Mobile Security as a Service

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Abstract

The purpose of this paper is to study how a software product company can expand its product-based business with the Software as a Service (SaaS) model in the mobile setting. In this research study we examine how the SaaS model can be implemented by a software company with existing PC-based software business and conduct a case study on F-Secure and its mobile security as a service offering. The differences between the product and service business are considerable and the change of focus from one to the other is not easily done. For example, the scale economies, which are associated with product business, are not easily achieved in service business. However, the SaaS business model has many benefits to offer to SaaS providers. To providers, SaaS offers e.g. expanded customer base, lowered production and distribution costs, more predictable cash flows, and shortened sales cycle.

Our findings include that by successfully solving the risks associated with the SaaS model and by fulfilling the customers' demands of customization and at the same time benefiting from economies of scale, scope, and aggregation, F-Secure has managed to leverage its domain area expertise with its SaaS offering: F-Secure has expanded its PC-based antivirus and security application business to cover also mobile devices. F-Secure has also increased its potential customer base amongst smart phone users (both end-users and businesses) with the help of its partners: mobile operators and handset manufacturers.

Keywords: Software as a Service, e-commerce, value creation, business model, mobile service.

1. The Change towards Services

The differences between the product and service business are considerable and the change of focus in a firm's business model from one to the other is not easy to accomplish (see e.g. Hoch, D. et al. 1999, Nambisan 2001, Cusumano 2003). For example, the scale economies, which are associated with product business (and especially with information goods), are not easily achieved in the service business. Furthermore, the economies of scope (e.g. applying domain area how-to knowledge) are harder to take advantage of in the product business as they usually e.g. increase the complexity of the software development (Nambisan 2001). The Software as a Service (SaaS) model tries to bridge the gap between the software product and service business in order for the Independent Software Vendors (ISVs) to provide valuable online services to the customers (SIIA 2001, Hoch, F. et al. 2001, TripleTree 2004, Sääksjärvi et al. 2005). The SaaS business model tries to provide answers on how the software firms can at the same time achieve economies of scale, economies of scope, and fulfil customers' requirements for customization to suit their business needs. Our objective is to study how a software product company can successfully change its product-focused business model to a more service-oriented one and in the process increase the number of its customers, access new markets easily and with very low risk, and more importantly, how to do these things without sacrificing profitability with the SaaS model.

The purpose of this exploratory and descriptive research study is to address the above-mentioned issues and propose different ways of how they can be solved. We use a case study, which is centred on one particular domain area (namely the anti-virus and intrusion prevention) to illustrate how one particular ISV has leveraged its domain area knowledge (which is associated with scope economies), expanded its customer base profitably (enjoying from economies of scale benefits), customized its SaaS service offering to suit its partners' and customers' needs, and also leveraged the complementary resources of its partners in creating a mobile security service offering (benefiting from economies of aggregation). The case company that we studied was F-Secure, which has operated in the anti-virus and intrusion prevention (product) business since 1988. In 2001, F-Secure started offering its software products as an online service via its Internet Service Provider (ISP) partners, which has been so successful that it now has 86 partners in 23 countries and SaaS now accounts for 30 per cent of its revenues and continues to grow at a fast pace (F-Secure 2006a). According to F-Secure, "there is an ongoing fundamental change in the customers buying behaviour" and that "consumers and businesses will prefer to purchase security as a subscription service over all other alternatives" (F-Secure 2006b). Although at the moment only a small fraction of F-Secure's revenues come from mobile security, F-Secure views that "mobile security is strategically a core area" and states that the prime vehicle for F-Secure's future growth is to offer its anti-virus and security software as a service (F-Secure 2006b). Therefore, from 2005 onwards F-Secure has also offered mobile security as a service based on its service platform for mobile handsets for consumers, businesses, and mobile telecom operators.

As in the PC world, viruses are also starting to appear on mobile devices. The first mobile phone virus named "Cabir" running on Symbian OS phones was discovered in the summer of 2004 and since then the number of Symbian malware has been rapidly increasing: in June 2005 it exceeded 100 and is now close to 200 (F-Secure 2006c). The mobile phone viruses have shown that it is possible to create malicious code that can make the phone unusable. For example, a mobile phone virus called "Skulls" replaced Symbian OS phones' system applications with non-functional versions disabling most of the functionality of the phone. In addition, mobile viruses can cause false billing and they can also delete, corrupt, or steal smart phone users' data. In order to cope with this growing threat, it is becoming necessary to use anti-virus and firewall software also on the smart phones as in the PCs. The mobile telecom operators have also noted this and are recommending that their customers should install anti-virus and intrusion prevention software on their smart phones and also to keep them updated. The above-mentioned issues combined with the fact that anti-virus software is (unfortunately) already outdated when it is taken out of its shrink-wrapped package because new viruses, their variants, and various other malicious software applications appear almost every day on the Internet (CERT 2005) mean that in order to take full advantage of these security applications they need to be updated (preferably) often via the network. The above-mentioned aspects together make this particular domain area of anti-virus and intrusion prevention software business especially suitable for the SaaS model.

1.1 Software as a Service

The Software as a Service is a relatively new concept although the origins of the SaaS model can be traced back to the time-sharing services (Kern et al. 2002, Walsh 2003). To put it briefly, SaaS is a networked e-commerce business model: the SaaS model moves the focus from owning the software to using the software as it examines the service aspect of the software business and ways for the ISVs to offer software as a service to their customers (SIIA 2001, Hoch, F. et al. 2001, TripleTree 2004, Sääksjärvi et al. 2005). Some of the proposed SaaS benefits for the customers include that SaaS enables them to focus on their

core competencies, offers easier access to technical expertise, frequent and free upgrades, and economic access to valuable software applications at anytime and from anyplace (Cherry Tree 2000, SIIA 2001, Hoch, F. et al. 2001, Ekanayaka 2002, Kern et al. 2002, Walsh 2003). For the ISVs, the proposed benefits of offering SaaS services includes e.g. scale economies in both production and distribution costs, expansion of the potential customer base, more predictable cash flows, and shortened sales cycle (Cherry Tree 2000, SIIA 2001, Kern et al. 2002, Walsh 2003). For a more thorough discussion of these benefits and risks see e.g. Sääksjärvi et al. (2005).

SaaS services, which are also called on-demand solutions or services, are said to be the next generation of Application Service Provision (ASP) services (Cherry Tree 2000, SIIA 2001, TripleTree 2004). The most important differences between the SaaS and the "old" ASP model are that SaaS applies an e-commerce point-of-view instead of the ASP model's outsourcing view, the SaaS model emphasizes the capability and need to (mass) customize customer solutions, and SaaS is a business model concerned with value creation and value appropriation whereas ASP is more of a technical definition. We propose that instead of e.g. the limited outsourcing perspective, the SaaS business model should be understood as a one-to-many e-commerce arrangement dealing with digital products (see e.g. Shapiro and Varian 1999 for a more thorough discussion on digital products). We define the SaaS as follows: "Software as a Service is time and location independent online access to a remotely managed server application, that permits concurrent utilization of the same application installation by a large number of independent users (customers), offers an attractive payment logic compared to the customer value received, and makes a continuous flow of new and innovative software possible" (Sääksjärvi et al. 2005).

However, creating a successful SaaS offering will require more concrete models of e.g. how the issues related to networking are managed (Gulati et al. 2000, Dyer et al. 2001), how the necessary scale economies are reached (performance and scalability issues of applications need to be resolved while meeting the clients' customizing requirements see e.g. Cherry Tree 2000, Hoch, F. et al. 2001, Susarla et al. 2003, Walsh 2003), and how the continuous flow of product innovations i.e. novelty for the customers (Amit and Zott 2001, Utterbach 1994) could be arranged. All in all, these observations make the SaaS model very challenging; some of the literature have probably underestimated the difficulties and risks (SIIA 2001, Walsh 2003, TripleTree 2004) caused by the SaaS model's requirement for the firms to be able to transform their software product business into online service business (Nambisan 2001, Cusumano 2003, Sääksjärvi et al. 2005). However, it has to be noted that for most ISVs, the SaaS model seems to be more of a new sale or distribution channel and does not require a complete renewal of the company's strategy (Lassila 2005). For an ISV with an existing customer base, the key questions revolve around bringing their software services to market with a minimum of disruption to current sales and distribution channels and achieving a maximum additive effect on sales. Key to this success will be partnerships and their management (Cherry Tree 2000, SIIA 2001, TripleTree 2004).

1.2 Organization of this paper

The paper is organized as follows. The next section introduces the theoretical framework used in this study. In section three the case study's research methodology is reviewed and in section four the overview of the case company is presented. In section five the findings from the case study are analyzed. The final section is for discussion of the results and also our conclusions and suggestions for future research are presented.

2. Value Driver Model

The network-based value perspective of Amit and Zott's (2001) value creation model provides a good background to explore and explain what are the driving forces behind the SaaS providers' reasons for partnering and the factors that affect these partnerships. Amit and Zott's model is based on the virtual markets "in which business transactions are conducted via open networks based on the fixed and wireless Internet infrastructure". According to Amit and Zott, several characteristics of the virtual markets, such as the ease of extending one's product or service range to include complementary products, improved access to complementary resources and capabilities, and new forms of collaboration among firms, have an enormous effect on how value can be created. Value creation opportunities in virtual markets may arise e.g. from new ways to combine information goods, physical products and services, and integration of resources and capabilities among partners.

The value creation model is based on the value chain framework (Porter 1985), the theory of creative destruction (Schumpeter 1942), the resource-based view (Barney 1991), strategic network theory (e.g. Dyer and Singh 2001, Gulati et al. 2000) and transaction cost economics (Williamson 1975). Amit and Zott's model enables an evaluation of the value creation potential of different business models through four value drivers: efficiency, complementaries, lock-in, and novelty. In this paper, Amit and Zott's model's four value drivers are used to review and analyze the case firm's actions in forming its SaaS service offering.

Amit and Zott (2001) emphasize the distinction between a business model and a revenue model: the business model primarily refers to value creation whereas the revenue model is centred on value appropriation. By the term "value" Amit and Zott refer to the total value created for all parties involved in the network that the firm's business model compasses. The four value drivers help in assessing the total value that can be appropriated by the participants of a particular firm's business model i.e. the ISV and its partners/complementors, and their customers.

In Amit and Zott's model the most important value driver is efficiency. Efficiency enhancements include e.g. reduction of transaction costs, achievement of scale and scope economies, reduction of search costs etc. Another source of value creation are complementaries, which are present whenever having a bundle of goods together provides more value than the total value of having each of the goods separately (for a more thorough discussion on bundling and economies of aggregation see e.g. Bakos and Brynjolfsson 2000). Business models can also create value by capitalizing on complementaries among activities e.g. when firms co-operate and create a SaaS offering together. The mobile application markets open new value creation possibilities since new relational capabilities, skills, and assets (i.e. shared resources) between firms can be exploited e.g. between online and offline capabilities in order to create sustainable advantage.

According to Amit and Zott (2001), the value-creating potential of a business model depends also on the extent of which it is able to engage customers to repeat transactions and this value driver is called the lock-in. Lock-in usually refers to the switching costs faced by clients who consider alternative services or products from other firms. Lock-in includes e.g. customer loyalty programs, customization, and branding. The fourth value driver, novelty, consists of new ways of conducting transactions, new product or service innovations, or new ways of combining products and services (such as creating a mobile security service offering). Usually the four value drivers and their effects are related.

3. The Case Study

This exploratory research study follows the interpretive approach to qualitative research as we conduct a case study and analyze the findings using hermeneutics as our mode of analysis (Myers 1997). We use the Klein and Myers's proposed set of principles for interpretive field research (Klein and Myers 1999) in conducting our research. In this section the case study's research design is examined with the help of research design method outlined by Yin (2003).

According to Yin (2003), the case study's research design components are: a case study's questions, propositions, unit of analysis, the logic linking the data to the propositions, and the criteria for interpreting the findings. In this case study we wish to explore how a software company can take advantage of the SaaS model's benefits while overcoming or avoiding the risk associated with the model. Therefore we use the four value drivers of Amit and Zott's (2001) model in order to find answers to the following questions: 1) how an ISV can achieve returns from scale while holding on to scope economies, 2) benefit from its partners complementary skills and assets, and 3) leverage its PC-based domain area expertise in mobile setting with its SaaS offering. Our propositions were reviewed earlier in section 2 were the theoretical framework was presented. The case study's unit of analysis is the F-Secure's SaaS business model, which we think provides useful insights also for other ISVs on how to create a SaaS offering. The logic linking of the data to the propositions is done in the following sections where the case study's findings are reviewed using the framework. As the criteria for interpreting the findings, the value creation model is used as the framework with which the case study's findings are analyzed.

For this case study information was gathered via interviews and discussions with the F-Secure's personnel in product management, research and development, and senior management. In addition, information was also gathered from newspapers and trade journals, web-based news services, and from the company's own communication materials such as annual and quarterly reports, press releases, product descriptions, and from F-Secure's web pages.

4. F-Secure and Its Mobile SaaS Offering

F-Secure was founded in 1988 and has been listed on the Helsinki Stock Exchange since 1999. It has its headquarters in Helsinki, Finland and offices in e.g. France, Germany, Japan, Sweden, the United Kingdom, and the USA. F-Secure's annual revenue in 2005 was 61.8 million euros (47.3 million in 2004), EBIT was 7.4 million (6.5m) and it had 390 (306) employees (F-Secure 2006a). The revenue was divided as follows: the corporate segment 32.5 million euros (representing 55 per cent of the anti-virus and intrusion prevention business), service provider segment 16.6m (28%), consumer segment 9.6m (16%), and wireless segment less than 0.2m (1%). Geographical breakdown of the revenues was as follows: Nordic countries 36% (34% in 2004), rest of Europe 45% (47%), North America 10% (10%), and rest of the world 9% (9%).

Currently the F-Secure's SaaS business has 86 partners in 23 countries (Q1 2006). In 2005, the SaaS business segment revenue had grown 95% from the 2004, constituting 28 per cent of F-Secure's revenues. All in all, F-Secure's SaaS business has been very successful since it has grown in just four years (from 2001) to account for 16.6 million euros in 2005, which means close to or over 100% growth rate in every consecutive year (F-Secure 2006a). In the beginning of 2005, F-Secure decided also to enter the market for smart phone applications with its mobile security as a service offering. However, compared to the PC-based SaaS figures, the mobile security still represents only a small fraction of F-Secure's

overall revenue. Nevertheless, F-Secure expects to see the number of mobile malware outbreaks continue to grow, which will in the (near) future underline the necessity to have an up-to-date security solution also in the handheld multimedia terminals (F-Secure 2006b).

F-Secure's antivirus software application is based on multiple scanning engines, that detect and remove malicious pieces of software from the smart phones, and updates that can be downloaded over the mobile network, which contain information about new viruses and other threats and how to disable them safely. F-Secure's anti-virus and mobile security applications consist of the following components: anti-virus, firewall, and filtering software. Key features of the F-Secure's mobile anti-virus solution are: real-time protection against harmful content in the device and memory cards, automatic anti-virus database and client updates to the mobile terminals over an HTTPS data connection (or incrementally with SMS messages), automatic detection of data connections (e.g. GPRS, WLAN, UMTS) for updates, and over-the-air activation of the antivirus service through HTTP. F-Secure's software supports different languages and runs on multiple mobile device operating systems, including e.g. Symbian OS 60 and 90 and Microsoft Pocket PC 2003 and 5.0. F-Secure sells its software through VARs and distributors in 50 countries, its own web store, and as a service via mobile handset manufacturers, such as Nokia, and mobile operators e.g. Elisa (Finland), T-Mobile (Germany), TeliaSonera (Finland), Swisscom (Switzerland), and TIM (Italy).

4.1. F-Secure's Mobile Security Offering

F-Secure has been in the anti-virus and intrusion prevention business for over a decade and until few years ago sold its PC-based software only as shrink-wrapped license-based products. According to F-Secure's CEO, F-Secure "has seen that our customers' purchase behaviour is changing dramatically and consumers as well as companies are acquiring data security preferably in the form of a service rather than in other ways" (F-Secure 2006a). Therefore, from the year 2001 onwards, F-Secure has offered its anti-virus software as a service via its ISP partners. In 2005, F-Secure started offering anti-virus software also to mobile devices as a SaaS service. So far, the mobile anti-virus business represents only a very small fraction of the overall revenue but F-Secure anticipates that this will change in the future (F-Secure 2006a). In Figure 1. we present an overview of the F-Secure's mobile SaaS business model.

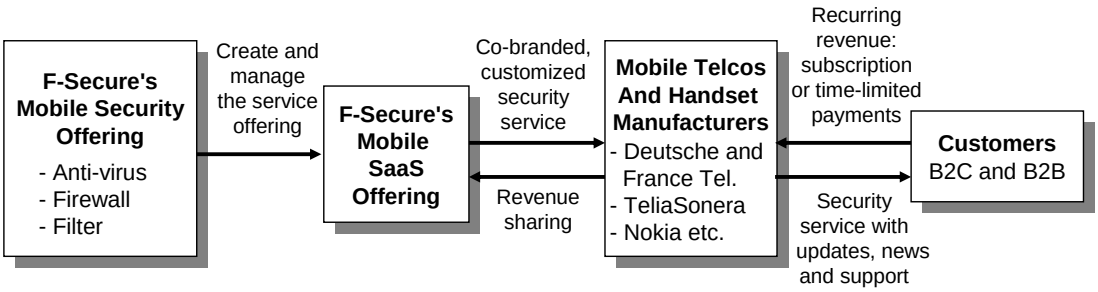

Figure 1. F-Secure's partner network and mobile SaaS offering

F-Secure's mobile security SaaS offering consists of the following components: anti-virus (which stops viruses, worms, trojans etc. in real-time), firewall (intrusion prevention), filter (operators can filter content to block harmful software in the network before it enters phones), and automatic update feature (which consists of virus definition database and software updates). For a monthly subscription fee, e.g., the mobile telecom operator's customers can subscribe to the security service, which consists of the anti-virus application,

automatic updates, and local customer support services. The revenue model can be either subscription-based or time-limited, which are both simple and straightforward to apply: F-Secure and its partners share the revenues received from the customers' payments.

5. Analysis of the Case Study's Findings

For F-Secure, its SaaS service offering has been a success story from the beginning: it has been able to increase its sales, international operations, and customer base profitably without having to make huge investments e.g. in different countries' sales and support personnel. The case study's findings in light of Amit and Zott's (2001) value creation model are summarized in Table 1.

Table 1.
Sources of value creation in the F-Secure's mobile SaaS offering

Efficiency	Complementaries	Lock-in	Novelty
1. Scale economies: lower distribution and marketing costs of SW, lower customer support and billing costs	1. Bundling offers economies of aggregation e.g. by enabling brand leveraging of both the F-Secure and telcos	1. Co-branded, tailored offering to suit the telcos' and their customers' needs and requirements	1. Security as a service offering via handset manufacturers and telcos' sales and delivery channels
2. Scope economies: F-Secure provides anti-virus how-to knowledge to a larger audience	2. Wireless access and associated security risks are overcome by F-Secure's offering: one-stop shopping	2. High-volume repeat transactions: recurring revenue from telcos and their customers	2. F-Secure benefits from the first mover advantage and positive feedback effects
3. Provides an easy, low cost, and low risk access to new market of smart phones and mobile telecom operators	3. Reduced search (efficiency related offering): telcos and handset manufacturers act as the sales and distribution channel	3. Efficiency features and complementary service offering both attracts and retains customers	3. Fast and effective distribution (of virus definition updates etc.) channel through telecom operator partners' networks
4. F-Secure and its partners can focus on their own core competencies	4. F-Secure benefits from its PC-based domain area expertise, which is transferable to mobile world		

Furthermore, F-Secure has been able to capture most of the potential benefits of the SaaS model. For example, F-Secure has taken advantage of its domain area how-to knowledge and managed to offer its product suite as a service to the wider customer base of the telecom operators via its one-to-many SaaS offering. In essence, F-Secure has managed to reach economies of scale while taking advantage of economies of scope (i.e. its anti-virus and intrusion prevention knowledge is used by a larger number of customers), and at the same

time managed to achieve e.g. lower customer support costs (mobile telcos handle support). In other words, F-Secure has successfully combined its own product-based business with the mobile operators' service business related skills and network assets. In addition, the risks associated with the SaaS model have also been successfully dealt with or downplayed: F-Secure has selected partners that complement its own skills and resources in creating and enabling its mobile SaaS offering (see also Lassila 2005). However, the mobile security business is still in its early stages and it is hard yet to say whether it will or when it will become a significant revenue source for F-Secure.

As mentioned earlier, this particular application domain area of anti-virus and intrusion prevention software seems especially suitable for the SaaS model e.g. because the required infrastructure, which was also needed in F-Secure's earlier PC product-based business, can be exploited in its mobile SaaS service business. Also the necessary commitment to frequent update cycle was of great importance in product-based anti-virus and intrusion prevention business: by increasing its number of customers F-Secure is now able to reap even larger returns of scale (by spreading the costs over larger number of customers). Last but not least, the architecture of the F-Secure's software suite, which basically consists of the multiple scanning engines and security threat definition database, makes it possible that the application is run on the customers' mobile devices and only the necessary updates are distributed in a centralized fashion via the mobile operators' network infrastructure.

In a summary, F-secure has successfully taken advantage of the SaaS model's potential benefits and managed to downplay the associated challenges. F-Secure's SaaS service has provided the firm a relatively easy and low risk access to new market of smart phones because e.g. F-Secure's domain area knowledge is easily transferable to the mobile setting and because its partners (the mobile operators) have an existing customer base, (distribution) network infrastructure, and the necessary customer care and billing systems in place. In addition, also the mobile operators have benefited from increased revenue streams by offering the value-adding security service to their customers. This means that both F-Secure and its partners have benefited from their complementary skills and assets and also from bundling together their online and offline assets. However, we have to note that there are some issues that might prove to be problematic for F-Secure in the future: the issue of who owns the end-customer and how to increase the lock-in (i.e. is F-Secure's brand strong enough) on the telcos in case F-Secure's competitors begin to compete more aggressively with their own mobile SaaS offerings are still open.

Although this case study concentrated on only one company and its SaaS offering, the results of this case study can be said to be generalizable on the analytical level (which is level-1 inference, Yin 2003). This is commonplace with case studies as they rely on analytical generalization (Yin 2003). According to Lee and Baskerville's generalizability framework, this research study's findings would fall into the category of generalizing from data to description (Lee and Baskerville 2003).

6. Discussion and Conclusions

The purpose of this paper was to study how a software product company can expand its business with the Software as a Service business model. We conducted a case study of F-Secure and its mobile SaaS offering to study how by taking advantage of the potential benefits of the SaaS model (such as expanding the customer base and by lowering the distribution costs) and by managing to solve or avoid the associated risks (e.g. by successfully managing the partnerships, making the customization quick and easy to implement, and by avoiding the high initial investment costs), a software firm can increase its sales, number of customers, and profitability at the same time. Our findings show that by

successfully solving the challenges associated with the SaaS model and at the same time benefiting from economies of scale, scope, and aggregation, F-Secure has managed to leverage its domain area expertise with its mobile SaaS offering and expanded its PC-based antivirus and security application business to cover also mobile devices. Furthermore, by managing to reach the necessary economies of scale while taking advantage of scope economies, F-Secure also managed to customize its SaaS offering to suit its mobile operator partners' and their customers' needs. In addition, both F-Secure and its partners benefited from economies of aggregation. Therefore, we can say that F-Secure was successful in changing the focus of its product-based business since it was able to overcome the difficulties and risks caused by the SaaS model's requirements for a firm to be able to transform software product business into online service business. All in all, it needs to be said that despite of all of the above-mentioned things, for F-Secure its mobile SaaS offering is still more of a new sale or distribution channel and does not represent a complete renewal of the company's strategy. In addition, on the basis of our analysis using the value driver model, we think that instead of just concentrating on efficiency improvements, the sustainable way to generate value using the SaaS model should be easy and low-cost access to innovative and useful software applications, based on a broader set of value sources i.e. complementaries, novelty, and lock-in.

On the basis of this study, we can say that as a part of a medium-sized software firm's (in this case F-Secure's) growth strategy the SaaS business model can be very beneficial. However, it needs to be said that this particular application domain area of anti-virus and intrusion prevention has features, such as the need for frequent updates and an efficient channel for their distribution, that make it especially suitable for the SaaS model. In addition, it also has to be mentioned that from the end-users viewpoint, the problems that are associated e.g. with bandwidth, different (and often incompatible) networks, and the high costs of downloading updates especially when roaming continue to remain unsolved. Although these problems are beyond the software company that creates anti-virus applications, they certainly do affect negatively on the adoption and diffusion of mobile services in the marketplace and therefore also have a negative effect on the revenue growth from these services.

In conclusion, since this paper concentrated only on exploring one particular software application domain area and on the F-Secure's mobile SaaS offering, the generalizability and transferability of our findings are somewhat limited. In order to gain more extensive and detailed understanding of the SaaS model and its implications, also other software companies and their SaaS offerings in different application domain areas should be investigated. Therefore we suggest that further empirical studies are conducted in order to reach a better understanding of the SaaS model in the mobile setting.

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