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Online Innovation Intermediaries In Healthcare

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ONLINE INNOVATION INTERMEDIARIES IN HEALTHCARE

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Abstract

Background: In today's knowledge rich environment even the largest organisations, such as pharmaceutical or medical technology companies, realize a bottleneck of knowledge resources for innovation. Harnessing the innovation potential of patients and other healthcare consumers contends to be part of the solution.

Objective: This paper questions if online health platforms can support innovative activities by creating and transferring relevant knowledge from engaged healthcare consumers towards innovating healthcare companies. It aims at identifying online health platforms that can serve as innovation intermediaries.

Method: An exploratory, case-study-based approach is chosen. Through desk review a sample of online health platforms is created and case vignettes are developed. Content analysis returns descriptive attributes which are examined throughout the sample.

Findings: 30 out of 306 health-related online platforms qualify as innovation intermediary. We observe that online innovation intermediaries look for profound experience from healthcare consumers, in particular patients with a higher degree of affectedness. Further qualitative findings are presented.

Conclusion: This paper puts emphasis on the mediating role of selected online health platforms as advocates of innovation. It suggests a classification and description of the variety of "health 2.0" platforms and sketches a preliminary picture of the market for online innovation intermediaries in healthcare today.

Keywords: Innovation intermediaries, Open innovation, Healthcare, Health 2.0, Classification.

1 Introduction

In today's healthcare systems, rising demand and expectations are increasingly out of step with the funding models available. In 2010, health spending in EU member states consumed on unweighted average 9.0% of their GDP while annual growth in health spending more than doubled GDP growth over the past decade (OECD, 2012). Without radical change it seems unlikely that we can sustain the kind of healthcare which we associate with highly developed societies. The healthcare sector has continuously been characterised by innovation – in treatments and drugs, in hospital and care systems, in primary and acute care pathways and in chronic disease management. Innovation has habitually been a collaborative, multi-player activity. But in today's knowledge rich environment even the largest organisations, such as pharmaceutical or medical technology companies, realize a bottleneck of knowledge resources. This drives a search to engage and employ a wide range of additional players. The ideas behind "open innovation" essentially involve finding ways to spread the knowledge net much more widely, bringing into the company's innovation process a wider range of players and mobilising their experience and creativity in the search for novel and sustainable solutions (Chesbrough, 2003).

One key direction in which healthcare innovation can open up lies in harnessing the innovation potential of patients and their carers (Wanless, 2002; Røtnes and Staalesen, 2009; Boote et al., 2002; Paterson, 2004). There are many examples where patients have played a key role in developing solutions to their healthcare challenges – and there is evidence that this process is accelerating (Habicht et al., 2012). One powerful route is opened up via interactive online platforms which build and mobilise communities with common interests. Surprisingly, given recent trends and challenges in the areas of healthcare, several scholars state that there is insufficient research on the impact of web 2.0 in healthcare (Randeree, 2009; Leimeister et al., 2008; Boulos and Wheeler, 2007). Leimeister et al. (2008) add that online healthcare communities are receiving increased research attention as new special interest groups, but much is still unknown about the design and impact of these groups.

This paper aims to link the domains of web 2.0 in healthcare and open innovation. We perform an extended review of such "health 2.0" platforms and examine if they can serve as innovation intermediaries. Our special interest lies in identifying health 2.0 platform operators who, on the one hand, make use of the innovation potential (i.e. the knowledge, experience, and ideas) of healthcare consumers and professional stakeholders and, on the other hand, can fulfil a bridging role between health 2.0 users and pharmaceutical/medical companies. These companies eventually have the resources to produce and commercialise a novel product. Therefore, our research question formulates as: How can online innovation intermediaries be identified in the domain of "health 2.0"?

The remainder of the paper is organized as follows. First, we introduce the background on web 2.0 in healthcare and online communities as well as the role of intermediaries in the innovation process. These pieces are synthesized into a typology on health 2.0 platforms. Section three explains our explorative approach based on a case study design. Then, we present an in-depth analysis of the case sample which is completed by a discussion of findings (sections four and five). Study limitations, options for future research, and a conclusion close the paper (sections six and seven).

2 Setting the Scene

2.1 Web 2.0 and online communities in healthcare

The term web 2.0 commonly refers to online platforms that enable increased information exchange between lay users, social networking and collective knowledge production (Adams, 2010; O´Reilly, 2005). As available definitions are not congruent, Adams (2010) pinpoints the following common points: (1) in web 2.0, lay users are important producers of content; (2) users interact with themselves

or the online platform; (3) facilitation of social opportunities such as community building and collaboration. As a discipline-related adaptation that incorporates the use of web-based technology in healthcare, the terms health 2.0 or medicine 2.0 were coined (Hughes et al., 2008; Eysenbach, 2008). In a similar vein, Van de Belt et al. (2010) have done a review on available definitions concluding by the following characteristic themes: (1) web 2.0 is the underlying means for communication and information sharing; (2) increased participation of healthcare consumers; (3) increased participation of health professionals or other stakeholders such as payers, providers, researchers; (4) emergence of online communities and social networking; (5) improving collaboration between health consumers and professionals; (6) health information that is patient-driven and user-generated; and (7) positive impact on the healthcare system in terms of higher quality and efficiency. A multitude of websites that attempt to incorporate (parts of) the above aspects have emerged in recent years – we will call them *health 2.0 platforms* from here on. A small number of prior studies has already reviewed and classified the landscape of health 2.0 platforms (Weber-Jahnke et al., 2011; Goerlitz et al., 2010; Kuehne et al., 2011; Birnsteel et al., 2008). However, the potential of web 2.0 in healthcare towards open, collaborative innovation remains under-researched in these works.

Virtual and online communities are one of the more popular forms of user interaction in the web 2.0 (Romm et al. 1997; Correia et al. 2010; Kuehne et al. 2011; Leimeister et al. 2008). In online health communities, users not only provide each other with experiences and (sometimes emotional) support, they also enable one another to comprehend the necessary medical information and science in the context of the respective disorder (Frost and Massagli, 2008; Hoch and Ferguson, 2005). Such communities are characterized by a high degree of interaction between users, and reciprocal exchange of information. The emergence of these interactive capabilities enable online health communities to be an effective source of jointly constructed and shared knowledge through participation of healthcare consumers, professionals and other stakeholders.

2.2 The role of intermediaries in the innovation process

Different strands of research elaborate on the importance of external sources of knowledge for enhancing firms' capability to innovate, e.g. research on technological change (Rosenberg, 1982), collective invention (Allen, 1983), user innovation (Von Hippel, 1988), and open innovation (Chesbrough, 2003). To facilitate these knowledge inflows, a large number of firms emerged in the last decade which serve as intermediaries in an open innovation process. A rich literature describes and analyses the role of intermediaries as third parties mediating between manufacturing firms and their customers (see review by Howells, 2006). From a network perspective, intermediaries connect an actor (the manufacturing firm) with different sources of knowledge and ideas (e.g. their customers) (Diener and Piller, 2010). Adapted to the context of this paper, 'manufacturing firms' indicate pharmaceutical or medical technology companies. Howells (2006:720) defines an innovation intermediary as follows: "*An organization or body that acts as an agent or broker in any aspect of the innovation process between two or more parties. Such intermediary activities include: helping to provide information about potential collaborators; brokering a transaction between two or more parties; acting as a mediator, or go-between, bodies or organizations that are already collaborating; and helping find advice, funding and support for the innovation outcomes of such collaborations*".

In the virtual world, a number of online innovation intermediaries have emerged who leverage the Internet to support the innovation capacity of manufacturing firms. Compared to the competences of innovation intermediaries in the physical world, they are significantly extended in virtual environments with regard to network access, knowledge absorption, knowledge integration, and knowledge implementation (Verona et al., 2006). Also within healthcare, health 2.0 platforms can act as online innovation intermediaries when bridging the gap between the online crowd of healthcare consumers and medical manufacturing firms. Such firms can greatly benefit from online innovation intermediaries for two reasons (Verona et al., 2006). First, they help to augment the network access by enhancing the

reach in engaging with customers. Second, firms can gain richness through bidirectional interactions and higher quality of its content.

2.3 Typology of health 2.0 platforms

In order to classify the multitude of available health platforms, we want to synthesize the above into a conceptual classification for health 2.0 platforms and propose the following dimensions: (i) the qualification as an innovation intermediary and (ii) the availability of an online community for its users. Both dimensions are defined as Boolean values (yes or no). We take these dimensions as basis for a two by two typology; further reasoning for both dimensions is given next.

We surmise that some health 2.0 platforms can fulfil the role of an online innovation intermediary under certain circumstances. Verona et al. (2006) describes the key roles as to collect dispersed sources of knowledge, to recombine it to support innovation, and to transfer it to new contexts (i.e. manufacturing firms). For the purpose of this paper, we therefore assess two essential attributes. When both of the attributes are fulfilled, we consider a health 2.0 platform suitable as innovation intermediary.

- *Explicit enquiry towards the users:* The health 2.0 platform has a determined interest in gathering data, information or knowledge from its users. Hence, the users are explicitly asked to share their health data, treatment experiences, unmet needs, preferences, opinions, etc. From the intermediary's view, the user is regarded as a valuable source of knowledge.
- *Knowledge exploitation:* Once users' knowledge is collected, the platform operator should exploit it somehow. One possible option is that the data could be analysed and aggregated into some new form by the intermediary himself. Another option, from the perspective of the innovation process, is that the newly gathered knowledge is being transferred to an innovating firm for the research and development of new products.

The second differentiation stresses the community dimension which we measure by the *presence or absence of an online community* for platform users. Online communities with all its social and behavioural aspects attached can have a significant impact in innovation outcomes (Fueller et al., 2004; Franke and Shah, 2003). Platform concepts that do not stem from group dynamics are, for instance, idea contests, where users submit a problem solution, or survey-like enquiries, where users are being asked for their opinion or experience. This differentiation is important as it requires a different set of methods and skills from the innovation intermediary.

3 Method

Since online innovation intermediaries in healthcare, as defined in this paper, are a rather new phenomenon, we chose an explorative qualitative research approach based on a multiple-holistic case study design (Yin, 2003). Data collection and analysis follow five steps as clarified next.

I. Sample collection: First, we created a sample of health or medicine-related online platforms through desk research. Unlike similar studies (Goerlitz et al., 2010; Weber-Jahnke et al., 2011), we did not employ a keyword-based web search to find relevant platforms, but built on the following key sources:

- An initial sample was populated by platforms showcased at three leading conference series in the field. We assume that operators of especially successful, innovative, or recent platforms would speak up there. For the period 2007 till end of 2012, agendas and speaker affiliations were screened from 19 *"Health 2.0"* (www.health2con.com), 5 *"Medicine 2.0"* (www.medicine20congress.com) and 2 *"Doctors 2.0 & You"* (www.doctors20.com) conferences.
- In addition, we enlarged the sample by screening scientific and practitioner-oriented articles (Boulos and Wheeler, 2007; Hartmann et al., 2011; Frost and Massagli, 2008; Bullinger et al., 2012; Leimeister and Krcmar, 2005; Swan, 2009; Randeree, 2009; Goerlitz et al., 2010; Weber-Jahnke et al., 2011; Seeman, 2008; Allison, 2009; Dannecker and Lechner, 2007; Pharma Relations, 2010;

Birnsteel et al., 2008; Miller and Washington, 2012). The identified references originate from a search using "health 2.0" and "web 2.0 +healthcare" as search terms in Google Scholar.

For the purpose of this study, we focus on platforms that offer knowledge or instruments to advance the user's desire for better health. The user should directly benefit from using the platform, e.g. through gaining new health knowledge, exchanging with peers or as a source of support, or should have the opportunity to contribute his knowledge and experience. Therefore, we excluded (i) pure corporate representations of companies or associations, and (ii) platforms that already stopped operations by Dec 2012. The goal of the selection process was to create a not necessarily complete, but broad repository of health platforms available.

II. Development of case vignettes: By exploring each of the websites of the sample following the method of "third-party web assessment" (Irani & Love, 2008), we developed a structured case vignette for each platform – available in a central repository in Microsoft Excel.

III. Removal of cases without user involvement: In order to ensure the interactive "2.0" character of the health platforms, we screened the vignettes and retained only those cases that offer a minimum level of user involvement, i.e. allow users to create, add or share content. For instance, pure health information portals were removed through this step.

IV. Qualitative content analysis: Following the procedure of content analysis (Mayring, 2000), further dimensions of analysis that oriented along the themes of health 2.0 (cf. section two) were elicited in multiple iterative rounds until saturation was reached.

V. Application of new dimensions to the sample: The last step covered a coding process based on the new dimensions identified in step 4. Two researchers from our team independently assessed each of the health 2.0 platforms according to the criteria (Mayring, 2000). Anchor examples were chosen.

4 Findings

4.1 Description of the health 2.0 sample

The sample collection yielded 306 health- or medicine-related online platforms (step I) of which 183 are health 2.0 platforms with user involvement (step III). This sub-sample will be the basis for the following analyses. Figure 1 shows the distribution of cases according to the above defined typology. For your reference, find the complete repository online at http://tinyurl.com/clx2ped.

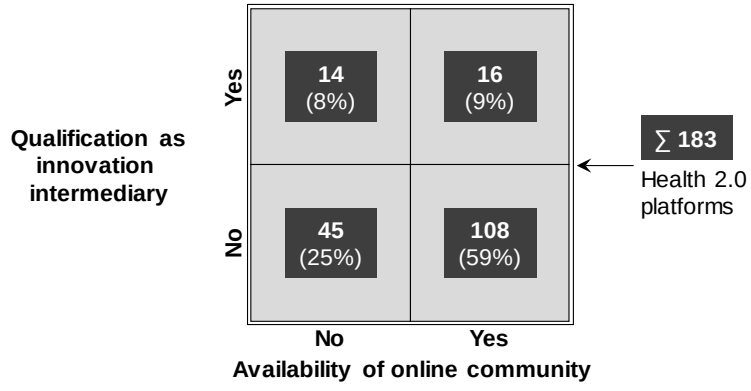

Figure 1. Empirically populated typology of health 2.0 platforms (Number of cases found)

For illustration, we present selected examples in the following. A representative case for a community based online innovation intermediary is *InnovationByYou* (www.innovationbyyou.com). It is an online platform sponsored by *Coloplast*, a manufacturer of medical devices and services related to ostomy, urology, continence and wound care. At InnovationByYou, like-minded patients with ostomy or con-

Dimension	Question	Answer choice* and answer attributes					
Healthcare consumer involvement	Is the platform designed to involve consumers? If yes, which type?	*mv*	No	The well	The newly diagnosed	Chronically ill and their caregivers	
Healthcare professional involvement	Is the platform designed to involve professionals? If yes, which type?	*mv*	No	Providers	Suppliers		
Level of interaction	Which level of interaction can be attained by the users?	*sv*	Information	Communication	Consultation	Cooperation	Collaboration
Stage of innovation process	At which stage of the innovation process the users' input can be utilized?	*mv*	None	Fuzzy Front End	New Product Development		
Online community (availability & access)	Does the platform offer an online community to its users? If yes, are there access restrictions?	*sv*	No	Non-restricted	Restricted		

** sv = single value only, mv = multiple values possible*

Table 1. Elicited dimensions

tinence issues can share ideas and learn from each other. The platform operator organizes idea challenges on related topics. Promising solution proposals are developed by the community members until prototype stage and are then presented to the top management to decide on large-scale production. Further examples of this type are PatientsCreate.com, HealthUnlocked.com, CancerCommons.org, Ambulanzpartner.de, Doctors.net.uk and others. Full details are given in the online repository.

A promising case as non-community based innovation intermediary is the *Data Design Diabetes Innovation Challenge* (www.datadesigndiabetes.com) initiated by *Sanofi*, a French pharma. Entrepreneurs, scientists or designers, as individuals or teams, are called to submit their solution proposals on diabetes-related problems. The platform creates its attraction from prize money, a board of judges and a competitive atmosphere. Strongest ideas receive mentorship by Sanofi. Other examples of this type are Connecting-Nurses.com, HealthTechHatch.com, iWantGreatCare.org, ArmyOfWomen.org and others.

4.2 In-depth identification of innovation intermediaries in health 2.0

Content analysis of the case vignettes provided further dimensions which describe crucial aspects of online innovation intermediaries. Table 1 lists the dimensions, related key questions and their possible answer values. Details on these dimensions and their empirical occurrence are presented in the remainder of this section while table 2 shows all findings in figures.

Involvement of healthcare consumers and professional stakeholders: To gain a deeper understanding of who the user actually is, we screened the sample for user types. On the top level, we suggest distinguishing between healthcare consumers and healthcare professionals. *Healthcare consumers* can be distinguished by the level of their affectedness into three general categories: (1) consumers who are *well*, (2) those who are *newly diagnosed* with an illness, and (3) those who are *chronically ill* including their medical caregivers (Cain et al., 2000). Concerning the involvement of *professional stakeholders in healthcare*, we found empirical evidence for the following two subgroups: (1) *Providers*, e.g., doctors, nurses, other health professionals and medical experts who provide care in hospitals, doctor's surgeries, nursing homes, and others; (2) *Suppliers*, e.g., scientific institutions and research groups, pharmaceutical and medical technology companies, who develop new products and treatments and heavily invest in research and development; pharmacies and wholesalers, who mostly do resale.

Analysing the data sample reveals that the big majority (83%, 152#) of health 2.0 platforms address healthcare consumers as user group while almost half of the platforms (45%, 82#) enable healthcare professionals to get involved. Looking specifically at consumer segmentation of the innovation intermediaries, we find that each intermediary with consumer involvement does address the chronically ill

		Absolute figures							*Relative figures*						
		Innovation Intermediary N		Innovation Intermediary Y		Innovation Intermediary Subtotal			Innovation Intermediary N		Innovation Intermediary Y		Innovation Intermediary Subtotal		
		Community		Community					Community		Community				
Dimension	Attribute	N	Y	N	Y	N	Y	Total	N	Y	N	Y	N	Y	Total
	Subtotal	45	108	14	16	153	30	183	100%	100%	100%	100%	100%	100%	100%
Consumer Involvement	None	2	22	3	4	24	7	31	4%	20%	21%	25%	16%	23%	17%
	W*	5	10	0	0	15	0	15	11%	9%	0%	0%	10%	0%	8%
	W-ND*	10	21	0	0	31	0	31	22%	19%	0%	0%	20%	0%	17%
	W-ND-CI*	17	4	8	2	21	10	31	38%	4%	57%	13%	14%	33%	17%
	ND-CI	9	31	2	6	40	8	48	20%	29%	14%	38%	26%	27%	26%
	CI	2	20	1	4	22	5	27	4%	19%	7%	25%	14%	17%	15%
Professional Involvement	None	29	64	5	3	93	8	101	64%	59%	36%	19%	61%	27%	55%
	Provider	15	35	1	0	50	1	51	33%	32%	7%	0%	33%	3%	28%
	Prov-Supp	1	9	7	11	10	18	28	2%	8%	50%	69%	7%	60%	15%
	Supplier	0	0	1	2	0	3	3	0%	0%	7%	13%	0%	10%	2%
Level of Interaction	Information	23	0	0	0	23	0	23	51%	0%	0%	0%	15%	0%	13%
	Communication	2	101	0	2	103	2	105	4%	94%	0%	13%	67%	7%	57%
	Consultation	13	1	13	2	14	15	29	29%	1%	93%	13%	9%	50%	16%
	Cooperation	7	6	1	4	13	5	18	16%	6%	7%	25%	8%	17%	10%
	Collaboration	0	0	0	8	0	8	8	0%	0%	0%	50%	0%	27%	4%
Stage of Innovation Process	None	45	108	3	2	153	5	158	100%	100%	21%	13%	100%	17%	86%
	FFE**	0	0	10	9	0	19	19	0%	0%	71%	56%	0%	63%	10%
	FFE-NPD**	0	0	0	5	0	5	5	0%	0%	0%	31%	0%	17%	3%
	NPD**	0	0	1	0	0	1	1	0%	0%	7%	0%	0%	3%	1%
Community Access	None	45	0	14	0	45	14	59	100%	0%	100%	0%	29%	47%	32%
	Non-restricted	0	92	0	10	92	10	102	0%	85%	0%	63%	60%	33%	56%
	Restricted	0	16	0	6	16	6	22	0%	15%	0%	38%	10%	20%	12%

** W - Well consumers; ND - Newly diagnosed consumers; CI - Chronically ill consumers incl. their caregivers*

*** FFE - Fuzzy Front End; NPD - New Product Development*

Table 2. Descriptive statistics on the sample of health 2.0 platforms

as part of their target user group. In combination with newly diagnosed consumers, these two subgroups bring along a certain level of experience and knowledge about particular disorders. In contrast to this, the service and content offerings of non-intermediary health platforms are more often designed to meet the demands of the well consumers.

Regarding the professional involvement, innovation intermediaries in health 2.0 are more open to integrate healthcare professionals than non-intermediary platforms. The relative shares of professional involvement are 73% for the intermediaries versus 39% for the non-intermediaries. Also, the intermediaries target a wider professional audience, notably providers and suppliers, while the non-intermediaries mostly focus on providers. In summary, we observe that innovation intermediaries in health 2.0 are seemingly interested in a broad user group (consumers and professionals) that provides a rich base of knowledge and experience.

Level of interaction: The level of interaction refers to the structure of the underlying relationships between the initiating health platform and its users. We propose five levels of interaction, in order of increasing intensity of interaction. (1) *Information:* The first level of interaction serves the purpose of an informational exchange. It can be characterized by a unilateral relationship between the platform and one user at a time. (2) *Communication:* The next level of interaction refers to a two-way exchange within a virtual community. The members are motivated by personal benefits and each individual's interest in an overarching topic which is also shared by the rest of the community. On behalf of the platform and community operator, the members' exchange is not tied to a common, innovation-related goal and requires little coordination efforts only, i.e. the community is highly self-governing. Online discussion boards, support groups and forums are examples in this category. (3) *Consultation:* It describes a deliberate enquiry regarding a specific question towards the healthcare consumers or other

users. Hence, the interaction is based on a dyadic relationship. Consumers are asked about their perspectives, needs, or priorities. Among others, appraisal platforms and innovation contests are usually settled in this category. (4) *Cooperation:* When online communities start to develop a momentum on its own, we can find a community-based relationship between the platform and a network of users. Basically there are n:n relationships between the members in the community and 1:n relationships between the platform operator and the members. Cooperation in this context is characterized by partnerships between users themselves and the platform operator. They work together for a common goal on an irregular and little formalized basis in order to bring a joint topic or project forward. (5) *Collaboration:* Collaboration can be considered as a more intense form of cooperation. On a regular basis, users work closely together in well-defined team structures. They share a common goal for the advancement of a joint project. Typically, the degree of coordination by the platform operator increases.

When we look into the empirical data again, it becomes apparent that the levels of interactions differ greatly between the four types of the typology. For example, when we look at non-intermediary platforms without communities, the levels 'information' and 'consultation' show the highest counts. Compared to this, the community-based intermediaries have their highest count on 'collaboration'. There is a tendency that the levels of interaction become more intense when the intermediary- and the community-attribute are true. This partly reflects our definition of an online innovation intermediary as it requires an 'explicit enquiry towards the user' (cf. section 2), i.e. can only be true when the level of interaction is consultation, cooperation, or collaboration.

Stage of innovation process: The dimension "stage of innovation process" describes the time at which the users' input and knowledge can be utilized and integrated into the innovation process. To do so, we lean on a linear phase model of the innovation process employed by Diener & Piller (2010). It suggests three major stages: (1) *Fuzzy front end*, comprising idea generation and evaluation; (2) *New product development,* comprising concept development and prototyping; and (3) *Commercialization*, compromising product test and market launch. Turning to our empirical data, we see the potential that the identified innovation intermediaries can support the innovation process – notably at two stages, the fuzzy front end (80%) and new product development (20%).

Community access: Some platform operators provide free access to their community, some others restrict the access. Online communities without access restriction trust the mechanism of self-selection of members. For reasons of simplicity, we distinguish between restricted and non-restricted access to online communities. Interestingly, intermediary platforms restrict user access to specialist communities to a greater extent than non-intermediary platforms do. We observe this in the relative share of restricted access communities of intermediary platforms compared to that of non-intermediary platforms (38% vs. 15%). On the one hand, this is due to the fact that some physician-only platforms in this subset require professional certifications during registration process. On the other hand, some other platforms also ask consumers to apply for membership through explicating their qualification or motivation levels.

5 Discussion

The previous section has provided us the evidence for five key observations that will be discussed in the following. First, innovation intermediaries in health 2.0 are looking for profound experience from the healthcare consumer. In particular, they focus on the chronically ill, i.e. patients with a high degree of affectedness. Hence, we understand this as a shift away from the generalist consumer experience towards a detailed knowledge base on specific disorders. While the focus of many online health communities is on emotional support among peers, the innovation intermediaries discussed here put emphasis on a pragmatic exchange of knowledge and potential solutions.

Second, apart from healthcare consumers only, such intermediaries are interested in a broad and professional knowledge base. In general, they are more open to professional involvement and professional contributions respectively. In particular, they look beyond medical providers by also targeting suppli-

ers. Nevertheless, this still means that other key players of the healthcare industry are not involved yet (i.e. not involved within the sample investigated). Notably *payers* (e.g., statutory health insurance, private health insurance, and government agencies) and *regulators* (e.g., ministry of health, national or regional committees who set regulatory guidelines) could also act as users and contributors, too. On this point, we hypothesise that the perceived benefits of engaging with healthcare consumers through the web are still too low for payers and regulators, but might be part of an on-going paradigm shift.

Third, intermediary platforms engage for more intense interactions with or between their users. Thus, knowledge exchange is made easier. And eventually, it can foster the emergence of new ideas and the support of innovative activities. The five levels that we discovered within the analysed sample are close to existing taxonomies which classify the degree of integration of the public (Boote et al., 2002; Arnstein, 1969; Piller et al., 2010). These models confirm the benefits generated by a higher degree of integration of and interaction among consumers. In each of the most intense forms of integration, the authors proclaim that participants/consumers can enter into partnerships with powerholders or even obtain the majority of decision-making.

Fourth, early stages of the innovation process (i.e. concept development and prototyping) are more supported than later stages (i.e. commercialization). However, it remains difficult to systematically involve users at the early stages as evidence for such activities is little. Furthermore, health 2.0 users seem to be not actively employed during the commercialization stage of novel products (at least, our sample did not provide clear evidence for this).

Fifth, access to specialist communities is more restricted at intermediary platforms. Evidence remains low on this point, but we interpret it as a tendency. This observation supports the previous hypothesis that operators of intermediary platforms search for particularly suitable and qualified users. By restricting access to their communities, the operator gains more control over the user recruitment process.

6 Limitations and future research

This study has three main limitations, which in turn has implications for future research. Firstly, the identified number of innovation intermediaries in health 2.0 cannot be considered large. We count 30 of such intermediary platforms in our sample. Hence it may be delicate to draw generalizations from our findings. Nonetheless the findings can function as well-grounded directions for future research.

Secondly, our scope on innovation intermediaries is somewhat limited to a bridging role between the healthcare consumers/professionals and medical manufacturing companies. We applied two rather simple criteria which qualify an online platform as an innovation intermediary. This pragmatic approach could be reconsidered and enhanced by other functions (see Howell, 2006 for more).

Thirdly, we have chosen a desk research approach. That is why the assessment of the dimensions was merely done with a blend of publicly available information, i.e. the websites and their self-descriptions, and third-party reports from Wikipedia to academic articles. Therefore, field research about online innovation intermediaries in healthcare may produce a higher level of understanding regarding their motivation, function, processes and relationships. In particular, it would be useful to explore the types of knowledge created by users on the platform (also claimed by Verona et al., 2006) and, subsequently, how the platform operators add value to the intermediation process by e.g. repackaging or refining the knowledge artefacts. Interviews with such intermediaries would confirm or revoke our assessment. Particular insight could come from health 2.0 intermediaries that failed (also raised by Hossain, 2012).

Furthermore, studies on the perceived strengths, weaknesses, requirements, and needs by health 2.0 users and by research and development departments of medical manufacturers (as potential clients and beneficiaries of such innovation intermediaries) can be a fruitful approach to further knowledge in this field. Eventually, we rather looked at the user-intermediary interface instead of the manufacturer-

intermediary interface. It is due to the user-oriented definition of health 2.0 that we have applied straight from the start. Hence, for the subset of health 2.0 platforms that qualify as online innovation intermediaries, it is advisable to strengthen the understanding of the interface between such intermediaries and medical manufacturers. Another area for future research could be the search for successful business models between medical manufacturers and online innovation intermediaries.

7 Conclusion

We began this paper by referring to the serious challenges in healthcare and the emerging need for innovation in this area. We focused on one of the new avenues along which the engagement of healthcare consumers and healthcare professionals might take place – the growing use of interactive online platforms in the healthcare sector. Hence our research question aimed at identifying health 2.0 platforms that can serve as intermediaries in the innovation process. This paper contributes to an answer in a threefold way.

First, it enhances the academic discussion by creating - for the first time according to our humble knowledge – a link between the domains of interactive online health platforms and open innovation. It thus puts emphasis on the role of such platforms as advocates of innovation and supporters of the innovation process. We used the term ‘online innovation intermediary’.

Second, it suggests an essential classification and description of the variety of health 2.0 platforms. Instead of structuring along technical features of online platforms (which are usually easy to observe and to count), the proposed classification scheme scrutinizes the purpose for which each platform is run. We started out by proposing an initial typology to differentiate health 2.0 platforms. The suggested classification scheme distinguishes along two axes: (i) health 2.0 platforms that mediate between innovating companies and external stakeholders, and those who do not; as well as (ii) community based and non-community based health 2.0 platforms. Based on case vignettes, we found further dimensions for classification which are: involvement of healthcare consumers, involvement of professional stakeholders in healthcare, level of interaction attained by users, the supported stage of innovation process, and the access to online community (cf. table 1).

Third, it provides a state-of the-art review of web 2.0 platforms in healthcare with an international scope that does not restrict to consumer services only, but also includes services for doctors and other professional stakeholders. With the examples given in this paper and in the case repository that is available online, we are able to sketch a preliminary picture of the market for online innovation intermediaries in healthcare. Based on this, it gives practitioners from corporate environments the necessary orientation when it comes to the decision whether to start their own innovation communities or to engage with existing actors in the field.

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References

Adams, S.A. (2010) Revisiting the online health information reliability debate in the wake of "web 2.0": an inter-disciplinary literature and website review. International journal of medical informatics, 79 (6): 391–400

Allen, R.C. (1983) Collective invention. J Economic Behavior & Organization, 4 (1): 1–24

Allison, M. (2009) Can web 2.0 reboot clinical trials? Nature biotechnology, 27 (10): 895–902

Arnstein, S. (1969) A Ladder Of Citizen Participation LeGates, R.T. and Stout, F. (eds.). Journal of the American Planning Association, 35 (4): 216–224

Birnsteel, L., Hoeksma, J. and Grätzel, P. (2008) Web 2.0 in the Health Sector: Industry Review with UK Perspective. London: E-Health Media

Boote, J., Telford, R. and Cooper, C. (2002) Consumer involvement in health research: a review and research agenda. Health Policy, 61 (2): 213–236

Boulos, M.N.K. and Wheeler, S. (2007) The emerging Web 2.0 social software: an enabling suite of sociable technologies in health and health care education. Health information and libraries journal, 24 (1): 2–23

Bullinger, A.C., Rass, M., Adamczyk, S., et al. (2012) Open innovation in health care: Analysis of an open health platform. Health policy (Amsterdam, Netherlands), 105 (2-3): 165–175

Cain, M.M., Sarasohn-Kahn, J. and Wayne, J.C. (2000) Health e-People: The Online Consumer Experience. Institute for the Future

Chesbrough, H.W. (2003) Open Innovation: The New Imperative for Creating and Profiting from Technology. Boston: Harvard Business School Press

Correia, A.M.R., Paulos, A. and Mesquita, A. (2010) Virtual Communities of Practice : Investigating Motivations and Constraints in the Processes of Knowledge Creation and Transfer. Electronic Journal of Knowledge Management, 8 (1): 11 – 20

Dannecker, A. and Lechner, U. (2007) "Zielgruppenspezifische Dienste für Virtuelle Patientengemeinschaften." In Oberweis, A.; Weinhardt, C.; Gimpel, H.. K. and A.; Pankratius, V.; Schmizler, B. (eds.). eOrganisation: Service-, Prozess-, Market-Engineering. 2007. Universitätsverlag Karlsruhe. pp. 935–952

Diener, K. and Piller, F.T. (2010) The Market for Open Innovation: Increasing the Efficiency and Effectiveness of the Innovation Process. Aachen: RWTH-TIM Group

Eysenbach, G. (2008) Medicine 2.0: Social Networking, Collaboration, Participation, Apomediation, and Openness. Journal of Medical Internet Research, 10 (3): e22

Franke, N. and Shah, S. (2003) How communities support innovative activities: an exploration of assistance and sharing among end-users Yolum, Tumer, Stone, et al. (eds.). Research Policy, 32 (1): 157–178

Frost, J.H. and Massagli, M.P. (2008) "Collaborative uses of personal health information: a study of PatientsLikeMe." In Information Systems Journal. 2008. ACM. pp. 1–4

Fueller, J., Bartl, M., Ernst, H., et al. (2004) Community based innovation: a method to utilize the innovative potential of online communities. 37th Annual Hawaii International Conference on System Sciences 2004 Proceedings of the, 00 (C): 195–204

Goerlitz, R., Seip, B., Rashid, A., et al. (2010) "Health 2.0 in practice: A review of German health care web portals." In White, B., Isaías, P. and Andone, D. (eds.). Proceedings of the IADIS International Conference on WWW/Internet. Timisoara, Romania. 2010. IADIS. pp. 49–56

Habicht, H., Oliveira, P. and Shcherbatiuk, V. (2012) User Innovators: When Patients Set Out to Help Themselves and End Up Helping Many. Die Unternehmung: Swiss journal of business research and practice, 66 (3): 277–295

Hartmann, M., Görlitz, R., Prinz, A., et al. (2011) "Ein Literature Review zur Aufarbeitung aktueller Forschungsergebnisse zu Health 2.0 Anwendungen." In 10th International Conference on Wirtschaftsinformatik. Zurich, Switzerland. 2011. pp. 78–87

Hoch, D. and Ferguson, T. (2005) What I´ve learned from E-patients. PLoS medicine, 2 (8): e206

Hossain, M. (2012) Performance and Potential of Open Innovation Intermediaries. Procedia - Social and Behavioral Sciences, 58: 754–764

Howells, J. (2006) Intermediation and the role of intermediaries in innovation. Research Policy, 35 (5): 715–728
Hughes, B., Joshi, I. and Wareham, J. (2008) Health 2.0 and Medicine 2.0: tensions and controversies in the field. Journal of Medical Internet Research, 10 (3): e23
Irani, Z. and Love, P. (2008) Evaluating Information Systems: Public and Private Sector. Elsevier/Butterworth-Heinemann
Kuehne, M., Blinn, N., Rosenkranz, C., et al. (2011) "Diffusion of web 2.0 in healthcare: A complete inventory count in the German health insurance." In Proceedings of the European Conference on Information Systems 2011. Helsinki. 2011
Leimeister, J.M. and Krcmar, H. (2005) Evaluation of a Systematic Design for a Virtual Patient Community. Journal of Computer-Mediated Communication, 10 (4)
Leimeister, J.M., Schweizer, K., Leimeister, S., et al. (2008) Do virtual communities matter for the social support of patients?: Antecedents and effects of virtual relationships in online communities. Information Technology People, 21 (4): 350–374
Mayring, P. (2000) Qualitative Content Analysis Granskär, M. and Höglund-Nielsen, B. (eds.). Forum Qualitative Sozialforschung Forum Qualitative Social Research, 1 (2): 1–12
Miller, R.K. and Washington, K. (2012) "Consumer Use of Online Health Information." In Miller, R.K. and Washington, K. (eds.) The 2012 Healthcare Business Market Research Handbook. Richard K. Miller & Associates. pp. 569–572
O´Reilly, T. (2005) What Is Web 2.0: Design Patterns and Business Models for the Next Generation of Software. Social Science Research Network Working Paper Series. 2007 (65) pp. 17–37
OECD (2012) Health at a Glance: Europe 2012. OECD Publishing
Paterson, C. (2004) "Take small steps to go a long way" consumer involvement in research into complementary and alternative therapies. Complementary therapies in nursing midwifery, 10 (3): 150–161
Pharma Relations (2010) Gesund per Klick? Vom Portal zur Community - Gesundheitswebsites im Wandel. Pharma Relations, (12/2010): 30–33
Piller, F.T., Ihl, C. and Vossen, A. (2010) A Typology of Customer Co-Creation in the Innovation Process. Social Science Research Network, 4: 1–26
Randeree, E. (2009) Exploring technology impacts of Healthcare 2.0 initiatives. Telemedicine journal and e-health, 15 (3): 255–60
Romm, C., Pliskin, N. and Clarke, R. (1997) Virtual communities and society: Toward an integrative three phase model. International Journal of Information Management, 17 (4): 261–270
Rosenberg, N. (1982) Inside the Black Box: Technology and Economics. Cambridge: Cambridge University Press
Røtnes, R. and Staalesen, P.D. (2009) New methods for user driven innovation in the health care sector. Oslo, Norway
Seeman, N. (2008) Web 2.0 and chronic illness: new horizons, new opportunities. Electronic Healthcare, 11 (1): 104–110
Swan, M. (2009) Emerging Patient-Driven Health Care Models: An Examination of Health Social Networks, Consumer Personalized Medicine and Quantified Self-Tracking. International Journal of Environmental Research and Public Health, 6 (2): 492–525
Van De Belt, T.H., Engelen, L.J., Berben, S.A., et al. (2010) Definition of Health 2.0 and Medicine 2.0: a systematic review. Journal of Medical Internet Research, 12 (2): e18
Verona, G., Prandelli, E. and Sawhney, M. (2006) Innovation and Virtual Environments: Towards Virtual Knowledge Brokers. Organization Studies, 27 (6): 765–788
Von Hippel, E. (1988) The Sources of Innovation. New York: Oxford University Press
Wanless, D. (2002) Securing Our Future: Taking a Long-Term View. London: HM Treasury
Weber-Jahnke, J.H., Agah, A. and Williams, J. (2011) Consumer Health Informatics Services – A Taxonomy. Victoria, Canada: Department of Computer Science, University of Victoria
Yin, R.K. (2003) Case Study Research Design and Methods, 3rd edition. Sage Publications