Software Business Models from a distribution perspective: A Systematic Mapping Study

Alberto Heredia a, Ricardo Colomo-Palacios b*, Antonio de Amescua a

a Universidad Carlos III de Madrid, Av. Universidad 30, Leganés 28911, Spain
b Østfold University College, B R A Veien 4, Halden 1783, Norway

Abstract

Business models (BMs) describe how a company creates and delivers value to customers, the products or services that it offers and the compensation for them. Software companies need to be able to adopt different BMs to be successful in modern economy. Despite the number of publications on the field, there is still not a clear picture of software BMs. The purpose of this study is to structure and characterize the state of the art on software BMs with focus on sales and distribution models to help discover possible research gaps. The authors of this study conducted a systematic mapping study using relevant keywords to identify primary studies in the existing literature related to software BMs from a business management perspective. The search strategy returned 1871 papers and 51 were selected as primary studies. The analysis of results helps clarify the picture of software BMs and highlights the most relevant sources of papers. Results also reveal the broad interest of researchers on this topic. Most of the primary studies were related to service-based BMs, and to a lesser extent on product-based or open-source-based BMs; there is also an increase in the attention of researchers towards models built around mobile apps. While many authors report experience papers, only some authors validate or evaluate new proposals of sales and distribution models.

Keywords: software business models, systematic mapping, on-premise software, SaaS, open-source software, mobile apps.

* Corresponding author. Tel.: + 47 6921 5000; fax: + 47 6921 5002.
E-mail address: ricardo.colomo-palacios@hiof.no
1. Introduction

Software organizations no longer describe architectures solely in terms of their technical characteristics; instead, they view them in relationship to BMs [1]. As technology itself has no value, companies need to be able to create and capture value through an effective BM [2]. The success of innovations in modern economy highly depends on the respective BM, especially in fast evolving sectors such as the software industry [3].

BM describe how a company creates and delivers value to customers, the products or services that it offers and the compensation for them [4]. A BM comprises elements such as company’s value proposition, customer segments and relationships, revenue streams and resources [5].

Although existing literature on BMs has been previously reviewed from a broad and multifaceted perspective, e.g. [6–9], the impact of the software industry in our society is a solid motivation for conducting deeper research in this specific field. Indeed, the interest of researchers and practitioners in software BMs is continuously increasing [10]. In the particular case of distribution models, which describe how the organization offers the software to the market, including the sales process and its outcome [11], published papers seem to gradually shift the focus from the traditional model of software installed on-premises to new on-demand models. Other BMs based on open-source (OS) software have usually receive much attention from researches throughout the years, but the boom of software applications for mobile devices gives the impression to emerge as a new competitor for these BMs.

To analyze the validity of these impressions and clarify the picture of this area, the objective of this paper is to structure and characterize the state of the art on software BMs with focus on sales and distribution models and from a business management perspective by means of a systematic mapping study.

2. Background

A BM describes the company’s basic value propositions, its activities, customer relationships, revenue streams and key resources, i.e., it provides a detailed view of how the software firm is conducting business to create value [5]. Internet changed the product-based software business to a service-based one; it was not just new protocols, processes and techniques, but also a jump to new markets that required new BMs to generate both value to customers and revenue to the owners [2]. Those new types of software businesses, such as Software as a Service (SaaS) and OS models, did not fit into the traditional archetypes of packaged software [12], that was predominant just few years ago [13]. Software companies traditionally presented a BM in which they offered Software as a Product (SaaP), so they delivered a copy of the software to the customer, who got usage rights but not ownership; the customer carried the cost for the usage rights, support, maintenance and operations. Contrary to these product-based BMs, in service-based BMs such as SaaS the software vendor does not deliver the software, but the customer gets access to the software and usage rights; the software vendor carries the cost of software support, maintenance, and operation [4]. These market trends also lead to product reengineering efforts to adapt traditional software packages to service-oriented solutions [14].

Revenue in traditional product-based BMs is based on copyright licensing and maintenance. In contrast to these perpetual-use licenses, revenue in service-based BMs is based on subscriptions by customers from vendors [15], depending the subscription fee on the number of rented software functions or the used length of time by customers. In addition, since customers access on demand to a remotely managed server application, it also simplifies deployment and reduces costs for customers in comparison with on-premise IT systems [16].

Apart from SaaS, the software industry has also shown an increased interest in the last decade on how to build BMs around OS software [17], a kind of software developed jointly around the globe and provided to be used under certain conditions, at no cost. Many software companies have tried to take advantage of the OS by creating BMs around it. Even when their product is distributed for free, companies can make a profit offering customized software based on OS or integrating it in a commercial package [17]. However, sometimes OS principles are just applied within a limited environment that has a closed border, such as a division, a company or a consortium [11]. On the other hand, a large number of software companies that operate in the OS market decided to deploy a “freemium” (free and premium) BM in which free access is limited in features, time or size, while premium value-added services or an enhanced version of the service have a subscription fee [18]. Nevertheless, a new competitor recently emerged. To conclude, the mobile devices industry has recently given rise to a BM for small, low-cost applications (apps) that
can be sold in large quantities [1]. The evolution of mobile ecosystems [19] and the outsourcing of mobile apps creation to a global base of external developers [20] brought organizational innovations shaping the production and distribution of software as well as the means of extracting value for a number of companies in the industry [21].

3. Research Method

The purpose of this study is to structure and characterize the state of the art on software BMs, analyzing research works already published in the existing literature to provide an overview of the topic and to help discover potential gaps for future research. Thus, the main research question driving this study is:

What is the state of the art of software BMs?

Due to the breadth of the topic, a systematic mapping study [22] is used to identify and classify all relevant research papers (referred to as primary studies) related to software BMs. The study follows the guidelines provided by Petersen, Feldt, Mujtaba and Mattsson [23]. To answer the main research question driving this mapping study, the authors of this study stated the following research questions:

RQ1. What are the journals that publish papers on software BMs?
RQ2. Which are the most investigated software BMs?
RQ3. Which are the research methods used for software BMs research?

3.1. Search strategy

The search strategy is key to ensure a good starting point for the identification of studies and ultimately for the actual outcome of the study. An extensive and broad set of primary studies was needed to answer the research questions. The most popular academic databases in the domain of software engineering were selected to be used in this systematic mapping to search for potentially relevant papers:

- ACM Digital Library (http://dl.acm.org)
- IEEE Xplore Digital Library (http://ieeexplore.ieee.org)
- ScienceDirect (http://www.sciencedirect.com)
- Scopus (http://www.scopus.com)
- Springer Link (http://link.springer.com)
- Wiley Online Library (http://onlinelibrary.wiley.com)

Regarding the keywords for the search, after some exploratory searches using different combination of keywords, the researchers jointly established the final string to be used in the search for papers in the databases: software AND “business model”

The search was applied to title, abstract and keywords, and limited to journal papers written in English in the area of Computer Science and from a business perspective. The search was performed at the end of the third quarter of 2014 and a total of 1871 papers were retrieved from the different databases.

3.2. Study selection

The main criterion that guided the inclusion of a paper was that it was related to software BMs from the point of view of business management, so strictly technical papers were not considered in the scope of this systematic mapping study. To reduce the possibility of researcher bias, the authors jointly agreed the exclusion criteria to be used in the following order:

- Based on title: the title does not suggest that there is any focus on software BMs.
- Based on keywords: there is no keyword related to software BMs.
- Based on abstract: the abstract shows the paper is not focused on software BMs.
- Based on full text (if available): the paper is definitely not related to software BMs.

In those cases where there was disagreement between researchers regarding the relevancy of a paper, the paper was not finally excluded. Additionally, the authors also excluded duplicated papers of the same research found in different databases; to do so, the authors used a reference management tool which detected duplicates based on meta-data. The authors of this study must point out that the revision of the full text of the primary studies allowed to
assure that all of them were relevant for structuring and characterizing the state of the art of software BMs. This revision is also important because this study does not contain a formal quality evaluation of the primary studies, which indeed is not essential in mapping studies and could not be properly achieved due to the inclusive nature of the search that includes theoretical studies as well as empirical studies of all types [22]. After the exclusion of irrelevant papers based on title, keywords and abstract, the full text of 76 papers was analyzed more in depth. The researchers finally agreed on 51 primary studies to be included in the systematic mapping study.

3.3. Study classification

A data extraction form was designed to collect relevant information from each one of the selected primary studies. It included the following properties: title of the paper; authors; year of publication; journal in which the paper was published; number of citations of the paper; software BM referred in the paper and research approach adopted in the paper. In order to avoid database bias in the measure of the number of citations of the primary studies, the authors decided to use the value provided by ISI Web of Knowledge. On the other hand, regarding the different software BMs, the authors decided to classify the primary studies in four main groups:

- **Product-based BMs**: founded upon the delivery of a copy of the software product on the premises of the customer, the production of embedded software, or Original Equipment Manufacturer (OEM).
- **Service-based BMs**: founded upon the delivery of Cloud services to customers or the delivery of SaaS.
- **OS-based BMs**: delivery of software developed under the OS paradigm.
- **Mobile-based BMs**: founded upon the delivery of applications for mobile devices.

Finally, for classifying the research approach, the authors used the schema proposed by Wieringa et al. [24]:

- **Validation research**: concerns evaluating novel models not yet deployed in industry.
- **Evaluation research**: concerns evaluating models implemented in industrial practice.
- **Solution proposal**: discuss novel or revised models.
- **Philosophical papers**: structure the field in new ways such as a conceptual framework.
- **Opinion papers**: express a personal opinion and do not rely on related work.
- **Experience papers**: discuss how someone did something in practice.

The following sub-section synthesizes the analysis of these results obtained from the data extracted from the primary studies. The topics covered are varied, although authors did not find a systematic mapping study or a systematic literature review among them. Thus, the authors can state that this is the first systematic mapping study on software BMs focused on sales and distribution models conducted from a business management perspective.

3.4. Data extraction and synthesis of results

This section synthesizes the results produced by the extraction of data from the primary studies according to the protocol described above. Regarding the progression of publications among the years (Fig. 1), there is a low number of publications before 2005, but this number experienced a significant growth since that year, taking out year 2012. Notice that the search for primary studies was carried out at the end of the third quarter of 2014, so more publications from this year may not be included in this study. Data extracted from primary studies revealed that a total of 123 different authors published papers on the topic, but surprisingly only two of them had more than just one authorship within the primary studies.

Regarding the journals that published the primary studies, IEEE Software is the journal that accepted the most publications related to the topic (7), closely followed by journals devoted to electronic business and commerce such as Information Systems and E-Business Management (6) or Journal of Theoretical and Applied Electronic Commerce Research (5) and Information and Software Technology (4).

To provide a better overview of the field, Fig. 2 plots a bubble graph to show the number of primary studies by software BM per year. Due to the low number of primary studies before 2007, the figure only includes data in the last 8 years. The authors have to point out that some primary studies were related to more than one software BM. According to the results, the number of primary studies (29) related to new software BMs—such as SaaS and Cloud—exceeds by far the amount of papers (13) related to more traditional models—such as on-premise and OEM—. The number of primary studies (17) focused on models based on OS is also relevant. The figure also shows an increase
in the attention of researchers towards mobile apps, which is related to the rapid growth of the market of smartphones and tablets in the last years. On the other hand, Fig. 3 shows the number of primary studies by research approach per year. Due to the low number of primary studies before 2007, the figure only includes data in the last 8 years. Especially relevant is the number of experience papers in 2014.

Fig. 1. Distribution and tendency of primary studies by year.

Fig. 2. Distribution of primary studies by software BM.
4. Analysis and discussion of results

In the following sub-sections the authors analyze and discuss the results produced by conducting the study in order to find answers to the research questions of this study.

4.1. What are the journals that publish papers on software BMs? (RQ1)

IEEE Software heads the list of journals dealing with the topic of software BMs focused on sales and distribution models. According to the results of this study, the primary studies reported by this journal were opinion papers published in 2011 and mainly related to service-based and OS-based BMs.

In a second place, other journals specifically devoted to electronic business and commerce –such as Information Systems and E-Business Management or Journal of Theoretical and Applied Electronic Commerce Research– have also published several papers on software BMs since 2010. Half of these papers focused on service-based BMs, and many others to mobile-based BMs. All of them were experience papers in the case of Journal of Theoretical and Applied Electronic Commerce Research, while Information Systems and E-Business Management published mostly opinion papers and validation research.

Other journals more specialized in the software industry –such as Information and Software Technology and Information Systems Journal– published solution proposals and experience papers related to OS-based BMs, mainly. Finally, other journals published papers related to more specific topics in the field of the software industry. For instance, Computer Law & Security Review published two experience papers focused on licensing and copyright issues. The authors of this study think that the abovementioned information can provide researchers with insights to select good targets for publications of future studies in the field depending on the focus of the study and the research method used.

4.2. Which are the most investigated software BMs? (RQ2)

Fig. 2 depicts the growing dominance of the presence of papers related to service-based BMs (almost 45 %) in comparison to other models. Research seems to focus on such models in the last years, while product-based and OS-based BMs have been studied in a more uniform amount during the last decade. On the other hand, the growth of software applications for mobile devices made mobile-based BMs to recently receive significant interest from researchers.
Product-based BMs are the most traditional ones, so it is not surprising that the oldest primary study published in 1997 was referred to this BM. The most recent papers, however, focus on embedded systems or use this model to make comparisons with other BMs. This traditional BM is also mentioned when discussing to transit from this model to another, such as to an OS-based or to a modern service-based BM. BMs based on services are usually referred to the delivery of Cloud services to customers in general or more frequently to the specific delivery of SaaS. There is also a lot of research on OS-based BMs among the primary studies; most of them are papers published in well-known scientific journals in computer science. Due to the commercial interest that the OS phenomenon has reached, the majority of these primary studies discuss the aforementioned transition from a traditional model based on proprietary software to an OS-based one and the benefits of using a hybrid between both of them. The combination of proprietary software and OS means that developers use both pieces of software or that software is offered with a dual license model, i.e., the same product is available as OS and also as a commercial software that one can buy. Finally, primary studies focused on mobile-based BMs examine the problems that arise when external developers produce the software (i.e. mobile apps) that is delivered to customers and also analyze the competition among the organizations that are at the forefront of this ecosystem adoption, such as Apple and Google, which use different BMs.

4.3. Which are the research methods used for software BMs research? (RQ3)

Results in Fig. 3 show that 40 % the primary studies are experience papers which discuss how someone did something in practice. Around 25 % the primary studies found discuss software BMs from a philosophical perspective or express a personal opinion and do not rely on related work. The remaining 35 % present some type of proposal of sales and distribution model, but only half of them provide some validation or evaluation of such a proposal. Results reveal that, in general, the use of each one of these research approaches is uniformly distributed throughout the years. Experience papers are however predominant in the last years, being their presence especially significant in 2014 as all the 7 primary studies in this year used that research method.

5. Limitations

The objective of this study was to structure and characterize the state of the art on software BMs with focus on sales and distribution models to help discover possible research gaps. For that purpose, the authors decided to use a general search string to not bias the study towards any specific software BM. However, other searches using keywords related to specific software BMs such as on-premise or SaaS could provide more primary studies. This limitation makes this study to be a first step towards a future research that could include a systematic literature review centered on new BMs based on the delivery of SaaS or mobile apps.

The exclusion of conference papers and books represent another limitation of this study. This publication bias is based mainly on practical concerns; the amount of primary studies to be included could have been unmanageable and a lot of analysis would be needed to handle the fact that many journal papers are improvements of previously published conference papers. Nevertheless, the inclusion of journal papers guarantees a high scientific quality of the primary studies. However, and in spite of the inclusion of journals, given the composition of databases for the study, some papers published in journals not listed in the databases can also be biased in this study.

Finally, another threat for this study is researcher bias that could have affected the selection of primary studies, their classification and the accuracy in data extraction. To reduce the subjective component of this study, two researchers participated in the selection and classification of primary studies following a multi-staged protocol for the inclusion and exclusion criteria and resolving disagreements by discussion.

6. Conclusions

Software BMs is a wide research topic that covers multiple aspects regarding how a software company creates and delivers value to customers, the products or services that it offers, and the compensation for them. To help clarify the picture of software BMs, this study structures and characterizes the state of the art on software BMs with focus on sales and distribution models from a business management perspective. The analysis of the results obtained
from this systematic mapping study reveals the most relevant sources of papers with regard to the research on software BMs, and also provides researchers with insights to select good targets for publications of future studies in the field depending on the focus of the study and the research method used.

This study highlights the growing tendency of the interest that many authors have on software BMs from a general perspective, especially since 2007. Their research interests focus mainly in service-based BMs and, to a lesser extent, on product-based or OS-based BMs; there is also a recent increase in the attention towards models built around mobile apps. The study also found a peak of primary studies in 2011 and a fall in 2012, coinciding with the advent of "the cloud" and the changes it brought that forced software companies to adapt their BMs in order to be more agile and dynamic. The majority of the publications are experience papers, while some authors present new proposals of sales and distribution models, although few of them provide some validation or evaluation of those proposals.

Future works are twofold. First, the authors aim to develop comparative studies of software BMs with regard to company size, sector and moment in time. Secondly, the authors propose the development of a framework to guide companies in the adoption of a software BM for a given project taking into account cultural, economic and technical factors. The creation of this innovative artifact would be based on the design-science paradigm, so the researchers will follow the set of guidelines developed by Hevner et al. [25] to better understand, execute and evaluate that research work.

References