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E-Health Market Development in the Netherlands: An Analysis of App Developer Strategies and their Drivers

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E-Health Market Development in the Netherlands: An Analysis of App Developer Strategies and their Drivers

*Paper to be presented at the International Telecommunications Society Europe conference
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*** Research In Progress ***

1. Introduction

Developments in e-health are promising: Lower costs and empowerment of patients are just a few benefits that are often heard in relation to e-health. E-health may concern various types of applications where digital and internet technologies are being used to provide information and services related to healthcare, cure, and prevention. Examples include applications ranging from ‘basic’ apps that provide information about certain types of diseases and their treatment, to apps that enable caregivers to communicate patient needs with each other, to digital watches that provide medication notifications and wearables that track physical condition. Various telecom operators, large ICT vendors and also small software development companies have ventured into the e-health business.

In 2014 the Minister of Health in the Netherlands has announced a number objectives related to e-health in the areas of 1) digital access to medical information; 2) self-monitoring and measurement; and 3) 24/7 access to a doctor through teleconsulting. The minister’s objectives are ambitious. For example, by 2019 80% of chronically ill people should have direct access to medical information, including information about medication, vital functions and test results, possibly for use in mobile apps or web-based applications (Schipper, 2014). However, in 2015 the percentage of patients having access to medical information is still less than 1% (Nictiz, 2015). Further, only 15% of people is able to ask online for repeat prescriptions (Nictiz, 2015). While already 19% of people tracks certain physical activity, only 7% has digital access to information about doctor’s visits or treatment (Nictiz, 2015).

These numbers suggest that a long road needs to be travelled to achieve the objectives as set out by the Minister of Health. Given that hundreds of e-health apps, informative websites, and increasingly also wearables, are already available in the Netherlands, this gives rise to the following questions: what factors are prohibiting adoption of e-health technologies in the market? And what may further stimulate e-health market development? This study aims to provide initial insights into these questions by focusing on the perspective of app developers. ‘App developer’ in the context of this study refers to small business that provides an app-based (e-health) service. They may either build the technology themselves or outsource the software engineering part of it.

While we can already observe a large number of e-health apps in the market, their uptake seems to lag behind. This study aims to shed light on some of the opportunities and challenges they face in the nascent e-health market. In particular, this study aims to answer the following questions: What are success factors and what are barriers in the development of sustainable business models for app developers?

2. Literature Review

2.1. Business Model Dynamics

To start answering this question first it is important to understand what business models and their key aspects are, and why the concept of business model matters in light of understanding market development success factors and barriers.

According to Osterwalder and Pigneur (2010), business models are perceived as models that describe the rationale of how an organization creates, delivers, and captures value. Others have described a business model as a “focusing device that mediates between technology development and economic value creation” (Chesbrough and Rosenbloom, 2002, p. 532). In other words, it explains the value creation logic (Lehoux et al., 2014). A universal definition of business model however is not available. Although there is no universal definition, researchers tend to agree on business models explaining how firms do business and hence increasingly use the business model as a unit of analysis (Zott et al, 2011). Various areas of interest as related to business models have gained interest over the years, in particular (1) e-business and the use of IT, (2) strategy, value creation and competitive advantage, and (3) innovation and technology management (Zott et al, 2011).

Given the focus of the business models on economic value creation in relation to technology development, it is a useful unit of analysis to analyze in terms of what works and where do challenges arise in the e-health market.

Business model design happens through the use of various models. A well-known one is the Business Model Canvas, which considers design variables including value proposition, key activities, customer segments and relationships, partnerships, revenue model, etc. Ballon (2007) has developed business models through taxonomical schemes (De Reuver et al., 2013), which is built on control and value parameters and a limited set of options (3) per parameter. These include value network parameters, functional architecture parameters, financial model parameters, and value proposition parameters (Ballon, 2007). The e3-value methodology is focused on economic and financial aspects of business models, and the exchange of value between organizations in a value network (De Reuver et al. 2013). The STOF method focuses on service as a unit of analysis, and the technology design issues that play a role in developing ICT-enabled services by focusing on service, technology, organizational, and financial domain issues (De Reuver et al. 2013). The Business Model Canvas prescribes little detail for the design variables. In a similar fashion, the model proposed by Ballon prescribes little detail on how to design the business models. The e3-value model is specifically focused on networks (De Reuver et al, 2013).

In relation to innovation, business models can be perceived in two ways. First, organizations commercialize ideas through a business model, and second, the business model itself is object of innovation (Zott et al, 2011). In the latter regard, literature has found that business model innovation is key to firm performance. In particular, Zott et al. (2011) find in the literature that business models influence outcomes either when the business model connects technology with customers (based on Chesbrough and Rosenbloom, 2002), or through networks (based on Calia et al., 2007; Bjorkdahl, 2009).

As indicated by Sprenger and Mettler (2015), business professionals are often overwhelmed when they have to define a business model due to lack of knowledge and experience with business model development.

While many studies focus on certain (static) aspects of business models and the extent to which they lead to success (e.g. MacInnes and Hwang, 2003), fewer studies focus on the dynamics of business models. Business models develop over time. For example, Bouwman and MacInnes (2006) developed a generic framework for analyzing the dynamic nature of business models, in which the influence of technology, markets, and regulation on service, technology, organizational arrangements, and economics is researched. They find that business models indeed change due to external influence from regulation, technology, and markets.

2.2. Business Model Innovation in e-Health

Business models in the healthcare industry have not gained much attention in academic studies. Nevertheless, the dynamics of business models have been pointed out a number of times. For example, Lehoux et al. (2014), who study the mutual influence of business model and health technology design, found synergistic readjustments, drastic reconfiguration and mismatch between business model and technology design occur in their case studies, resulting in a change of the initial value proposition.

In addition, Van Gemert-Pijnen et al. (2011) argue that e-health development is an iterative, flexible, and dynamic process. Through its usage, technology is reshaped. In the case of interactive technology, users reflect on the content or system via feedback (Van Gemert-Pijnen et al., 2011).

As part of the business model, organizational capabilities and network aspects have gained some attention in the field of e-health. For example, Uruena et al. (2016) find that organizational capabilities contribute in transitioning e-health innovation projects from pilots to real implementations. In addition, the authors find that experts see health today as an ecosystem with various parties taking decisions. In the center of the ecosystem is the patient who co-creates many initiatives related to the e-health project with other members of the ecosystem. Related to the network aspect, the authors also find that most e-health projects use stakeholder-networking capability for attracting new knowledge. Hence, this capability is considered important for the success and sustainability of their projects. Finally, organizational flexibility relates to the implementation of e-health projects. In particular, flexibility for updating the business model operation emerges as important for the projects.

Van Limburg et al. (2014) also emphasize the networking aspect, arguing that the step-by-step guide for business modeling with stakeholder involvement enables e-health researchers to apply a systematic and multidisciplinary, co-creative approach for implementing e-health. Business modelling becomes an active part in the entire development process of e-health and starts an early focus on implementation, in which stakeholders help to co-create the basis necessary for a satisfying success and uptake of the e-health technology.

3. Research Approach

The main goal of the paper is to provide insights in a number of factors related to success and barriers to adoption of e-health from the perspective of the e-health app developers. To this end, this study will identify aspects of the business model of various e-health providers that are successful as well as identifies elements of the business model that are challenging. In addition, the study will assess how business models change over time, to gain more insight into what aspects app developers perceive as (potentially) successful and which factors are driving this.

The study will employ the STOF model to identify aspects of the business model that app developers perceive important in developing a sustainable business model. The STOF model is chosen as it accounts for organizational and network aspects that in earlier studies have been found to matter in e-health businesses (Uruena et al., 2014; Van Limburg et al., 2014). Further, this model unites various frameworks into only four components, thereby providing a fairly comprehensive, yet manageable view of business model components and their interrelations. The STOF model specifically looks into the service, technology, organizational, and financial domains.

In addition, to gain insight into the dynamics of business model innovation, the objective is to identify which external factors influence changes in the business model. In particular, the study will identify how technological, regulatory, and market changes affect transitions in business models according to Bouwman and MacInnes (2006), or whether possibly other external factors play a role.

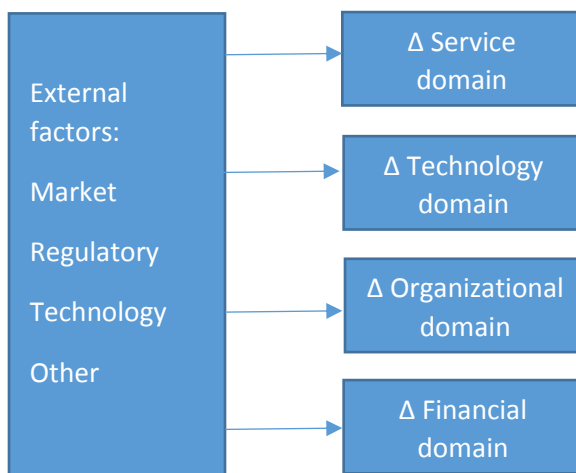


Figure 1: Theoretical framework

Interviews and desk research (content analysis) have been carried out to gain insight in efforts of e-health app developers. Themes addressed during the interviews with developers include revenue models, barriers experienced in bringing their services to market, and partnerships sought during the development process, among others.

Respondents were chosen based on their target group (consumer, caregiver, and/or health provider), primary app functionality (information provision, social networking, diary, etc), and topical focus (specific health issue vs. more generic app). A total of 9 people were interviewed.

4. Findings: An Analysis of STOF Developments and Driving Factors

A variety of app developers were interviewed. All businesses were still in ‘start-up’ phase, with the oldest one dating back to early 2012. Functionalities vary greatly, including administrative functionalities, logging, information, communication functions, agenda functionality, etc. At all times the apps are focused on the consumer/patient/client or caregiver, sometimes with health professionals added. Next, developments in service, technology, and financial and organizational arrangements for the interviewed app developers are described as well as their drivers.

4.1. Service developments

This category regards changes in the value proposition or added value of the service offering. All respondents indicate that their services have stuck with the primary value proposition. The provided services all have changed however through the adding or adjusting of certain functionalities, but the main idea has remained the same. This is to be expected of course, since most respondent have companies that are only a few years old.

While all respondents indicate to work on new functionalities, one respondent also says: “we should watch out to be tempted to make the app too complex”. Another respondent seconds this by saying that “too much functionality easily makes the app impossible to understand”. Simplicity is thus often a key word.

The adding of functionalities happens because of questions coming from the market: either from the consumer (patient/client), or from the healthcare provider (to better integrate the app in their working practice).

Drivers for these developments come from the market, and include thus primarily user needs/requirements, both from the consumer as healthcare provider.

4.2. Technology domain developments

The technology domain relates to the technology architecture and related design issues concerning infrastructure, platforms, and software (De Reuver et al., 2013).

Developments in the technology domain happen in light of platform choice, multiplatform development complexity, ease of outsourcing, app integration with pre-existing systems, and the impact of technology problems on the business.

First, technology development is indicated an important part of the app developers' business activities. One respondent indicates that 40% of their time goes to technology development, as opposed to other important tasks, which is primarily marketing for new customers (both end users and healthcare providers).

Platform choice is an important part of the development process. One respondent indicates that Windows is not worth building for, with only receiving requests to develop for Windows once or twice. Another respondent however indicates to receive more requests for Windows due to the cheaper Windows phone models (previously Nokia) that recently came to market. One respondent indicates that Android was the preferred OS due to its better compatibility with NFC. Another respondent indicates that the choice of IOS vs. Android is a difficult one: Android has more devices with different screen sizes which makes development for Apple easier.

Multiplatform development (for both Apple and Google operating systems) is said to be complex.

The technical development of the app itself proves difficult for a number of respondents; particularly those respondents that do not have a technology background themselves. For example, two respondents indicate that the second version of their apps was very different than the first one – built in a different framework.

Another respondent that had to outsource the development because of lack of software development skills, indicates that it is very costly to outsource. Further, for one respondent it turned out difficult to find a good Android programmer; there are more job ads for Android programmers than Android developers offering programming services to businesses.

Technical problems also provide barriers to business development (i.e. losing customers/ decreasing speed of take up of more customers); servers have gone down in a number of instances.

Finally, apps have to fit with other software (e.g. electronic patient file or other) when the app is offered in a B2B manner. Therefore, software development sometimes is 'more about form than content': different parties have to collaborate to ascertain the app can be integrated into existing systems.

Finally, the issue of privacy is mentioned a few times; when collaborating with healthcare providers, there are many demands related to ensuring patient privacy.

Overall, drivers for these changes come from technology, market, and regulation. Technology determines ease of building for one or more operating systems (development frameworks). Drivers from the market include availability of programmers and customer needs/requirements (i.e. demands regarding the operating system). Regulation comes into play as well through requirements due to privacy laws.

4.3. Developments in the Financial Domain

In the financial domain developments relate to how a value network intends to generate revenues from a particular service offering. A broad categorization can be made into apps whose revenue stream is based on B2C (business to consumer) vs. B2B (business to business) revenue models. Next, developments surrounding models for B2C vs. B2B businesses will be described.

B2C

One developer does not yet have a clear-cut business model and is still experimenting. One of the respondents that does not have a revenue model yet has made attempts to make arrangements with healthcare providers by trying to sell pilots. After that they changed to going directly to end-users to test whether people want to work with it. Another lead regards an innovation budget by an insurance company. The business model has changed from freemium to advertisement model. In addition, it is felt that competing in business contests helps to increase company/brand awareness. In the future the respondent aims to pitch for investors. Meanwhile, they are working with a coach.

Another respondent started with customers and the freemium model. The app had a few hundred downloads. However, it was felt that selling software to consumers is difficult. Another attempt was made with an app for little over five euros a month, but this does not sell easily. Therefore a switch to selling to organizations has been made. But this also proved difficult, healthcare providers “easily find it too expensive”, although they tried both higher and lower prices.

Another developer sells the app for a few euros. With a few thousand downloads so far, expansion is sought in the US rather than with organizations. Organizations take a long time, “while technology keeps on evolving”, and thus the app needs continuous development.

B2B

The B2B revenue models are different and seem more sustainable.

One respondent has started with own money for which consultants were hired to build the app. After that they started a crowdfunding campaign to generate publicity. This was mostly for initial investment. The app was much more expensive to build than expected. After building the initial app organizational arrangements were sought for a revenue model.

Another developer has made its app for one healthcare providers through co-creation. The healthcare provider received a discount, while the developer was able to sell the app to others as well.

One respondent has followed the strategy from targeting customers in the lifestyle area first, in order to gain many customers, and next, to switch to the medical area.

These B2B strategies thus are different strategies: focusing on gaining a large customer base in one area after which to change focus, vs. after initial investments focusing on selling to large organizations, vs. collaboratively developing with a partner.

4.4. Developments in the Organizational Domains

Developments in the organizational domain relate to the structure of the multi actor or intrafirm value network to create and distribute service offering.

4.4.1. Types of organizational arrangements

The cases show some similarities and differences with regard to organizational arrangements based on whether their initial focus was B2C (selling the app directly to consumers), B2B (selling the app to healthcare providers).

Initial B2C focus

All developers that initially focused their business model on putting their apps in app stores and directly selling them to consumers have found that this does not lead to a sustainable revenue stream. All respondents have changed their focus towards selling to organizations.

For example, one respondent started selling an app for approximately 6 euros a month. This was felt as too expensive by consumers. Therefore the respondent is looking to change the business model into selling the app to organizations.

They all indicate that finding new organizations is one of their key activities. Another one also had as starting point finding organizations as well as end-users/caretakers. Finding additional organizations is one of the key activities; currently they give 2-3 presentations a day.

Another respondent with an initial B2C focus indicates that finding both programmers and partner organizations is the key focus of their current activities.

Initial B2B focus

One respondent has developed multiple e-health solutions by starting with one care provider. The care provider received a bonus for the service upon completion, while the respondent was allowed to sell the resulting service to other organizations as well.

One respondent whose app focuses on lifestyle, and coaching in addition to the app is provided (although the coaching is provided by the third party provider) also continues to focus on adding new organizations.

One of the social network oriented app developers had partnerships established in the beginning. The type of partnerships are changing however: while they wanted to start with care organizations paying for their service, they will also focus on paying customers. This will be an additional revenue stream. Continued development of partnerships however remains a key focus.

Thus, all developers targeting organizations continue to do so, while one organization will try to expand to target customers as well as an additional revenue stream.

4.4.2. Strategies to increase revenue streams and customer base

Various strategies are used to expand organizational arrangements. They include various strategies to expand the number of partnerships in the Netherlands but also include going abroad.

Expanding abroad

Going abroad also seems a trend. Approximately half of the respondents indicate they consider going abroad (without being asked). One respondent indicates to expand to Belgium. Partnerships with organizations are important, and through already existing contacts they feel to have good potential in Belgium. England is perhaps a next target. Another respondent is considering the US. The US because in the US consumers are used to pay for apps more than in Europe. Another one also targets the US store because they feel the American consumers already have more experience in health tracking, which will make their own app fit better.

The Process of Establishing Partnerships

For expanding the number of partnerships in the Netherlands, the following strategies can be discerned: top down, bottom up, finding an ambassador, and taking advantage of network effects.

One respondents' experience is that going top down when approaching municipalities works best. Bottom up is found to be difficult at times. Often managers of professionals do not understand the added value of e-health technology.

One organization indicates that having a professional as 'ambassador' has helped significantly: the professional advertises through word of mouth, but also helps showing the solution at conferences. This respondent experiences that usually talking to professionals works well, although sometimes they also directly talk with managers.

Another organization that is just changing its business model to selling to organizations, also believes that working with an ambassador will work. However, they have tried both bottom up and top down but both are difficult. It is felt that the idea often gets stuck in 'innovation groups' within healthcare organizations, while individuals are often enthusiastic.

One respondent that is just starting to try to sell to organizations, has sent out linkedIn messages to directors. This top down approach has given them a number of opportunities to present, but whether it will lead to more opportunities is yet unknown.

Finally, bureaucracy makes it difficult to make partnerships with large healthcare organizations. One respondent indicates that they have presented at various organizations, but that particularly hospitals are difficult: they are used to develop themselves and they are very closed for giving room to new innovations. In addition, decision making is very slow in such large organizations. Further, to deal with these organizations privacy must be ensured. Overall, it is felt that it takes approximately 5 months for organizations to make a decision. In the meantime, technology evolves. This respondent is therefore considering to go to organizations with an idea, and develop afterwards, rather than develop and then try and sell it.

Network effects are important as well: One respondent indicated that once the first partnership with a municipality had been established, others followed much easier. The respondent that initially started to develop in collaboration with a healthcare provider, also experienced easy uptake by being able to show potential healthcare providers what they are already doing.

Having received one or multiple awards has also helped, and others indicate that this is one way to generate interest by third parties.

Drivers for changes in the business model in the financial and organizational domains include primarily market factors. In particular, lack of revenue streams due to limited customer willingness to pay plays a role in changes.

5. Discussion

Overall, different phases of business model innovation can be discerned, driven by various factors: in the first phase initial development of the service takes place. In the next phase, developers search to initiate or extend partnerships, and/or extend functionality of their service. Finally, technology is adjusted to fit technological and functional and privacy requirements of partners. See also Figure 2.

The analysis gives insight in various innovations that take place in the business model. After the initial phase, in the service domain we see that typically the value proposition remains the same as the initial one, although functionalities are added. This is driven by customer needs and requirements.

Problems seemed somewhat dependent on the background of the developer; those with a business background tend to have difficulties in attracting software developers. Those with a software development background tend to have difficulty in thinking of a revenue model.

In the technology domain, initial technology can be changed for system integration, development into more robust technology, rebuilding the app in a new development space, or building the app for an additional operating system.

In the financial domain we see remarkable changes for all respondents from a B2C focus to a B2B focus through establishing organizational partnerships. Those already having started in the B2B domain continue to develop extra partnerships, or target a new type of customer base, often trying to build on network effects.

For small developers it is particularly difficult to build a sustainable business model. Focusing directly on end users by putting the app in an app store, does not generate sufficient income. Rather than focusing on B2C, the Business to Business (B2B) market (selling through healthcare providers) thus seems the more profitable. It seems important to generate revenue arrangements with relevant institutions. These can be municipalities, hospitals, occupational health services, etc. are. Applications focused on wellness (prevention / lifestyle) and care (rehabilitation, maintenance chronically ill) bring a different dynamic with him with regard to the development of a business model than the applications designed to cure (diagnosis and immediate treatment). Especially in this last branch of healthcare often expensive clinical trials are required, particularly when services are used for explicit measurement or monitoring of bodily functions.

In the organizational domain changes take place to add similar new organizations as a customer or to expand to different sector or type of organization (e.g. municipality vs. healthcare

providers). A remarkable number of developers consider to expand abroad, which is indicative of the need to establish a significant customer base in order to generate revenue.

Developments in both the financial and organizational domain are driven by a limited customer willingness to pay, be they consumers or organizations (healthcare providers/municipalities), since the latter are also found difficult to convince to buy apps.

A major hurdle is how cooperation with institutions is achieved. Problems that have been addressed are among others low budgets, slow decision-making, but also for developers to find their way within healthcare institutions. Does one start to talk and negotiate with health professionals, managers, or directors?

Once new organizations are added as a customer, technology has to be adjusted to fit existing systems and privacy requirements, plus potential customization of functions

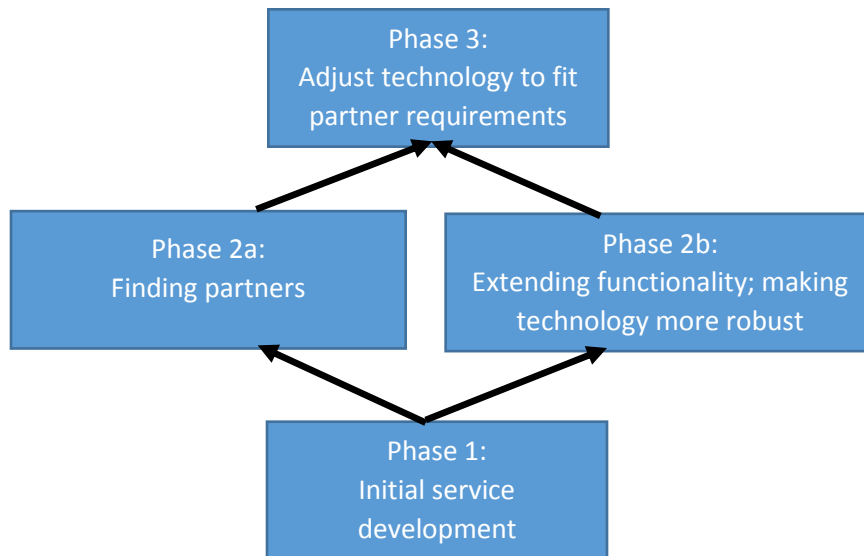


Figure 2: Phases of Business Model Innovation

To conclude, findings of this study suggest that the search for a sustainable business model appear to be primarily in finding a sustainable revenue model, and to this end establishing organizational partnerships.

6. Conclusion

This study aimed to answer the following question: What are success factors and what are barriers in the development of sustainable business models for app developers? To this end the study identified business model innovations for e-health app developers.

Various success factors were identified, such as having an ambassador within the health sector to promote the service, of focusing on the lifestyle sector before the medical cure sector to establish a large (enough) customer base. These success factors however cannot be generalized because

not all services lend themselves for an 'easier accessible' market or simply do not have easy access to a truly influential ambassador.

Among identified barriers a few possibly more generalizable trends were identified: B2C business models are difficult to make profitable; findings suggest B2B focus is more likely to be successful. However, establishing organizational partnerships is a difficult, and time consuming task.

In line with Bouwman and MacInnes (2006) this study thus finds that market, technology, and regulatory factors drive business model innovations in the e-health market. Market drivers include customer customer needs and requirements related to operating system and functionalities, availability of software engineers, and lack of willingness to pay. The key regulatory driver concerns privacy law. The primary technology driver concerns software development frameworks.

This study also shows that although unlike Lehoux et al. (2013) no drastic reconfigurations or readjustments between business models and technology have occurred (yet), transitions in the business model take place. Moreover, this study makes clear that it is not only investors and end-users that shape value capture and value offer, but in the e-health sector there is an additional role very important: the role of the health care provider.

Therefore, to better understand market development of the e-health sector, adoption patterns of e-health providers will provide useful complementary insights. This constitutes an important area for further research.

The study has also brought to light a number of factors to consider before building an app or starting the e-health business. First, the study brings to light the importance of early partnership seeking. Although an argument can be made that building before partnership seeking helps in order to be able to show the service, findings suggest one might not want to wait too long and showcase a basic service to potential partners.

Further, technology standards play an important role for system integration purposes, but also related to privacy. This also underscores the importance to talk with potential partners at an early stage so that the need for rebuilding of the service is minimal when deals are made with partners.

While various drivers for business model innovation have been identified, not all have presented equal challenges. The key problem that was found is in finding a profitable revenue model, which in turn is problematic due to problems of willingness to pay. While consumer willingness (patients/clients) is difficult to change, since it is in line with other mobile use practices where consumers tend to use primarily free apps, the willingness to pay for organizations (partners) could be addressed. At this point in time, healthcare providers do not seem to have major incentives to introduce e-health: it takes an investment and change in the way of working. A more proactive role by government or insurance companies could help stimulate interest in e-health.

Of course, this study constitutes only a first inquiry into factors that play a role in adoption at the market level. Additional interviews could be conducted to see if other factors play a role as well

in business model innovation. In addition, to better understand market development, the role of other stakeholders need to be studied as well; for example, as already mentioned adoption patterns of e-health providers will result in useful complementary insights.

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