined in such an extent that researchers would use it similarly. Now every research article defines in detail what is a business model, what parts are included and what are excluded. Some researchers define business model with just one sentence (e.g. Valtakoski and Rönkkö, 2010), while others find even 20 elements in five groups (e.g. Schief and Buxmann, 2012). Clearly there is room for a more standardized definition.

Despite of being defined in many ways, the actual meaning of business model has also been interpreted in many different ways. Käkölä (2002) mentioned the term *business model* in the title, but the article itself stated that it outlined *business strategies*. Weiner and Weisbecker (2011) describe how a business model is an abstraction of business logic. In addition,

Osterwalder and Pigneur (2002) describe three levels of business: strategy, model and process. In contradiction Schief and Buxmann (2012) put strategy inside the business model concept. Sainio and Marjakoski (2009) state that the revenue logic is a strategic part and the revenue model is operational. In addition, it is stated that the revenue model equals a pricing strategy and the revenue logic is mentioned being one element of a business model. It seems that the concepts of business strategies, models, processes are mixed and researchers are using these terms in a disordered way.

It is argued that business model is not such a thing that can be developed and left as it is (Hienerth et al., 2011; Olsen, 2006). In a way, a business model is in the state of a constant flux as changes, for example, in technology or legislation, can make current business models obsolete and open a room for new ideas, companies and business models (Hienerth et al., 2011; Olsen, 2006; Tsangaris et al., 1996; Valtakoski and Rönkkö, 2010). Additionally Ren and Hardwick (2008) point out how revenue model of smaller companies need to change when the big player changes its own model.

Cloud computing and software-as-a-service are also covered in the articles (Liao, 2010; Luoma et al., 2012; Nahar et al., 2012; Olsen, 2006). Valtakoski and Rönkkö (2010) present a discussion how different business models perform in different circumstances, how the service and product-based business differ (Kontio et al., 2005; Luoma et al., 2012) and what happens when transitioning from a product to a service (Olsen, 2006). The change from the product-based software business to the service-based is not just new protocols, processes and techniques. Besides these technological parts it is also a jump to new markets and learning to take the basic steps there (Olsen, 2006). This requires a different business model and an understanding of how to build a business model to generate both value to customers and revenue to the owners. Luoma et al. (2012) argue that a more holistic business model is required when software-as-a-service is studied.

Open source business models are also discussed in several articles (Bonaccorsi et al., 2006; Hemphill, 2006; Munga et al., 2009; Pykäläinen, 2007; Rajala and Westerlund, 2012). Open source business models are being taught even in universities and their commercial use is increasing (Munga et al., 2009). As the open source phenomenon has reached commercial interest, also hybrid business models have been discussed in the literature (Bonaccorsi et al., 2006; Hemphill, 2006; Pykäläinen, 2007). This means that software developers use both open source and proprietary pieces of software (Pykäläinen, 2007). A software company can also license its products with a dual license model where the same product is available as open source (as free and libre) and also as a commercial software that one can buy (Hemphill, 2006).

We also noticed that there has been discussion whether the software business itself should be one research discipline (Käkölä, 2002) or not (Rönkkö et al., 2010). These kind of conflicting views indicate that the software business has drawn researchers' attention.

The research includes also a discussion whether software development differs from conventional manufacturing, like building ships or cars. Ojala and Tyrväinen (2006) argued that software differs as it is intangible and has a short product life-cycle. In addition, Jagannathan and Almeroth (2002) noted that the cost of replication of software is almost zero.

To summarize all the articles in one table (Table 6), or *map*, we decided to categorize the articles from two points of view: the type of the article and the topic it covers. The type was based on the empirical approach in the article, whether the article included data gathered from industry. The classification of topics include the business model in general, success factors, expanding business, tools and concepts, pricing and costs and also one paper was a pure scientific discussion.

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Table 6. Matrix showing how the articles are related to different topics

Type \ Topic	Business model in software development	Success factors and features of software companies	Expanding business	Tools and concepts to model business	Pricing and cost structure	Scientific discussion
Industry data driven article	<i>Cloud computing:</i> (Luoma et al., 2012; Olsen, 2006) <i>Open source:</i> (Bonaccorsi et al., 2006; Hemphill, 2006; Rajala and Westerlund, 2012) <i>Other:</i> (Desai et al., 2003; Valtakoski and Rönkkö, 2010)	<i>Cloud computing:</i> (Nahar et al., 2012) <i>Other:</i> (Bernroider, 2002; Hienerth et al., 2011; Kontio et al., 2005; Soini et al., 2006)	(Ojala and Tyrväinen, 2006; Roberts and Senturia, 1996)	(Weiner and Weisbecker, 2011)	(Ren and Hardwick, 2008; Sainio and Marjakoski, 2009)	
Theoretical article validated within industry / Data gathered indirectly form industry	(Tsangaris et al., 1996; Wirtz et al., 2010)	<i>Open source:</i> (Munga et al., 2009) <i>Other:</i> (Chen and Wang, 2010)	(Waldner et al., 2011)	(Schief and Buxmann, 2012; Tyndale-Biscoe et al., 2002)	(Wu et al., 2013)	
Theoretical article	<i>Cloud computing:</i> (Liao, 2010) <i>Other:</i> (Asfoura et al., 2008; Käkölä, 2002; Li and Mou, 2010)			<i>Open source:</i> (Pykäläinen, 2007)	(Jagannathan and Almeroth, 2002)	(Rönkkö et al., 2010)

The research of business models in the field of software covers articles that describe a business model or models and how they are used in the software business. Desai et al. (2003), for example, compared two companies and their problematic entrance to the application service provider (ASP) business. Rajala and Westerlund (2012) studied how changes in the industry are managed with different business models. Valtakoski and Rönkkö (2010) studied how various business models perform differently in different scenarios. In general the articles in this topic group argue that business model matters – whether it is online or offline, cloud or mobile. (Tsangaris et al., 1996; Valtakoski and Rönkkö, 2010; Wirtz et al., 2010).

The second topic group contains articles that are focused on success factors. These may be important inside the company (e.g. satisfaction of employees) (Soini et al., 2006) or may also have effect outside the company (e.g. user-centric design) (Hienerth et al., 2011).

Two articles covered expanding the business. Ojala and Tyrväinen (2006) described how 8 small Finnish companies expanded their business to Japan through different entry modes related to their business models. Roberts and Senturia (1996) compared 19 US firms that went overseas. They underline that the business model is important for the globalization strategy of the company. Besides these two articles, Waldner et al. (2011) discuss how business models of

different industry could be implemented in another one. Their example is adapting service-based business model of computer games to the music industry.

Four articles introduced tools and concepts to be used when modeling business. Weiner and Weisbecker (2011) designed software for building business models, Tyndale-Biscoe et al. (2002) used UML to model business and Schief and Buxmann (2012) built their own framework for designing, describing or analyzing a business model of a software company. Pykäläinen (2007) proposes a model for describing profit conditions. The model consists of three factors: ideology, type of technology and complementary assets.

Four articles covered pricing and cost issues. Sainio and Marjakoski (2009) found out that the more established the software company is, the more independently it can carry out its business model and benchmark its revenue logic and revenue models. In addition (Ren and Hardwick, 2008) studied how Chinese game companies have refined and innovated their business model during this millenia. Jagannathan and Almeroth (2002) argue that an Internet business model should include the following determinants: transaction model, pricing strategy, customer behavior, distribution resources and competition. Their article discusses how these determinants affect revenue and how models of conventional markets cannot be applied in the Internet but more dynamic pricing is recommended. (Wu et al., 2013) developed a model to be used when calculating profit on online games. Their ideas are based on the increased use of free-to-play revenue model where the actual income is coming from advertising and in-application purchasing.

Rönkkö et al. (2010) argue that software business is not its own research discipline. The purely theoretical article is a part of an academic discussion and it gives an overview of how the software business is studied.

5. DISCUSSION

In the beginning we set two research questions: RQ1 - *How has the use of business models in software business been studied?* and RQ2 - *What kind of relationships are there between success factors and business models of software companies according to the literature?* After reviewing literature we have found out that the software business models have been studied only on a high level and we did not find articles deeply describing how companies utilize business modeling. Few studies (Kontio et al., 2005; Rajala and Westerlund, 2012; Valtakoski and Rönkkö, 2010) report how companies utilize and design business models, but from our point of view it seems that origins of this information could be even more deeply from industry. Although two articles (Ren and Hardwick, 2008; Wu et al., 2013) discuss innovating and refining revenue models, these studies did not focus on how companies are able to improve and analyze their business model as a whole.

For the second research question we found studies (Bernroider, 2002; Chen and Wang, 2010; Hienerth et al., 2011; Soini et al., 2006) describing success factors in the software business. For example, Chen and Wang (2010) describe six elements of a business model and 20 related critical success factors. In their study they categorize different success factors under different business model components. Bernroider (2002), Hienerth et al. (2011), Soini et al. (2006) all describe internal success factors in their studies and they argue that “soft” factors (e.g. employees) seem to be more important than “hard” ones (e.g. financial). Based on this

we may conclude that there is a relation between success factors and the business model, but the relation is still unclear and requires more research.

We found out that the present scientific literature has no consistent definition of what is included in a business model. We also saw the term used in different contexts and in numerous ways with other similar terms, like business logic and business strategy. These concepts require further research on how we can use them in a more unified manner, for example, what is the relation between a business model, business logic and business strategy. We also need to deepen the knowledge on how companies may benefit from business models in their strategic business development activities.

Also it was not clear how software business is separated from traditional brick and mortar business. Although there has been discussion if software business is its own research discipline or not (Käkölä, 2002; Rönkkö et al., 2010), we are not sure whether the business model of a software company emphasizes the same factors than, for example, the business model of a shipyard or a car manufacturer.

6. LIMITATIONS

In our study we collected articles from six scientific databases. This does not, however, cover all articles published, and therefore we might have missed some useful information. We tried to select the databases covering both engineering and business sides to get a selection of articles as wide as possible. We concentrated only on peer-reviewed journal and conference articles. This excludes books, white papers and other non-peer-reviewed articles.

Our search keywords were limited to software business and for example content creation was not searched. Also we only searched for *model*, not for *modeling* (or *modelling*), which might have limited the search results as we don't know exactly how search engines in different databases work.

7. CONCLUSION AND FUTURE RESEARCH

We found out that we are working on an area that has no clear picture of itself. The concept of business model has not yet been defined in such an extent that the research community could use a uniform definition for it. Discussing about business model can mean discussing about business strategy or about business logic.

We also found some evidence of how company success factors are related to the business model and how different business models produce different results in companies' ability to compete. We also noted that there was very little research done with software industry to gain knowledge on how companies are actually modeling their business.

These results mean that we still need to define the concept of the business model thoroughly to be able to position the research in the correct category. This study also suggested that the business model and its design are relevant issues when software companies are doing their business.

In our future research, we are going to interview software companies and study how they utilize business models and how they model their business. Another target we aim at is to establish a common way to define the software business model concept, its related concepts and their connections based on existing literature and empirical data.

We also aim to study how software business differentiates from other business areas. The current literature does not give a clear picture of how we can utilize the business model concept nor do we need to do adaption between different factors of the model, which is yet another thing we are going to study in the future.

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