International Master of Science in Business Administration

How can Health Care Social Networks increase User Innovation in Health Care?

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Abstract

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The health care industry has experienced a significant advancement in the usage of modern Information and Communication Technologies (ICT) that has allowed the different health care stakeholders an increasing access to health information and enables them to take health care decisions on their own behalf. In this thesis we evaluate this increasing usage of modern communication means and networking opportunities in health care online communities and which effects it can have on user innovation.

The overall aim of this thesis is to present and analyze characteristics and determinants to the interested reader of Health Care Social Networks (HCSN) and their online communities and how they can be leveraged for user innovation purposes. In order to do so we analyze previous research conducted on user innovation and online communities and apply relevant findings and methodologies to user innovation behavior in health care. This includes an analysis and differentiation of user entrepreneurs from classic entrepreneurs, their drivers to innovate as well as process of innovation. We will find that HCSN especially support the user entrepreneur process with forms of online collaboration, feedback and reinforcement that can lead to higher individual or collective innovation outcomes. Additionally, we determine strategies HCSN currently apply or should follow in the future in order to further increase the attractiveness of the platform and the respective innovativeness of its users. In a last step of the analysis this thesis evaluates if and how intellectual property protection in health care communities should be practiced and presents the private-collective model developed by von Hippel and von Krogh.

The main findings of this thesis help to understand the relevance of Information and Communication Technologies in health care, which implications social networking and online collaboration on Health Care Social Networks have on user innovation and how they can be leveraged.

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I am grateful to have had the chance to make use of previous research on user innovation made by von Hippel from MIT and Shah and Tripsas from the University of Washington and HBS which have provided great insights and inspirations for the development of this thesis.

I am glad to have gained valuable insights into health care owing to a private project in this field as well as an internship in the pharmaceutical industry during this master studies, which raised my attention and interest to chose this topic.

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List of abbreviations

HCSN	Health Care Social Networks
ICT	Information and Communication Technology
R&D	Research and Development

1. Introduction

Today modern Information and Communication Technologies make it much easier for us to access information and share knowledge with others. Health care has experienced a transformation process towards a targeted usage of such ICT which has already great potential to increase patient treatment, decrease medication and treatment costs and revolutionize the way patients, doctors, care givers, family members, researchers and the interested public communicates with each other on health care matters. In order for the health care industry and its participants to provide and receive top class service and continuously advance in finding innovations and solutions to health problems, the further integration of these communication tools and all health care stakeholders in research and development is seen as essential (Bullinger et al. 2012).

Users are a fruitful resource of ideas that often emerge from extensive usage of a specific product or service like for example in extreme sports (von Hippel 2005) or driven by a specific need like it is the case for many user innovators in health care. Especially in health care users are keen on innovating for their own use, driven by the circumstances of a disease, lack of medical treatment opportunities, scarce resources or the general goal to increase ones and others health situation. The main benefit users receive is from social nature and from direct usage of the product or service created. This differentiates user entrepreneurs specifically from classic entrepreneurs who have the main goal to gain profits from commercialization of an innovation. With the advancement of the Internet and interaction on online communities, user entrepreneurs benefit from social interaction and collaboration provided on such networks. Health Care Social Networks provide a common platform for people with similar health conditions or experiences, who come together to share knowledge about their disease, symptoms or treatment possibilities as well as to give and receive social and emotional support. These platforms allow users to freely share knowledge, ideas and solutions to health problems in order to gain valuable feedback that can lead to fostering idea generation, product adaptation and improvements. Finally, this process of voluntary online collaboration increases the benefit for its members and can ultimately result in the diffusion of an innovative solution to a common health problem from which a broad mass of patients can benefit.

2. Literature Review

2.1. Methodology

In order to conduct the analysis of how user innovativeness is related to and can be fostered through interaction and collaboration on Health Care Social Networks we have searched technical, medical and social science literature in order to benefit from previous research in this field. Internet research on selected health networks / platforms and communities has been conducted to examine which of these will be relevant to consider for analysis and contribution to our research questions. Key words for research were amongst others: innovation in health care, user innovation in health care, information and communication technology and health care, health 2.0, medicine 2.0, diffusion of user innovations, health care social networks, communities in health care, intellectual property rights protection in health care, and related search criteria.

Following the goal to answer the overall question on "How can Health Care Social Networks increase User Innovation in Health Care?" we have separated the thesis in three main research questions that will be answered. The first research question aims to evaluate the different motivators of entrepreneurs and user entrepreneurs in conducting innovation efforts:

RQ1: What are motivators of user entrepreneurs versus classic entrepreneurs when innovating?

In answering this question the reader will get an insight in the different characteristic of the respective groups and their motivations to follow innovative behavior. Further the reader will be able to understand the relevance of modern ICT for user entrepreneurs and the relevance of user innovations in health care. We are then able to pose the second and main research question which analyzes the role of Health Care Social Networks and their communities in the user entrepreneur process and how these networks can be used to enhance user entrepreneurs´ innovation efforts:

RQ2: How can Health Care Social Networks and their communities foster user innovation behavior?

In order to answer this question we further separate entrepreneurs from user entrepreneurs by analyzing each entrepreneur process from idea generation to commercialization. By

doing so we will distinguish that collaboration and community interaction is of great importance in the user entrepreneur process and further narrow down the scope of this thesis´ analysis. In this course a presentation of the different Health Care Social Network types and their relevant features will be provided as well. Thus we are able to demonstrate to the interested reader that a set of functions and benefits provided to users have great potential to increase individual and community collaboration which increases innovativeness. Finally, the last part of the thesis deals with the question of intellectual property protection and if and how users are able to protect this on online communities:

RQ3: How can user innovators protect their intellectual property on Health Care Social Networks?

Since research on the diffusion of user innovations from online communities is rare, we will make use of relevant related research that has been conducted and applied for open source software development designed by von Hippel and von Krogh. By applying his model we will be able to draw hypothesis and a preliminary conclusion on the intellectual property protection mechanism and relevance for user innovations freely shared on online communities.

2.2. Innovation in Health Care

2.2.1. Nature of User Entrepreneurs versus Classic Entrepreneurs

User entrepreneurs are individuals that tend to receive benefit directly from the product, process or service they create (von Hippel 2005). In general, user entrepreneurship is defined “as the commercialization of a new product and/or service by an individual or a group of individuals who are also innovative users of that product and/or service” (Shah and Tripsas 2007: 124). Since classic entrepreneurs, predominantly manufacturers, mostly create products and services targeted to an economically large enough attractive customer segment, some users are left outside with specific needs that remain unserved (von Hippel 2005). Especially in health care innumerous diseases, symptoms and solutions to disabilities have not been researched or invented, thus leaving patients, care givers and related family members with the desire for a customized solution. These individuals become user entrepreneurs especially when the individual circumstances for innovation

behavior are favorable, i.e. resources are scarce, users feel an intrinsic need for improvement, for example for a specific health related problem, and when access to modern Information and Communication Technologies is high. Especially in these circumstances users do not innovate with the primary goal to commercialize their ideas. They take into account that opportunity costs, such as time and eventually money consumption exist in order to solve a personal need. As Shah and Tripsas (2007) have stated, user innovations thus often emerge without the specific aim to commercialize, users often accidentally innovate: "The development of the idea, experimentation, adaption and preliminary adoption often occur before the formal evaluation of the idea as the basis of a commercial venture" (126). Modern Information and Communication Technologies have a significant role in this process since they facilitate collaboration and exchange of ideas and knowledge with other likeminded people or openly and has become a recognized means of collaboration among user entrepreneurs (Cain and Mittman 2002). This process can have strong impacts on a user entrepreneur and her motivators to further engage in innovation behavior which will we will point out later in this thesis.

On the other hand, user entrepreneurs may also emerge from distress or anger in their former employment. Since manufacturers produce for a targeted market, employees that develop innovative solutions that might not be commercially attractive to the firm itself owing to a too small economic created value and / or feasible innovation for the targeted customer segment, employees that are also users of that specific product or service are pushed to become entrepreneurs. Furthermore, firms may ignore the community's needs which may push the individual users to engage in product development for their targeted needs or even firm formation, thus, to become user entrepreneurs (Lakhani and West 2008).

What eventually differentiates a classic entrepreneur from a user entrepreneur is the characteristic and primary expectation to receive private innovation related benefits from the respective innovation investment (von Hippel and von Krogh 2003). Manufacturers carefully benchmark existing opportunity costs in order to evaluate the future economic benefit of the investment. This can include a conscious and purposeful research for innovation purposes such as industry and market trends, process or customer needs which might include changes in customer perception and new knowledge (Drucker 2002). A user entrepreneur can thus be differentiated from a classic entrepreneur or manufacturer by two

main determinants: Firstly, users' innovation behavior emerges from their own specific needs which cannot be solved by the current market place. Secondly, a user entrepreneur does not innovate with the primary goal to commercialize the innovation. A user directly benefits from using the product or service she creates. In this process users "do not have to develop everything they need on their own: they can benefit from innovations developed and freely shared by others" (von Hippel 2005: 64). The form of online collaboration and idea sharing in order to benefit from other users feedback is another criterion that differentiates user entrepreneurs from classic entrepreneurs, which makes use for introducing the first research question: ***What are motivators of user entrepreneurs versus classic entrepreneurs when innovating?***

2.2.2. Motivators of User Entrepreneurs versus Classic Entrepreneurs

As introduced in the previous chapter, user entrepreneurs and entrepreneurs have very different interests when pursuing efforts for innovation. Besides the monetary objective as the primary incentive to innovate for entrepreneurs and the main differentiator between the groups, there are other motivators that the two groups to some extend share but that also further separate them.

When talking about the general drivers of innovation we can depict motivators directly related to the individual innovation process, factors related to the society and factors that are clearly economically driven. Individual motivators that drive one to innovate are benefits directly related to the innovation process such as receiving fun, enjoyment and learning from innovating which are drivers that apply to both groups. Other personal related benefits when innovating are for example receiving social respect and increasing ones reputation. This can also lead to increased networking or even realizing future job opportunities. Furthermore, there are factors related to the community such as providing a potential solution to existing problems or the overall dissatisfaction with existing solutions that motivate one to innovate (Cain and Mittman 2002). Especially in health care unmet clinical needs can motivate an individual to innovate in order to improve diseases and quality of life. This process can be further separated as classic entrepreneurs do conduct innovation efforts in fields where users are currently dissatisfied with products or services; but manufacturers will only engage in innovation when the product promises to target an

economically large enough audience and expected profits at least amortize the initial innovation investments. For user entrepreneurs this does not apply since generating a solution for personal or social benefit is a main motivator to innovate. In this process the reach for help privately or publicly is another criterion that can motivate a user to conduct innovation behavior. Positive feedback is a source of motivation that has applied in many fields of user innovations (Shah and Tripsas 2007) and can also be applied to health care.

The differentiation between user entrepreneurs and classic entrepreneurs we have made here is not exclusively neither fully exhaustive. It is to be used as a basic understanding that, especially in health care, the circumstances and motivators of users to innovate are primarily affected by immediate individual and/or social needs, i.e. to overcome a specific health problem that the current market cannot or will not satisfy. The main goal that we have determined as commercialization of an innovation by entrepreneurs is not the underlying goal of user entrepreneurs. Nevertheless, in the process of innovation users may, owing to forms of receiving positive feedback through collaboration or similar reinforcement, decide to commercialize their innovation after having realized the market potential for it.

2.2.3. Importance of User Innovations in Health Care

The sheer number of differentiated customer needs and unmet desires lead to innumerous product and service requirements that have to be met by manufacturers. In order to survive in the health care market, much like in other research and development (R&D) intensive fields, the innovative output of a company highly shapes its economic success. Generally speaking, a high incorporation of innovations in manufacturer's solutions leads to a high profit generation (von Hippel 2005). But in health care, various challenges such as an increasing aging population, geographically spread of patients and care givers, increasing health care demands and regulations, make it almost impossible for health care organizations and manufacturers to allocate their R&D resources to meet all the customer requirements.

In the past especially health care professionals have experienced this phenomenon, who, through individual innovative effort, became important first developers of products and services that later have been sold by manufacturing firms. So were 51% of the medical

device startups that received venture capital investments between 1978 and 2007 founded by practicing physicians (Smith et al. 2013). Von Hippel (2005) found out that around 80% of the most important scientific instrument innovations have been user generated, such as Lüthje (2003) found that around 22% of the medical surgery equipment in Germany has been invented from surgeons working in university clinics.

Today, it is clear that user-centered innovation is a very powerful wide-spread phenomenon, that is not only restricted to health care companies, professionals or patients: Also "individual lay persons can be identified who independently develop solutions to their health problems" (Bullinger et al. 2012: 167). This area is rapidly growing due to continuing advances in Information and Communication Technologies (von Hippel 2005). This structural change in information and knowledge availability as well as the possibility of both, giving and receiving targeted health information and advice via modern ICT, increases the chance of integrating further relevant health care stakeholders up to the general public into innovation practices, and thus increase innovativeness in and the overall benefit for the health care sector.

2.3. Information and Communication Technology in Health Care

Traditionally, innovation in health care was a prerequisite for health care professionals and manufacturing firms for two main reasons: One was the lack of knowledge of unrelated health care groups such as patients or family members, but also pharmacists and nurses were excluded of the process. The second reason for the exclusion of the general public and other interested health care stakeholders in the innovation process was that the integration of the general public in health care research was associated with significant costs (Bullinger et al. 2012). Today, new usage behaviors and technological developments in ICT have revolutionized the way of communication and interaction between patients, physicians and other related care givers up to family members, the general public and even biomedical researchers (Eysenbach 2008). This process has created new means of communication and information accessibility as well as new possibilities for a more cost-effective and active innovation process. In this dynamic environment ICT are therefore taking on a leading role and have significant impact on health care at all levels

(Tsiknakis et al. 2002), especially "the availability of interactive web-based technologies and the trend towards social networking" (Bullinger et al. 2012: 167).

Von Hippel (2005) describes this trend of increasing accessibility and widespread use of ICT as a process that enhances the democratization of innovation, meaning that users of products and services – both firms and individual consumers – are increasingly able to innovate for themselves. According to research this increasing trend is especially driven by "two related technical trends: The steadily improving design capabilities (…) that advances in computer hardware and software" (64), which can be translated into an advancement of ICT in health care, and secondly, "the steadily improving ability of individual users to combine and coordinate their innovation-related efforts via new communication media" (64), the phenomenon of Health 2.0.

2.4. Health 2.0

With the transformation of ICT for the usage in health care practice, the general public and other related or even unrelated stakeholders in health care increasingly become enabler to create online content in the form of personal blogging, content sharing like video or photos among others, which is called Health 2.0 (Sarasohn-Kahn 2008):

> *"Health 2.0 applications, services and tools are Web-based services for health care consumers, caregivers, patients, health professionals, and biomedical researchers, that use Web 2.0 technologies and/or semantic web and virtual-reality tools, to enable and facilitate specifically social networking, participation, apomediation, collaboration, and openness within and between these user groups"(Eysenbach 2008).*

This fundamental change as we have seen it inherent with the "Web 2.0 movement – changes that emphasize participation, shared data, and collective intelligence" (Hesse et al. 2010: 45) have the potential to increase the engagement of health care users and related groups to "obtain information on conditions, drugs, exercise and diet regimes, doctors and hospitals, insurance providers, and a host of other health related topics" (Hesse et al. 2010: 45). Research has shown that patients have already been keen on finding, evaluating, applying and synthesizing health information online, so called patient empowerment 2.0 (van de Belt et al. 2010). The application of health information is either done individually or in corporation with a care giver, which can be conducted via various online channels

taking the form of telemedicine. Telemedicine offers patients the opportunity for a fast and easy channel to reach care givers, and on the other hand provides health care professionals with an important form of "IT-enabled delivery and decision support" (Chau and Hu 2002: 298).

Besides offering information on a wide range of health related topics, Health 2.0 is characterized by its collaborative aptitude. We will now introduce forms of online platforms and communities where (specialized) information to health care groups is being offered and more importantly social networking and online collaboration fostered.

3. Health Care Social Networks

3.1. Definition and Relevance of Communities in Health Care

While there are many communities, this thesis analyzes the implications of online user communities that tend to support innovation efforts outside the boundaries of a firm in health care, in contrast to Chesbrough´s (2003) definition of open innovation as a firm´s usage of internal as well as external resources and ideas. We are making use of the definition of Joel West and Karim R. Lakhani (2008) adopted from Gläser (2001) where a community is "a voluntary association of actors, typically lacking in a priori common organizational affiliation (i.e. not working for the same firm) but united by a shared instrumental goal" (224). Furthermore, a community in health care "refers to a group of people (and the social structure that they collectively create) that is founded on telecommunication with the purposes of collectively conducting activities related to health care and education" (Demiris 2006: 179).

Not only individual users have an impact on creating, shaping and disseminating technological and social innovation, which has already been recognized by von Hippel (2005) at the end of the 90th, but also increasingly communities and networks have implications for innovation theory and practice (Lakhani and West 2008). Networks and communities have been and will increasingly become a method which facilitates the diffusion of innovation. Traditionally the diffusion process of information and innovation in health care was primarily driven by the professional and social network of a health care professional. The larger extend of the respective network of the health care professional would have effects on the information availability, treatment possibilities for its patients and finally on new drugs and even innovations (Cain and Mittman 2002). Through the usage of ICT the term community today becomes a more important role than ever. Health 2.0 allows users to operate the Internet and other media much more efficiently, so they are increasingly taking responsibility for their own health care, either in cooperation with their physician or by themselves, or in cooperation with other likeminded people via an online community (Cain and Mittman 2002). Online communities can be formed using technologies that bridge geographical distance rather than the traditional community approach that assumes physical proximity (Demiris 2006). Early research by Demiris (2006) on the widespread diffusion of the Internet and its effect on online community

creation has shown that already “in May 2005, Yahoo!Groups (…) listed more than 68,000 electronic support groups in the health and wellness section” (182). This trend has transformational effects on life sciences and on how health care will be conducted in the future. People now make health decisions “well before they become patients” (Swan 2009: 494) and it accelerates the trend of patient empowerment which we have introduced earlier. The advancements of ICT and trend towards community building have also an effect on innovation, since it is now occurring in more venues, “not just governmental and industrial research labs but increasingly at technology companies, startups, small-team academic labs and by creative entrepreneurs and other individuals” (Swan 2009: 493). We will now examine the transformational effect online health care communities can have on health care and its benefits for user innovation.

3.2. Forms of Health Care Social Networks

Health Care Social Networks are emergent, patient driven, online based community-platforms where users may be able to find health resources at a number of different levels (Swan 2009). These networks provide services and features that could include “actual delivery of health care services, staff or patient education, a platform for providing support, discussing health and treatment related issues and problems, sharing documents, consulting with experts and sustaining relationships beyond face-to-face events” (Demiris 2006: 179). These networks or communities and their services provided are primarily targeted to patients, but also health care professionals, researchers and other interested stakeholders are able to participate (Swan 2009). Within these communities, which most of the time operate out of the boundaries of the firm, community-based innovation does take place (West and Lakhani 2008).

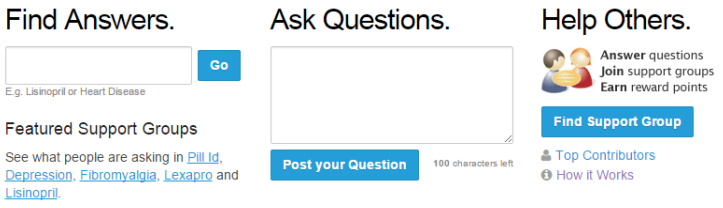
3.2.1. Health Information Platforms

The search of the Internet for health care and medical information has evolved simultaneously with the rise of the Internet. Health Information Platforms capture the increasing interest of health care stakeholders to get direct, clear-cut access to health information. The services of such platforms range from information on health and medication to fitness and lifestyle which therefore results in a broad user base, approaching

all stakeholders in health care. These services have already emerged in the early 2000 and are available in diverse forms. Another characteristic is that information is provided free-of-charge and without the necessity of users to subscribe and become members of the platform, even though some platforms do provide this feature to members to get medical expert advice which is presented in the following subchapter. Thus, the great majority of Health Information Platforms can be described as a one-way information source for its customers. The technological features that these platforms offer range from simple information on symptoms and recommendation of relevant medications, to the identification of different drugs by their form or color, to drug interaction checking and specialized medical information for professionals. Popular examples of such platforms are Drugs (www.drugs.com) or WebMD (www.webmd.com) among others. Both platforms have experiences a steady growth rate and are targeting the rising demand in providing online medical information (see Appendix for detailed profiles of Health Information Platforms).

3.2.2. Medical Advice Platforms

Besides solely information provision, platform providers have identified the relevance of patient-to-patient interaction and doctor-to-patient assistance. According to research there are currently two relevant forms on the Internet that offer patients help-seeking possibilities for medical conditions. The first one is empowering patients and other relevant groups to help each other via an online community in the form of patient-to-patient interaction. *Drugs* for example has an extended portfolio of features that now allows users to pose medical questions that are being answered by so called support groups. Users are able to join such a support group and in return to providing help earn reward points that add to a personal profile (see Figure 1).



Source: www.drugs.com

Figure 1: Drugs Online Community Features

This service is offered free-of-charge and has the potential to benefit a broad mass of people that might not have access to professional medical information in the first place. The level of professionalism within these groups is limited to each user and the respective information provided and the way it is used, i.e. the network does not guarantee the correctness of data since it can also be given by non-medical professionals.

The second form of posing medical questions online is to approach platforms that aim to provide an expert opinion to patients online. These platforms operate by offering patients a medical consultation opportunity according to their symptoms provided by real medical professionals. Potential users of this service typically subscribe to the platform to become a member of the network. The consultation takes place online and will be provided within a certain period of time as well as for an agreed-upon service fee. The services provided by such platforms range from generalist to specialized medical services such as dermatology or psychotherapy. Two examples of platforms offering patient-to-doctor services are Medlanes (www.medlanes.com) and HelloDoctor (www.hellodoctor.com) (see Appendix for detailed profiles). Potential users may benefit from a higher data privacy and professionalism than on user community groups. There are also platforms such as MedHelp (www.medhelp.com) that are offering a mixture of community based tools, where peers or professionals may respond as well as users have the option to pose the question more discretely to a medical professional.

3.2.3. Networks for Medical Professionals

Online Health Care Social Networks also exist for medical professionals. These platforms intend to provide medical specialty information and consultation possibilities in the form of doctor-to-doctor assistance and interaction. Most of such networks are closed community platforms enabling their members to share information about specific topics and give or receive qualified feedback from other professionals. DocCheck (www.doccheck.de) offers medical advice for health care professionals, and additional features such as posting questions in the community, receiving drug information or even job postings, whereas RemoteMediHelp (www.remotemedihelp.com) (see Appendix for detailed profiles) is a network that provides first aid medical information for health care professionals operating in remote geographic areas.

Besides professional networks that aim to provide medical advice and information only, HCSN for medical professionals offering the possibility for socializing and engage in further health related activities, up to conducting research with other peers, have also emerged. Sermo (www.sermo.com) is a social networking Website for medical professionals and, according to the platform, the leading Health Care Social Network for medical professionals in the US. The features provided for the members target to create "new opportunities for collaborative diagnosis, expert review, and continuing professional education" (Hesse et al. 2010: 45). For this reason community interaction to solve real-life health cases, vote on physician opinions on current medical issues and trends are fostered, like the opportunity to engage in and contribute to health care research which is incentivized with financial contributions to practitioners (see Figure 2).

Source: www. Sermo.com

Figure 2: Sermo Online Community Features

A key benefit these social networks provide to the professional users is the generation of a talent pool with medical specialty information. This allows a more comprehensive look at a patient´s health by covering a "deeper and broader range of conditions than is expedient for traditional medicine" (Swan 2009: 496).

3.2.4. Health Care Online Communities

What differentiates Health Online Communities from the other three HCSN types is first of all the different peers it targets to attract as users: Health Care Online Communities are HCSN that encourage all health care stakeholders access to likeminded people who have the same or similar problem. Peers in this form of HCSN are all relevant groups to health care that create benefit to the network unlike in most of the former introduced

networks that are targeted to specialized groups, i.e. patient-to-patient, doctor-to-patient or doctor-to-doctor interaction.

> *"A peer-to-peer system enables any unit within a network to communicate with and provide services to another unit within the network. All peers are of the same importance to the system; no single peer is critical to the functionality of the system and the application functions (...). Peers can be assumed to be of variable connectivity and can join and leave the system at their own discretion."(Demiris 2006: 182)*

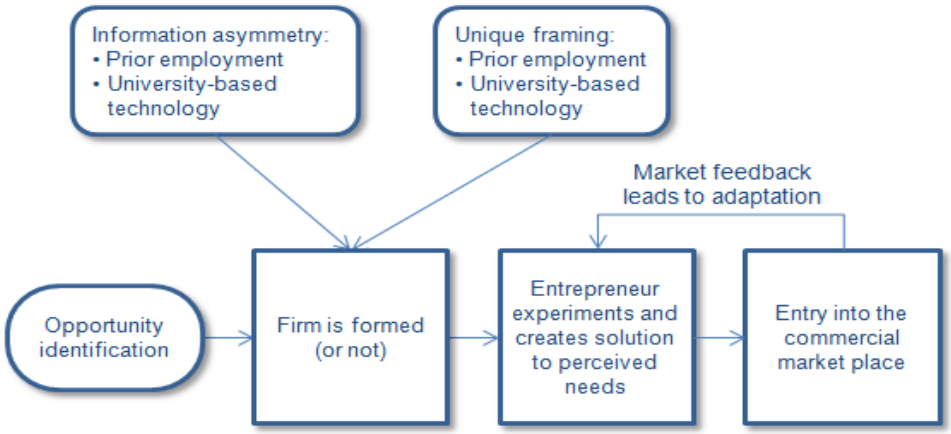
Secondly, the features provided on these platforms are extended beyond the one-way information and advice provision to real online collaboration, allowing patients to determine the level of interaction and type of information exchange themselves which targets to foster the creation and diffusion of user innovations. The main features provided throughout many of these platforms are offering users to exchange social and emotional support, exchange information and experiences on diseases, conditions and treatment possibilities as well as empowering users to collaborate on innovative ideas and solutions. This kind of patient empowerment and online collaboration has increasingly gained popularity and furthermore the potential to create a great pool of users and data on different health categories. Health Care Online Communities also actively engage in fostering user innovations by providing the respective environment and incentives. Patient-Innovation (www.patient-innovation.com) is an online platform that encourages health care stakeholders of all levels to provide relevant experiences and solutions to their health problem which are freely shared on respective health groups online (see Appendix for detailed profile). Users are able to collaborate online by commenting, rating or editing on the shared ideas and solutions. This has the potential to leverage an individual user´s experiences and ideas to create social benefit for other likeminded people as well. WeGoHealth (www.wegohealthsolutions.com) is another Health Care Online Community that connects health care stakeholders via online groups and empowers members to navigate discussions and online collaboration.

The following chapters of this thesis will closely examine characteristics of how these networks, in specific Networks for Medical Professionals and Health Care Online Communities influence and potentially increase innovation among the users.

4. The Role of Health Care Social Network Communities in User Innovation

4.1. User Entrepreneur Process vs. Classic Entrepreneur Process

Innovation usually results from a process of trial and error, moreover a phase of conscious and careful search for innovation opportunities (Drucker 2002). This search of innovation and the process of developing an idea towards a real product or service differ between user entrepreneurs and classic entrepreneurs. In order to analyze which role communities on Health Care Social Networks have in the user entrepreneur process we will in a first step contrast both entrepreneur processes. The first model, obtained from Shah and Tripsas (2007), displays the "Model of the Classic Entrepreneur Process". This process is characterized by relatively calculated, roughly linear stages, which follow the main goal of the entrepreneur to develop an idea or innovation that will lead in firm formation and commercialization of the product or service. Once an opportunity has been discovered and respective commercial potential assessed, the steps taken within the process towards firm formation might be different owing to the entrepreneur´s individual characteristics, like "the ability to attract resources, opportunity costs or prior entrepreneurial experience" (Shah and Tripsas 2007: 128) but follow a typical rational, displayed in Figure 3 below:



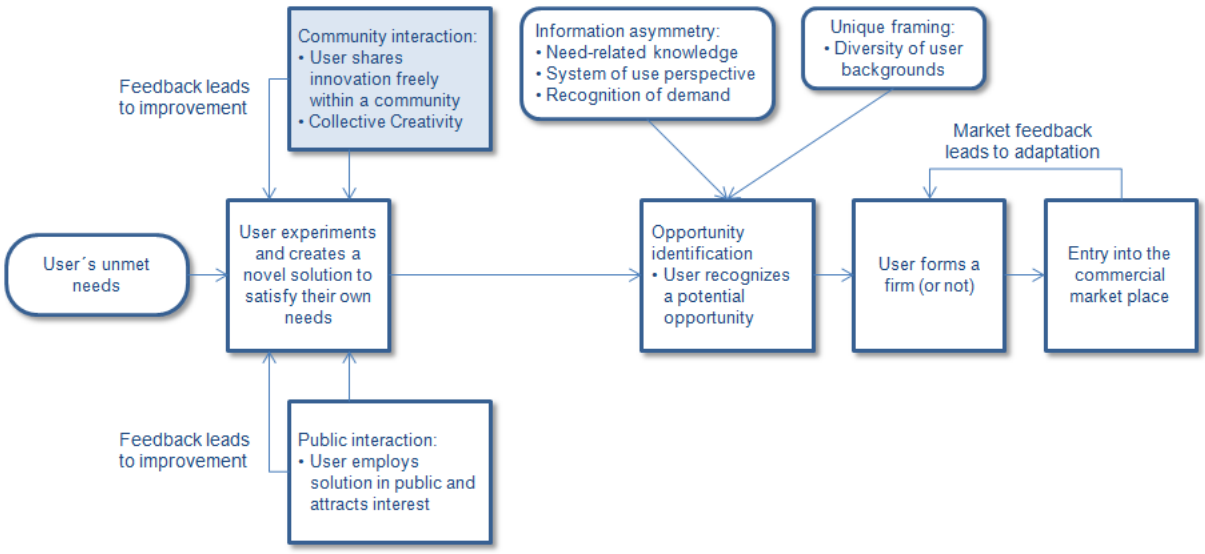
Source: Own creation adapted from Shah, Tripsas (2007)

Figure 3: Model of the Classic Entrepreneur Process

The investment decisions taken within this process are followed by strategic choices and actions. These choices can include, but are not limited to, the development of prototypes

and testing, development of business plans and partnerships, deciding on pricing and marketing as well as the final launch of the product or service. “After product launch, consumer demand either materializes or doesn´t, providing the firm feedback on its idea and enabling adjustments” (Shah and Tripsas 2007: 128). An entrepreneur´s success thus highly depends on the performance and acceptance of the product or service on the market place – after product launch. Failure to meet the customer needs will result in high costs for product adaptation or even product withdrawal.

While the Model of the Classic Entrepreneur Process is driven by the entrepreneur´s goal to profit from high returns on innovation investments, it lacks the important factor of user and community interaction that provide the user entrepreneur with relevant and (early-stage) feedback that often occur before the user even contemplates a commercial venture (Shah and Tripsas). The following figure illustrates the stages of the user entrepreneur process, showing actions taken by users in rectangles and input actions represented in ovals, also adapted from Shah and Tripsas (2007).



Source: Own creation adapted from Shah, Tripsas (2007)

Figure 4: Model of the User Entrepreneur Process

As we have depicted the different motivators and drivers of user entrepreneurs in earlier chapters (see chapter 2.2.2 Motivators of User Entrepreneurs versus Classic Entrepreneurs) we will at this stage briefly explain the different stages of the user entrepreneur process. We will then continue to analyze in more detail the role of community interaction (displayed in the light blue rectangle in the "Model of the User Entrepreneur Process):

1. **User´s unmet needs – Incentive to innovate:** The user innovation process is typically emergent, the user entrepreneur conducts several steps of creating a product or service for own use without the evaluation of its marketability / commercial opportunity. Often intensive innovation efforts are undertaken in order to satisfy their own needs.

2. **Public interaction – Exposure of innovation to others (by usage):** User entrepreneurs often receive unintended feedback to their solution / innovation when displaying it publicly. This can attract interest from other potential users and provide valuable feedback that might be used to adapt products or services.

3. **Community interaction – User collective process:** Free sharing of information, resources and ideas within a community of likeminded people outside the boundaries, hierarchical control and coordination of a firm. This leads among others to collaboration and early stage feedback generation, which can result in adaptation of products or services, which is one form of collective creativity.

4. **Opportunity identification and firm formation:** The process of opportunity identification in the user entrepreneur process might also be supported by community interaction as well as through the existence of information asymmetry, i.e. the possibility to obtain need-related knowledge and identify the potential product demand. Finally, after market potential for the innovation has been recognized, user entrepreneurs might undertake steps to firm formation, which has previously been a subordinate goal of the user.

Since community interaction can have a significant effect on the innovativeness of the user entrepreneur and the potential of the diffusion of her innovation, we will now further examine this step of the user entrepreneur process, analyze different factors that compose it

such as the term collective creativity and determine which roles Health Care Social Networks, respective their communities, can obtain in this process.

4.2. The Role of Health Care Social Networks for User Entrepreneurs

As we have now elaborated that several aspects come into play when users engage in innovation, we are now further analyzing how community building and innovation sharing within a Health Care Social Network can assist innovation behavior and increase innovativeness. From the research on the four relevant types of Health Care Social Networks we have summarized four relevant characteristics that first of all enable community building on Health Care Social Networks, and secondly, more importantly, characteristics that can incentivize users´ innovation behavior and furthermore support these efforts. Those characteristics that an online social network should support are (1) social responsibility and website philosophy, (2) help-seeking and help-giving, (3) knowledge and information exchange and finally (4) encouraging the creation and diffusion of useful innovations. These characteristics depicted are either already implemented on Health Care Social Networks, fully or to some extent, and if not form a guideline to demonstrate the relevance of each in leveraging innovation behavior in practice and in answering the overall research question on how Health Care Social Networks can increase user innovation in health care.

4.2.1. Social Responsibility and Website Philosophy

Inherent with the formerly described advancement of ICT in health care and patient empowerment – Health 2.0 – are also expectations and motivators of the user groups to approach a Health Care Social Network. “After some hard lessons learned from failed web ventures that disappeared overnight taking any user-generated data with them people expect web applications to be open, [reliable] and interoperable” (Eysenbach 2008). Personal data security and transparency of conditions of use are increasingly relevant for today´s sophisticated Internet user. In order to primary attract users, irrelevant from which group of society or health condition, the platform has to establish guidelines in order to attract and maintain these users, i.e. in order to build a trusted community. Each platform has thus initially to provide the respective environment that correlate to the motivators of users and potential entrepreneurs we have depicted in earlier chapters (see 2.2.2. Motivators of User

Entrepreneur versus Entrepreneurs). A platform will attract more users by developing the relevant environment that suits their current and future needs and motivations (Battistella et al. 2012). Being socially responsible with any data provided to and from these users is therefore of high importance for the success of a platform and forms the basis for any future interaction and exchange of data from the users.

The closer a website´s philosophy can match a user´s perception of belonging to a community in which he or she is welcome will create value in the form of the user´s willingness to share (personal) information and experiences and further interact with members, and thus maintain the user in the community. Online social networks might have the potential to bring people together and allow for a certain degree of anonymity which might be desired for a special health condition, but they are lacking the benefit of physical proximity. Traditional researches find personal interaction one of the most relevant methods to create relationships and communities (Demiris 2006). Building a community on social norms, trust and privacy protection is thus highly relevant for any online platform and especially Health Care Social Networks have to meet social responsibility requirements in order to gain trust of the different, sensitive health care groups.

Examples for relevant features that a Health Care Social Network should apply for building a trusted and valuable user community are for example not frequently changing terms of usage, privacy protection of users and their sensitive personal data if needed, empowering users to communicate (e.g. in chats), easy-to-use platform design and structure as well as transparently displaying the platform vision and mission as well as the management team. This gives users transparency of information and enables platforms to offer features that require personal user information.

4.2.2. Help-seeking and Help-giving

When a Health Care Social Network has established these social responsibility guidelines, which we could call hygiene factors, it paves the way for user collaboration, e.g. in the form of community interaction. In the user entrepreneur process this step is characterized by the free sharing of innovations among users and the process of collective creativity. We will now closer analyze what collective creativity is, and how the sharing of innovation among users on Health Care Social Networks can increase innovativeness in

health care. Shah and Tripsas (2007) have cited Hargadon and Bechky (2006) in their research who found "four inter-related activities that trigger collective creativity (…): help-seeking, help-giving, reflective framing and reinforcing" (131). The first feature we now want to elaborate on is help-giving and help-seeking. Health Care Social Networks oftentimes provide functions that allow users to create a personal profile in order to for example share personal information on symptoms, experiences, life-style behaviors or even in order to track the personal health record (Swan 2009). These platform features allow patients to engage in help-seeking as well as help-giving activities which Health Care Social Networks like WeGoHealth or DailyStrength (www.dailystrenght.com) provide within targeted online communities. Within these communities patients give and seek emotional and social support by following discussions, or posting questions and experiences in the respective support group. Other perceived benefits from joining such online communities range from the value of feeling part of a community up to receiving hugs or greetings on the personal profile from other community members (Swan 2009). Table 1 has summarized these benefits divided by implicit and explicit benefits, offered to health care stakeholders when approaching a community in Health Care Social Network.

Emotional support, social support, patient empowerment	
Implicit benefits	**Explicit benefits**
- Seeing that there are others with similar conditions ("I am not alone") - Being part of a community - Participating in the process of creating a personal profile - Recording health information (and getting remarks from non-medical professionals) - Finding out what remedies others with same symptoms have tried	- User interaction - Comment on forums - Publicly or privately message each other - Give each other advice - Transmit social greetings

Source: Own creation in accordance to Swan (2009)

Table 1: Implicit and Explicit Benefits of Health Care Social Networks

The benefits of help-seeking and help-giving will be very different to each individual user and have the potential to, but not necessarily result in an increase in innovativeness within

or beyond these groups. Since we have identified that user innovators receive direct benefit from the product or service they create we can synthesize at this point that users of online communities receive direct benefits from social collaboration on online health communities which creates emotional and social benefits and can ultimately also result in an economic one. This could be measured for example in the redundancy of psychological help, doctor visits, and more abstractly by a user who changes her current medication or treatment owing to an engagement in or a recommendation obtained from the user community. The social benefit is an increased well-being of the user owing to an advanced medication or treatment opportunity, while the economic benefit can be measured in the difference of the value between the old, less effective treatment and the new, more effective treatment possibility.

In conclusion we see that platform features allowing users to interact on a social level can have very positive effects for the users and the platform providers themselves. It provides social and emotional support for the users who therefore engage more in the online communities which leads to a positive network effect – users will be more likely to stay on the platform and the larger a community it is more likely to attract new users.

4.2.3. Knowledge and Information Exchange

In recent chapters we have introduced reasons for why user entrepreneurship in the health care environment has long time been dominated by health care specialists and practitioners. Besides high costs of integrating the general public, information asymmetry among health care stakeholders has been pointed out as a main factor that has traditionally left not professional health care participants outside of the innovation process.

Health Care Social Networks not only provide information on a broad and often very detailed scale for a wide user base but more importantly allow and encourage the free flow of information and knowledge among its community members. Since innovations often emerge from the intersection of disciplines, and users from unrelated disciplines may oftentimes generate original problem-solving approaches because they frame the problem differently (Shah and Tripsas 2007), Health Care Social Networks have the great possibility to create a pool of diversified resources, which is described in the user entrepreneur process as unique framing. We know that diseases do not stop at a person´s education level or job

title, thus likeminded people with different backgrounds can mix and match on these platforms, creating a valuable knowledge base. Reflective framing, the third step within the collective creativity process, leads to feedback generation through the free sharing of ideas within a community of likeminded people who have various backgrounds and resources to assess a potential innovation (Shah and Tripsas 2007).

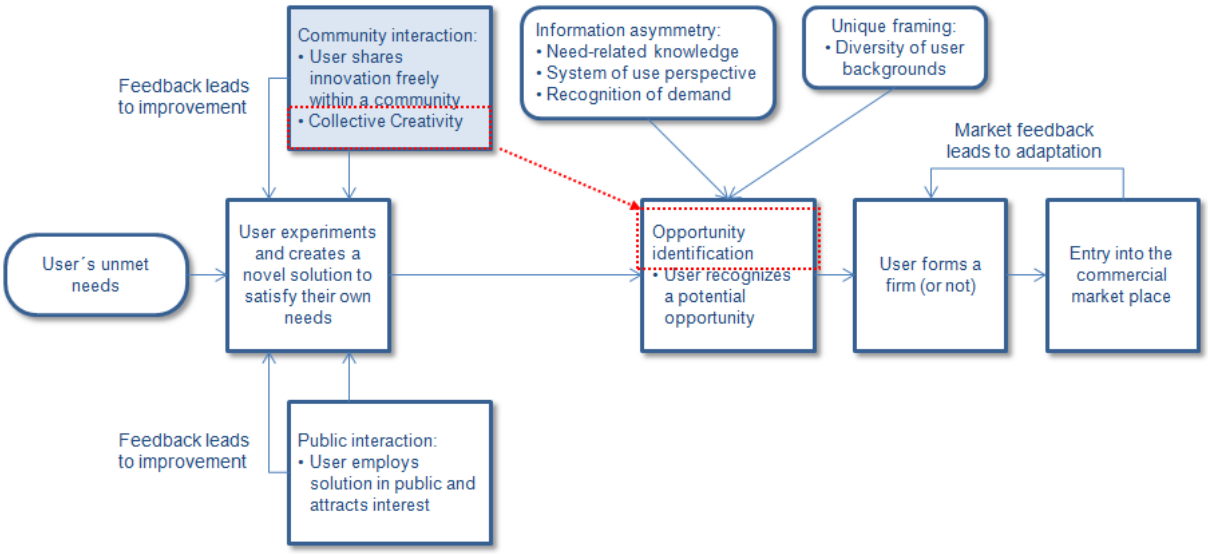
Especially Medical Professional Networks benefit from this form of knowledge and information exchange within online communities. Sermo and Medting (www.medting.com) offer health care professionals the possibility to engage in real life medical cases. These cases typically involve a medical example of a patient case which is shared in a relevant community and supported with additional data such as general medical information or media such as X-Rays. This feature makes use of the described knowledge pool of health care professionals which can mix and match online and help to deeply analyze the patient case.

4.2.4. Encouraging the Creation and Diffusion of Innovations

The social norms of a Health Care Social Network, i.e. platform philosophy and platform features, provide reinforcement for the other three activities of the collective creativity process. When users are embedded in user communities, the community can play a significant role in the development and diffusion of the innovation (Shah and Tripsas 2007). In specific users might at an advanced stage of the user entrepreneur process share their prototypes for free and in return receive potential adopters´ and beta testers´ opinions, knowledge on common problems and interesting applications related to the innovator's product or service. These first-hand insights regarding the needs and preferences of potential users would have been very hard or impossible to obtain through other sources (Shah and Tripsas 20007). Ultimately, the engagement in user communities, free sharing of ideas and peer-to-peer diffusion, which is a process of collective creativity, has the potential to increase the user´s opportunity identification and diffusion of innovations into the market place (see Figure 4) (Dimiris 2006). For instance, increasing a user´s perception about the possible marketability of her innovation can reduce the fear of opportunity costs. We have argued that user entrepreneurs might take high opportunity costs into consideration when innovating (see chapter 2.2.1. Nature of User Entrepreneurs versus

Entrepreneurs), but opportunity costs can still demonstrate a barrier to innovate and lead a user entrepreneur to stop following a potential innovation, thus existing the user entrepreneur process at an early stage.

> *"(...) user entrepreneurs typically lack the status and access to resources that can accompany individuals founding spin-offs from established firms. Thus one might expect lower performance and a lower survival rate for user-founded firms" (Shah and Tripsas 2007: 136)*



Source: Own creation adapted from Shah and Tripsas (2009)

Figure 5: Effects of Knowledge and Information Exchange on Health Care Social Networks

Besides passively receiving feedback and help via the online collaboration on HCSN, users can also engage more actively in order to get practicability results and test marketability of the innovation. Methods that can be used, if the platform design allows and features on HCSN provided, to capture these user perspectives and needs are for example usability tests, interviews and questionnaire surveys (Gulham et al. 2006). A practice example of how users and at which stage of the product development life-cycle of medical devices are engaged in innovation has been conducted by Ghulam, Robinson and Shah (2006). They found out that users play a significant role in the medical device development process as they are involved in this process via various means: usability tests, interviews, questionnaire surveys, discussions, simulations, focus groups, (…), observation, task analysis, use experiment, user and producer seminar, user feedback, video recording.

Finally, reinforcement within user communities can decrease innovative behavior in a very positive way: As Morrison, Roberts and von Hippel (2000) have identified, the value created by a potentially useful user innovation is substantially greater "if that innovation is made available to all users either by direct user-to-user sharing or by revealing of the innovation to a manufacturer" (1522). In regards to health care it becomes explicitly visible that an innovation that has not been shared leaves all other users at the cost of going through innovating it as well, which not only harms economic benefits but also individual health outcomes. Especially in health care we have identified that users innovate to overcome ones or others health problem. Receiving valuable help in the form of information, beta-testing and finally reinforcement of the idea within a user community lets us assume, that the incentive to share a potentially useful innovation within these groups is high in order to create social benefit for likeminded people. Besides the benefits for users, diffusion of an innovation is also beneficial for manufacturers, since they only "seek out modifications and innovations by users if user innovators are willing to reveal what they have done" (Morrison et al. 2000: 1522).

A network´s goal should therefore be increasing the possibilities of collaboration and collective creativity within and beyond the user communities. Increasing the possibility of a potential user entrepreneur to share an innovation with a diversified user base, like it is practiced by Patient-Innovation increases the possibility of receiving relevant qualitative and quantitative feedback. This can influence the product adaptation, features and design and finally result in the diffusion of the innovation to the marketplace. Furthermore, user entrepreneurs are frequently deriving from peripheral industries or nascent environments (Shah and Tripsas 2007). Manufacturers do not possess the resources to fill the niches of every market; Health Care Social Networks have the great possibility but also social responsibility to provide targeted information on emergent and turbulent segments for the very special health care groups that it attracts. This leverages existing know-how among user entrepreneurs which can strengthen niche product development efforts which are more likely to evolve in a user environment rather than in the producer environment.

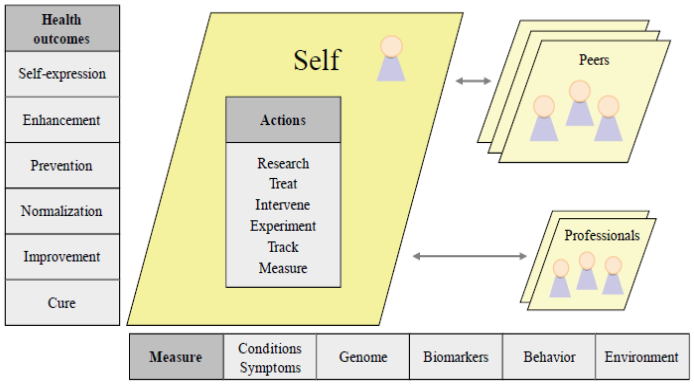
5. Online Platform Strategies

5.1. Platform Features

We have now analyzed that Health Care Social Networks do have the potential to increase user innovation / user entrepreneurship by various means. In this chapter we want to give an excursion and elaborate on types of platform strategies that could further enhance the generation of user innovative efforts.

> *"To further reinforce and support cooperative behavior, many user communities will develop norms and rules, methods for attracting and socializing new members, and techniques for maintaining their structure and integrity over time" (Shah and Tripsas 2007: 130)*

The transformation of health care, its significant change in how health and health care is conducted and understood, benefitted the emergence of the different types of Health Care Social Networks (see chapter 3.2. Forms of Health Care Social Networks). Figure 6 obtained from Swan (2009) illustrates how the transformation in health care and advancement in ICT have provided patients with a broad range of resources to pick from in order to measure for example conditions or behavior and thus individually or in collaboration with professionals or other peers increase the health outcome (as introduced in earlier subchapters). One strategy on how Health Care Social Networks can grow, respectively increase social and innovative impact is by developing and incorporating features that approach the increasing phenomenon that health care decisions are being made by individuals on their own behalf's. Health Care Social Networks can help to increase the health care system´s effectiveness and quality of care by providing the right features to its users. Today, those features already include, but are not limited to, providing general and specialized medical information on conditions, symptoms and medications; measuring health conditions, including genomic testing, blood-based and biomarker testing and behavioral tracking such as nutritional



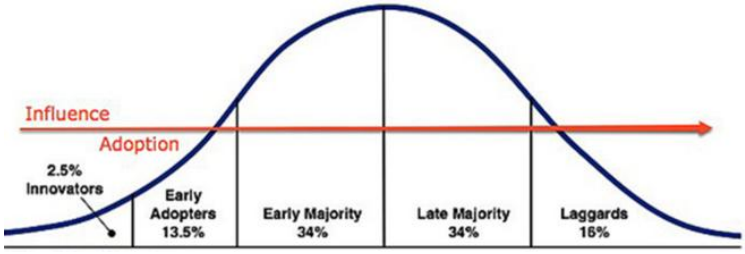
Source: Swan, Melanie (2007)

Figure 6: A new Model of Health and Health Care

intake, exercise and sleep; more systematically evaluating and monitoring a person´s environment (Swan 2009). Further we have identified the relevant features for online collaboration and community interaction. These features and the platform architecture enable communication, free flow of information, ideas and advice which allow for help-seeking and help-giving as well as collective creativity.

5.2. Preemption Strategy

In order to attract users that possess the potential to innovate, Health Care Social Networks have to be quick in launching the platform targeting online services to relevant health care groups in order to attract innovators and early-movers to join. Preemption strategy is described by Shapiro and Varian (1999) as to build an early lead, so positive feedback works for you and against your rivals. According to them, a platform strategy should be aggressive in order to gain early adopters or so called "gadget freaks" that are most eager to test new technologies. A platform´s overarching goal is thus to increase demand side economies of scale to preempt the competition. Translated to health care this means that an online health platform or community can only create value for its participants and for the platform provider themselves if it attracts enough users that engage in using the offered features and interact with each forming online communities. Research on the usage of specialized health care platforms by pharmaceutical firms has shown that social networks are most successful the earlier they attract users to engage in the platform and build trust. Engagement thus is measured in a level of activity by its users in the form of likes on a Facebook page, followers on Twitter or the number of user versus company messages. On the other hand trust building is measured as a feeling of sentiment by users liking messages on Facebook or retweeting on Twitter (Karindalam and Cutie). A high activity level with positive tweets and many likes creates a positive return on (marketing) investment. Needless to say that a positive platform image attracts likeminded people to join, which leads to another platform strategy to follow which is scaling up for network advantages.



Source: Solis (2008)

Figure 7: Product Adoption Curve

5.3. Scale up for Network Advantages

In community intensive networks like Facebook or Twitter it was most important to grow as quickly as possible in order to gain a large user base and leave competitors behind. For Health Care Social Networks this strategy does not apply to that extend, but it is of relevance for two important reasons: First of all the online supply for specialized health platforms and communities is increasing and consists of innumerous small players. Thus it is important for Health Care Social Networks to be able to attract and maintain a large user base in order to survive on the market. Secondly, a Health Care Social Network is only as effective, informative and innovative as its user base is. Users will only visit a platform if the value provided is worth visiting. The type and amount of users is therefore unnoticeable relevant for the platform´s success. Size and composition of users is also relevant for the platform providers since they might follow the strategy to commercialize the generated, often specialized, information on the platform to, for example, pharmaceutical companies or research institutions.

When scaling up Health Care Social Networks should also be aware of the negative effects that an increase in user base and potential commercialization of data has. Negative effects associated with a large user base are a possible lack of social responsibility and data privacy on the platform, lack of belonging to a (specialized) group of the users and the lack of a sustainable platform vision. Platform providers aiming to scale up must also ensure that the platform is both easy to use and reliable. “Failure to do so will lead to confusion at best, and it could result in dangerous health practices or exposure to exploitative business practices …” (Hesse et al. 2010: 45).

5.4. Partnerships, Management Team and Investors

Forming strategic partnerships right at the beginning and the composition of the founder team of the social network are also very relevant aspects that shape the future success of the platform. A lot of health care online services attract Web traffic from third party Websites that pose an important source of visitors and users, like for example WebMD does. Besides gaining reputation and users this has also the potential to pose a relevant revenue stream from online advertisements or links to third party Websites. In order to attract venture capitalists the platform management has to be not only academically sound but also intrinsically motivated to provide a significant benefit to its users by founding the platform. Attracting well-known investors can create heavy media coverage but also increases the attractiveness for smart people to join the company. This encourages the positive network effects we have presented in earlier subchapters and increases reputation and public expectations on the performance of the platform.

In non-health related network environments high user interaction and extensive feedback gathering combined with a solid mission statement have been drivers for platform and network success. Foursquare is an example of successful customer integration within the establishment of the platform and beyond. After the launch, the founders decided against traditional market research or field studies but instead interacted and responded to all criticism and feedback concerning the app through e-mail, the foursquare blog, and also twitter. This not only linked them closely to the user community but also provided them with insights into the different uses of the platform to figure out a purposeful prioritization of future features and steps (Piskorski et al. 2010).

6. Intellectual Property Protection on Health Care Social Networks

Manufacturers typically invest a high share of overall costs into research and development in order to develop a new product for the market place. Free sharing of the idea would therefore result in the danger of someone else copying it. Despite the existence of open innovation practices in manufacturing companies that target to deeper involve potential users or external participants into the product development process, we have seen in the classic entrepreneur process that freely sharing innovations does not occur and manufactures use property rights protection mechanisms in order to avoid any "spillover" of proprietary knowledge developed (von Hippel and von Krogh 2003). Research also revealed that most common innovations undertaken by manufacturers are patented in the phase of product/process development and manufacturing process. Manufacturers commonly make use of property rights protection mechanisms such as to patent a product or solution in combination with licensing it (or not), or to cooperate with another manufacturer, and so on. These rights, in turn, guarantee innovators the generation of private returns from their innovation related investment (von Hippel and von Krogh 2003). Von Hippel and von Krogh have described these property rights protection mechanisms with the "private-investment model". This model assumes that "returns to the innovator result from private goods and efficient regimes of intellectual property protection" (von Hippel and von Krogh 2003: 209).

In contrast to this model stands the "collective-action model", which assumes that "under conditions of market failure, innovators collaborate in order to produce a public good" (von Hippel and von Krogh 2003: 209). Previously we have evaluated that especially in health care the willingness to freely share information on user communities is high, since the main benefit received by these users is from personal and social origin. According to von Hippel and Krogh (2003) in order that users benefit monetarily from sharing their innovation on the market place, according property rights protection might be necessary, which is "costly to attempt, with very uncertain outcomes" (214). This fact also supports previous research that user innovations in health care, when shared, are not targeted to monetize but to reach further product development opportunities and create social benefit. The model allows to recover the social loss associated with the "private-investment model", since knowledge is

now made available to a common pool. In their study von Hippel and von Krogh (2003) introduce the “private-collective” model for open source software development, which can be applied to health care as well. It assumes that individual users use their own resources in order to privately invest in the development of novel solutions and then freely share them within a community. For the research conducted we can apply this model to the current praxis on communities in Health Care Social Networks and thus strengthen the assumption that patenting user innovations stays in contrast to a further, early stage, product development which freely shared creates social benefit.

Much has to be done to further analyze the intellectual property rights protection mechanisms that are currently applied to user developed innovations – especially with the help of online health communities. This research should include numerical examples as well as a deeper literature research, analyzing current user innovations on the market and how the topic intellectual property protection has been put into practice.

7. Conclusions

7.1. Practice Implications

The research on Health Care Social Networks and their influence on the innovativeness of users in health care have revealed four main areas in which these networks can engage in supporting and leveraging the innovation efforts of their respective users, those are: social responsibility and Website philosophy, help-seeking and help-giving, knowledge and information exchange and encouraging the creation and diffusion of innovation. The following aspects should give the interested reader and potential Health Care Social Network users or providers a gist of implications for practical usage which we have determined that could enhance the four categories and thus increase innovativeness:

- **Exploit new and growing technologies:** ICT and Health 2.0 empower health care stakeholders to use the Internet more effectively and efficiently. HCSN should apply the latest features provided by ICT in order to attract tech-savvy users to engage in collective creativity (e.g. cloud-services, video-streaming and other interactive media provision).

- **Serve as clinical trial lab:** HSCN great benefit is to overcome the physical distance between its users by creating online connectivity. It allows gathering a significant share of patients with the same health care situations, especially for rare and chronic diseases. These information pools can be used to assist and facilitate clinical trials, contribute to an increased scientific discovery and improve medical processes. Furthermore, shared standards and reusable components may enable rapid authoring, integration, and evaluation of personal data capture for clinical care and research (Estrin and Sim 2010). Limitations and personal data restrictions have to be taken into consideration when conducting clinical trials with user data.

- **Early involvement of medical professionals:** Some features of HCSN already provide (real-time) medical professional assistance. The early involvement of medical professionals as contact persons, in the management team or for example as research collaborators can leverage a platforms reputation, attract users in early phases as well as serve for trust building.

- **Provide incentives on platforms:** Incentives can be used to target a specific audience in health care and increase the overall attractiveness of the platform. These incentives should vary according to the user audience and platform philosophy, examples could include: Innovation challenges; bonuses for cooperation (e.g. update of the private user profile, monetary rewards for research practices); entrepreneurial and / or health care literature; prominent or professional guest contributions; links to relevant media and third party Websites, literature or health care professionals; open sharing of successful innovations and solutions; collaboration with other platforms, universities or even research institutions and companies.

7.2. Limitations and Future Research

This paper focuses on one aspect of the broader shifts in life sciences, how user innovation in health care, particularly through communities on Health Care Social Networks is influenced and can be enhanced. The paper is intended to provide an early view into these models which could potentially have a large future impact but are still in emerging phases. This thesis has been limited by certain choices taken in order to focus the research on the specific role of communities and collaboration on Health Care Social Networks on user innovation efforts. Thus this thesis has been limited by the following factors that could form the basis for future research:

- Research available on the role of online health communities in the creation and diffusion of user innovations is very limited.

- Also in this early survey of the field, the paper only gives anecdotal rather than comprehensive coverage to the many shortcomings of Health Care Social Networks. Some of these shortcomings may include potential bias, error, lack of rigor in data collection and analysis..

- The role of the health care system as well as organizations has been mainly excluded from this thesis because we were focusing on the role of individual health care stakeholders and communities, outside of the boundaries of an organization. In a future

step of the analysis it should be analyzed which effect the integration of organizations in online health communities can have on open innovation in health care.

- This thesis has not provided a quantitative analysis of the outcomes of user innovations from HCSN. Further analyzed could be the type of innovations that are likely to diffuse from HCSN and what kinds of health groups are more likely to benefit from those.

- The cluster of the main four health care network types as well as HCSN chosen in the thesis poses a limitation to this thesis, since it can be extended and is intended to give a selected overview of currently existing online platforms. This list was chosen from research and previous knowledge in the eHealth field. Thus it can contain errors or lack of information.

All of these areas could be reviewed more fully in a subsequent and more extensive analysis of the emergence and efficacy of Health Care Social Networks and health care driven communities as the industry continues to develop.

7.3. Conclusion

The literature review as well as practical implications gained from analyzing different types of online Health Care Social Networks have demonstrated that innovativeness by users can be fostered through online communities and specific features provided on Health Care Social Networks.

We have analyzed that entrepreneurs and user entrepreneurs separate certain motivators from another when innovating which also significantly shapes the respective process of entrepreneurship. Classic entrepreneurs seek to increase the return on investment on their innovation through commercialization of the product or service to a large customer audience. User entrepreneurs in health care though often undertake private efforts to innovate, driven by the existence of a strong and specific need to create a solution to the current health problem. The radically improving quality and advancements of Information and Communication Technologies has improved user´s ability to access information and undertake individual and collective innovation efforts. Potential solutions developed by users are thus freely shared on online health communities in order to seek feedback and testing from potential users of that product or solution. The main goal remains creating

personal and social benefit. With those research findings we have answered the first research question posed to this thesis.

In a second step we have presented four different types of Health Care Social Networks that empower users to navigate health information online as well as collaborate on different user communities. In order to determine how Health Care Social Networks can increase user innovation in health care a deeper analysis of the user entrepreneur process was conducted and the role of online collaboration and collective creativity emphasized. Thus we determined how the benefits of online collaboration on Health Care Social Networks can be fostered and engage more users in collective creativity as well as increase the likelihood of users to become user entrepreneurs. For this purpose Health Care Social Networks should apply some "hygiene" factors that allow the creation of a valuable user community and pool of ideas. Therefore specific features on the HSCN should either be fostered or integrated in order to allow users to seek and give social and emotional support, empower its members, engage in community interaction, and finally to foster the creation and diffusion of user innovations. Finally we have determined platform strategies that can apply to Health Care Social Networks and can increase their attractiveness to users. Among those strategies are the selected and targeted use of features to attract the right user audience, increasing demand economies of scale and scaling up to increase positive network advantages within the user community and providing a clear and transparent platform vision and mission in order to create long-term value for users and platform providers as well.

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Appendices

Appendix: Analysis of Health Care Social Network Categories and Characteristics

The following model presents selected online Health Care Social Networks divided into the four categories we have introduced in this thesis (see chapter 3.2. Forms of Health Care Social Networks), those are: Health Information Platforms, Medical Advice Platforms, Networks for Medical Professionals and Health Care Online Communities. For each category we will present selected network types and rate these according to their characteristics, respectively their features provided for users. The more a platform feature is able to provide the user the environment that fosters online collaboration, information and knowledge exchange and the diffusion of innovation, the higher the rating will be. For this analysis we have created five measures according to the features introduced in chapter 4.2.

These measures which we have titled “Benefits” are: General Medical Information (GI), Patient Empowerment (PE), Help-seeking and Help-giving (HS&HG), Online Collaboration / Collective Creativity (CC) and Diffusion of Innovation (DI).

Health Care Platform (Name, URL and Logo)	**Features**	**Benefits** General Medical Information (GI) Patient Empowerment (PE) Help-seeking / Help-giving (HS&HG) Online Collaboration / Collective Creativity (CC) Diffusion of Innovation (DI)	**Innovativeness** (low - high)
Health Information Platforms			
Drugs www.drugs.com	Drug library	GI, PE	○
Drugs.com Know more. Be sure.	Pill identifier	GI, PE	○
	Interactions checker	GI, PE	○
	Medical news	GI	○
	News for health care professionals	GI	○
	Question & answer section	GI, PE, HS&HG	◔
WebMD www.webmd.com	Health A-Z, symptom checker	GI, PE, HS&HG	◔
WebMD	Drugs & supplements	GI	○
	Living healthy	GI	○
	Family & pregnancy	GI	○
	News & experts	GI, PE, HS&HG	◔
Summary:	Health information platforms enable patients and other health care stakeholders to search the internet for targeted health information and to increasingly take care of their own health condition. Health Information Platforms are a first instance for patients to get medical information on different conditions or symptoms through online media.		
Benefit:	Health care information is provided via different online resources (articles, videos, posts, links to other Websites) which facilitates information availability to a broad range of health stakeholders at all ages. Patients are empowerd to engage in health care, which increases awareness for health care topics in general and for the personal well-being in specific.		
Outlook / Potential:	The reach of these platforms has potential to increase awareness of health care issues in society, enable patients to live healthier and engage in prevention mechanisms. Some platforms have also seen the potential to increase the services offered online in order to attract more users and increase the relevant data bases.		

Health Care Platform (Name, URL and Logo)	**Features**	**Benefits** General Medical Information (GI) Patient Empowerment (PE) Help-seeking / Help-giving (HS&HG) Online Collaboration / Collective Creativity (CC) Diffusion of Innovation (DI)	**Innovativeness** (low - high)
Medical Advice Platforms			
Drugs www.drugs.com Drugs.com Know more. Be sure.	Support groups	GI, PE, HS&HG, CC	◑
	Personal medication eRecords	PE, HS&HG	◔
Summary:	The support groups and eRecords feature allows patients or family members to create a personal profile when signed up to the platform. Different medications and medical notifications can be added to track individual health. It also allows to engage in communication with others, giving or receiving advice in the form of commenting on the open community groups.		
Benefit:	It allows to interact with likeminded people as well as get access to targeted health information. It empowers patients to take individual responsibility for their health situation.		
Outlook / Potential:	Usage of health gimmigs to measure health conditions or life style behaviors have potential to gain ground in the future. Community interaction empowers patients and other stakeholders in collaborating but the degree of interaction and potential outcome underlies restrictions to knowledge and professionalism of community members.		
Medlanes www.medlanes.com MEDLANES	Professional medical assistance	PE, HS&HG	○
HelloDoctor www.hellodoctor.com hello doctor	Professional medical assistance	PE, HS&HG	○
Summary:	Medlanes and HelloDoctor as well as other similar services offer patients a real-time consultation possibility with doctors via online media. Most of these online platforms offer this services as their single function for a service fee to its members		
Benefit:	It provides patients and medical professionals with another communication channel and thus provides the possibility for telemedicine approaches. It empowers patients to solve health matters interactively, which safes time and eventually money.		
Outlook / Potential:	In countries in which the public health care system does not provide broad service coverage (e.g. USA) Medical Advice Platforms have the potential to increase access to professional medical help for certain health care stakeholders. It is also a possbility to provide the service for patients in geographically more rurally located regions and a 24/7 service, at the respective costs.		
Mdjunction www.mdjunction.com	Online support groups for multiple health segments	PE, HS&HG	◔
MDJunction			
Summary:	MDJunction is an online network that consists of a variety of communities for different health problems. Users are allowed to freely join or create a group for a specific health related topic and thus give or receive help and medical advice from different health care stakeholders.		
Benefit:	It is a free-of-charge service for all health care stakeholders who seek help and support for the current health problem. User engagement is empowered as well as the creation of different health care support groups.		
Outlook / Potential:	With more than 800 online support groups it provides great benefit for people seeking information, social or emotional support.		

Health Care Platform (Name, URL and Logo)	**Features**	**Benefits** General Medical Information (GI) Patient Empowerment (PE) Help-seeking / Help-giving (HS&HG) Online Collaboration / Collective Creativity (CC) Diffusion of Innovation (DI)	**Innovativeness** (low - high)
Networks for Medical Professionals			
Sermo www.sermo.com	Medical crowdsourcing for problem solving	GI, PE, CC	◑
SERMO talk real world medicine	Real-time physician opinions on medical issues	GI, PE, HS&HG, CC	◔
	Knowledge exchange with peers	GI, PE, CC	◔
	Research conducted by doctors	PE, CC, DI	◕
Summary:	Sermo offers health care professionals the opportunity to engage in online collaboration to solve real-life medical cases, exchange knowledge and even offers monetary rewards for relevant research activities and results conducted by care givers.		
Benefit:	The platform provides great network possbilities for care givers, enhancing and leveraging the existing knowledge and expertise of professional members, offers collaboration on different levels and health care matters and even to conduct research and tests which eventually creates new innovations / solutions.		
Outlook / Potential:	As the largest online community for care givers (in the USA) Sermo has potential to increase research efforts and results from an increased data base and availability of potential participants. The current platform structure, size and revenue streams have the potential to leverage both number of participatns and reserach outcomes.		
DocCheck www.doccheck.de	Medical news and comments	GI, PE, HS&HG, CC	◔
DocCheck Dein Social Medwork	Sharing of online content (links, pictures, tv, etc.)	GI, PE, HS&HG, CC	◔
	Online job portal	GI, HS&HG	○
Summary:	DocCheck is a German online community for care givers that provides information and online content in different forms. Care givers have to subscribe to the platform and are able to share information on relevant topics or pose questions to the community as well as individually share and create online content.		
Benefit:	With over 1 million subscriptions and different features it offers significant expertise throughout health care. The size itself poses a constraint to the platform since the flow of data and information can hinder potential collaboration.		
Outlook / Potential:	The platform has just recently added new features (access to publishing material and information channels) and has further potential to exploit the knowledge base and collaboration potential within the community.		

Health Care Platform (Name, URL and Logo)	**Features**	**Benefits** General Medical Information (GI) Patient Empowerment (PE) Help-seeking / Help-giving (HS&HG) Online Collaboration / Collective Creativity (CC) Diffusion of Innovation (DI)	**Innovativeness** (low - high)
Networks for Medical Professionals			
RemoteMediHelp www.remotemedihelp.com Remote MediHelp	Online communities to give advice on medical cases	GI, HS&HG, CC	◔
Summary:	The platform offers free participation on real medical problems posed by doctors in geographically underdeveloped locations and health areas.		
Benefit:	It increases the footprint of collaboration on medical cases for doctors across geographies and allows eHealth and telemedicine to reach poorly located and poorly developed countries. It is thus a source of first aid medical professional help to support other medical professionals.		
Outlook / Potential:	It has the potential to increase reach and support for underdeveloped health care areas - geographically as well as content wise.		
MedTing www.medting.com MedicalExchange MEDTING	Collaboration groups for medical professionals	HS&HG, CC	◔
Summary:	Medting is an online case sharing platform for medical professionals (free-of-charge). Members are able to participate in solving real-life patient cases that are supported by data such as X-Ray or special medical information. Additionally, members are able to create a clinical committee group which only allows selected members to join (it includes private access for a monthly fee).		
Benefit:	It allows free community building and interaction as well as private group settings with additional features. The possibility to include data and additional informaiton on the patient cases allows the professionals to get a more comprehensive look at the case which allows for a more accurate solution.		
Outlook / Potential:	The platform poses a great source of online learning for medical professionals. The integration of online applications and of new software services allows increasing data and content sharing possibilities.		

Health Care Platform (Name, URL and Logo)	Features	Benefits General Medical Information (GI) Patient Empowerment (PE) Help-seeking / Help-giving (HS&HG) Online Collaboration / Collective Creativity (CC) Diffusion of Innovation (DI)	Innovativeness (low - high)
Health Care Online Communities			
Patient-Innovation www.patient-innovation.com	Join and / or create patient group for specific health conditions	GI, HS&HG, CC	◔
Patient Innovation SHARING SOLUTIONS, IMPROVING LIFE	Online collaboration on patient groups (share knowledge, experiences and rate potential solutions)	HS&HG, CC	◑
	Share potential solution / innovation to health problem	HS&HG, CC, DI	◕
Summary:	The platform offers patients and their stakeholders (e.g. family members) to share innoative solutions on health conditions, symptoms, treatment possibilities or devices in specially designated groups. Members are encouraged to share their solutions, comment on existing solutions, share knowledge and give feedback as well rate the solutions.		
Benefit:	It empowers patients to share health related experiences and knowledge with likeminded people in order to let a broad user base of benefit. The free-sharing of the information, ideas and innovations allows collective interaction and increases the potential to gain constructive feedback, beta-testers opinion and helpful advice for product adaptation and usage.		
Outlook / Potential:	The platform has the potential to increase the collective creativity process and diffusion of user innovations since the users are empowered to create new groups of conditions, share knowledge and ideas. The easy-to-use platform architecture allows the engagement of all kinds of participants on the platform and the generation of a valuable user pool.		
Patientslikeme www.patientslikeme.com	Join patient groups for specific health conditions	GI, HS&HG, CC	◔
patientslikeme	Features for health self-tracking	PE	○
	Online collaboration on patient groups	PE, HS&HG, CC	◑
	Data base used for research purposes	CC, DI	◕
Summary:	The website empowers patients in collaborative acitivites and information sharing on a broad scale, including health conditions, symptoms and medications. It is a large (free-of-charge) online community that integrates each member´s information in order to create online content and consequently apply this for research purposes.		
Benefit:	The network has the possibility to take a more comprehensive look at a patient´s health covering a deeper and broader range of conditions and offering patients a form of disease self-management. With the incorporated features PatientsLikeMe has the potential to match patients with similar conditions and thusto create a broader data base. Further benefits are time and money savings for identifying, screening, contacting and receiving responses for clinical trials as PatientsLikeMe incorporates the data anonymized for research purposes.		
Outlook / Potential:	The increasing Internet affinity of patients and their care givers has potential to increase the reach of PatientsLikeMe also in geographical terms. This can increase the information density on rare or chronic diseases which can then be used to leverage research efforts and outcomes.		
Thestrokenetwork www.thestrokenetwork.org	Online support groups targeted to stroke patients and their care givers	PE, HS&HG	◔
StrokeNet	Information resources	GI, PE, HS&HG	◔
Summary:	A network targeted to stroke survivors, their family members and care givers offering various types of resources to inform about stroke and related information (e.g. Blogs, Gallery, Links, News, etc.)		
Benefit:	Free-of-charge platform for stroke patients, their relatives and care givers that seek help and support for the current stroke related health situation. User engagement is empowered as well as the continuing creation of user content.		
Outlook / Potential:	The platform has potential to engage further stakeholders in health care in order to foster data generation and to form a valuable research pool. Information provided can be used for prevention mechanisms as well as to help stroke patients better cope with the situation - physically and mentally.		

Health Care Platform (Name, URL and Logo)	**Features**	**Benefits** General Medical Information (GI) Patient Empowerment (PE) Help-seeking / Help-giving (HS&HG) Online Collaboration / Collective Creativity (CC) Diffusion of Innovation (DI)	**Innovativeness** (low - high)
Health Care Online Communities			
DailyStrength www.dailystrength.com	Support groups (for specific health conditions)	GI, PE, HS&HG	◔
DailyStrength	Health blogs (articles on various health issues)	GI	○
	Expert answers on medical questions	PE, HS&HG	◑
	Treatments	GI, PE, HS&HG	◑
	People (personal profile creation and interaction with other members)	PE, HS&HG	◔
Summary:	The platfrom offers users and members who signed up to the services health information and support in the different sections described (see features above). It actively involves patients and care givers in discussions, sharing and creation of online content.		
Benefit:	DailyStrength empowers patients to take care of their health situation themselves, in combination with others and / or medical experts. Empowered is the free flow of information and creation of online content on discussion boards, giving and receiving social and emotional support, providing treatment reviews and other features which can help a patient to overcome a specific health condition.		
Outlook / Potential:	The large user base has great potential to be leveraged in order to create content for research purposes that might be sold anonymized to pharmaceutical companies, research labs or universities. The communities already provide a platform where help-seeking and help-giving is practiced, this might already pose the possibility to share solutions and innovations.		
WeGoHealth www.wegohealth.com	Specialized health care groups	GI, PE, HS&HG, CC	◑
wegohealth	Patient education and support	GI, PE, HS&HG, CC	◑
	Clinical trials within patient groups	PE, CC, DI	◕
	Engagement of patients in innovation	PE, CC, DI	◕
	Enhancement of knowledge sharing	PE, CC, DI	◕
Summary:	WeGoHealth provides individual patients the possibility to become a health care activist, sharing konwledge and favourite online resources, experiences and educational advice with likeminded people. The platform tends to empower patients as well as care givers to create online content and fosters collaboration on communities.		
Benefit:	Rich knowledge base and sharing on the platform, increasing online collaboration on health topics. Creation of specialized groups and even a link between patients, companies and care givers.		
Outlook / Potential:	The increasing online data availability, density of information and knowledge on special conditions and symptoms is a rich resource for the platform. Potential for members and new users to engage in research, collaboration and information sharing.		