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Abstract

Mobile sensor devices such as smart wearables and activity trackers open up new opportunities to be used in the health care sector. Moreover, since the positive effects of wearable technologies on individuals have been examined, and with fitness trackers becoming significance in preventing chronical conditions which are typically caused by the lack of regular physical activity and causing problems in weight gain and obesity, diabetes and/or osteoporosis has led the statutory health insurance companies in different countries to introduce fitness trackers as part of their reward systems. The objective of this study is to empirically examine individual's overall perception and experience with mobile fitness tracker, drivers as well as adoption barriers, with a particular focus on individual attitude and response when these trackers are implemented in novel services offered by professional health insurance companies. Based on 32 qualitative interviews with users, non-users and experts from insurance companies, our study will contribute toward a better understanding of individuals' smart wearable perception and adoption in the context of health insurance companies.

Keywords: Smart Wearables, Quantified Self, Health Insurance, m-Health, Fitness Tracker, Empirical Study.

1 Introduction

The Quantified Self movement initially started in the Silicon Valley and rapidly became a mainstream phenomenon of self-tracking practices (Lupton, 2013a, 2013c; Swan, 2013; Hoy, 2016). In particular, the wide adoption of commercial activity trackers such as Fitbit HR, Xiomi Mi and Garmin Vivo made it possible for individuals to collect their biometrics and also track their physical activity (steps done, distance walked or calories burned) throughout the day (Anderson et al. 2007). The huge amount of data generated by individuals became highly interesting not only for online based companies like Google or Amazon, but also for the more traditional industries such as car manufacturers and insurance companies, which also started to pay attention to the Quantified Self data (Swan, 2015).

For instance, a car manufacturers aim is to integrate personal tracking devices inside the automotive environment by linking individuals´ biometrics to their driving behaviour (Swan, 2015). In addition, car insurance companies plan to use this new found information as a source for better risk calculation and premium adjustments based on real-time data taken from activity trackers (Mueller and Zimmer-mann, 2002). Furthermore, the health care sector is also becoming digitalized with emerging areas of e-health and m-health, these in turn are already extending the scope of the traditional health care sec-tor. Therefore, the role of the patient is shifting away from the passively informed to the digitally en-gaged, and ultimately to the more self-responsible and active patient (Eysenbach, 2001; Swan, 2009, 2012a; Barello et al., 2012; Lupton, 2013b). Mobile sensor devices such as smart wearables and activi-ty trackers open up new opportunities to be used in the health care sector (Collier and Randolph, 2015). For example, on the one hand they bear new potential for more convenient control and moni-toring of chronical diseases (Gay and Leijdekkers, 2007; Steinhubl et al., 2013, 2015; Chiauzzi et al., 2015) yet on the other hand, they are more than suitable to be used in the area of personalized preven-tive medicine (Swan, 2012a). Naturally, people may experience concerns regarding the usage of fit-ness trackers particularly if they are implemented within the medical context. For example, the insuffi-cient data security and privacy concerns are one of the main barriers for acceptance of wearable devic-es (Atzori et al., 2010; Lupton, 2012; Swan, 2012b;).

Screening IS-related research, we could find numerous studies dealing with self-tracking, fitness-tracker adoption, or usage intentions as well as the impact of wearable fitness (Kupfer et al. 2016; Gimpel et al .2013)). Early work identify motivational drivers for self-tracking such as self-entertainment, self-association, self-design, self-discipline and self-healing (Gimpel et al. 2013). Other studies investigate acceptance of wearable self-tracking technologies identify such as perceived use-fulness, perceived enjoyment, social influence, trust, personal innovativeness, and perceived support of well-being as the strongest usage drivers (Pfeiffer et al. 2016). Moreover, studies differentiate be-tween self-tracking for exercise, nutrition, sleep and activity (Makkonen et al. 2016). It is not only a trend for the individual user, but corporate companies also see the benefits and possibilities from fit-ness tracker for their employees' well-being (Giddens et al. 2016).

However, the implementation of fitness tracker as a professional service for health insurance compa-nies is a new and mostly unknown phenomena, which has received little scientific attention so far. Furthermore, empirical research in the context of self-tracking and health insurance is very limited. Against this background, our study tries to answer the following general research question:

- How do Individuals perceive Smart Wearables offered by Insurance Organization?

To be more precise, the objective of this study is to examine individual's overall perception and expe-rience with fitness tracker, drivers as well as adoption barriers, with a particular focus on individual attitude and response when these trackers are implemented in novel professional services offered by health insurance companies. To the best of our knowledge, no empirical study has focus on user per-ception of fitness tracker as part of the health insurance reward program so far, therefore our study contributes to literature in several ways: First, our empirical study contributes to the overall under-standing of smart wearable adoption and self-tracking behaviour by confirming and extending existing drivers and barriers. Second, our study investigates a new domain (health insurance industry) in which fitness tracker can be used and the application in this new domain is analysed from a user perspective. Third, this research is amongst the first to investigate the usage and consequences of fitness tracker in a professional (non-private) context.

2 Background literature

In the past, health was seen from the outside perspective, which means it was placed as the responsibility of physicians to solely monitor patients' health conditions in regular periods and to detect abnormalities which could be a sign of an illness at an early stage. The emerging health-related mobile devices and applications of m-Health area brought the health care to a more individual level transforming it to the concept of self-care. So individuals themselves started to take actions regarding their conditions (Swan, 2009, 2012a). The internet enhance patients independency from traditional doctor appointments even more. To date, before individuals make an appointment with the doctor, they are looking up their symptoms online first. They often use Google search engine or Wikipedia platform to gain first information about their conditions (Dennison et al., 2013; Piwek et al., 2016). Then they search for people with similar medical conditions in forums and health social networks, to inform themselves and to exchange knowledge and share own experiences with other participants with similar conditions (Swan, 2009; Dennison et al., 2013; Lupton, 2014). The Quantified Self trend and the availability of new self-tracking devices increased peoples interest in their own health allowing room to monitor their own biometrics and link them to a particular behavior trait trying to gain insights on factors which can be optimized actively by the individuals themselves (Hood and Flores, 2012; Swan, 2012a). Therefore, laypeople become more engage in own self-care initializing the shift in health care industry from passively informed patient to actively and digitally engaged patient, who takes higher responsibility for own health (Mead and Bower, 2000; Lymberis, 2003; Swan, 2009; Mays et al., 2010; Swan, 2012a; Barello et al., 2012; Appelboom et al., 2014; Lupton, 2013a, 2013b, 2014). Hood and Flores (2012) also describes this development as a shift towards the proactive 4Ps, so to predictive, preventive, personalized and participatory medicine. According to the extended definition of e-Health by Eysenbach (2001) the empowerment of the patient becomes more important in health care industry since it enables people to have more control about their self-care and to influence it more directly (Steinhubl et al., 2013). This paradigm shift is promising to lead to costs reduction in health care sector by avoiding unnecessary visits by physicians and improve its efficiency by minimizing wrong diagnoses due to a lack of information (Eysenbach, 2001; Lymberis, 2003; Varshney, 2007; Atzori et al., 2010; Lupton, 2013b; Steinhubl et al., 2013; Boulos et al., 2014; Steinhubl et al., 2015). The self-monitoring and health-tracking practices including wearable technology for activity tracking can bring new advantages in both chronical disease observation and personalized preventive medicine, since they are cheap, easy to operate an though perfectly fitting in the patients everyday life even for long-term periods (Varshney, 2007; Barrett et al., 2013; Lupton, 2013a; Marino et al., 2013; Hoy, 2016). As described at the beginning of this study, the monitoring of chronical diseases or special health conditions, emerged from the Quantified Self movement directly and is still developing and adopting to different diseases (Lymberis, 2003; Piwek et al., 2016). The self-monitoring of patients suffering from chronical illnesses like diabetes can make it more convenient for the patients to undergo their regular check-ups at home (Couturier et al., 2012). Moreover, it would give the patients the feeling of being more in control of their illness (Beaudin et al., 2006; Varshney, 2007; Appelboom et al., 2014; Chiauzzi et al., 2015; Steinhubl et al., 2013). Additionally, the monitoring of elderly people can enhance their autonomy from personal care and support the recovery process, e.g. after a surgery, within their usual home environment. Patients at higher risk, e.g. for cardiovascular diseases or people who had have a heart attack, can benefit from home monitoring and increase their quality of life by feeling confident when they use always-on monitoring devices, which can detect abnormalities and set an emergency call automatically if the metrics become critical (Jovanov, 2005; Gay and Leijdekkers, 2007; Lymberis and Dittmar, 2007; Varshney, 2007; Alemdar and Ersoy, 2010; Dobkin and Dorsch, 2011; Stephens et al., 2011; Chan et al., 2012; Couturier et al., 2012; Lockhart et al., 2012; Chiauzzi et al., 2015; Steinert, 2015). Therefore, the use of smart wearable technology in medical context was al-ready examined in previous research, which shows there are various number of potential benefits for patients and medical professionals as mentioned above.

Nevertheless, in both cases, personal activity trackers are bearing potential for cost reduction and effi-ciency increase in the health care industry (Appelboom et al., 2014). Moreover, since the positive ef-fects of wearable technologies on individuals have been examined, and with fitness trackers becoming significance in preventing chronical conditions which are typically caused by the lack of regular phys-ical activity and causing problems in weight gain and obesity, diabetes and/or osteoporosis (Speck and Harrell, 2003; Barkhuus, 2006; Stephens et al., 2011; Fritz et al., 2014; Findley, 2015; Wang et al., 2015) has led the statutory health insurance companies (SHIC) in different countries to introduce fit-ness trackers as part of their reward systems. Together with the objective to enhance individual moti-vation should in turn increase their daily level of physical activity (Choe et al. 2014).

3 Study Design, Methodology and Initial Results of Study 1

We are following an exploratory research design, to be more precise we use qualitative research that reflects ways, in which individuals think about the topic of interest (smart wearables) and helps us to identify their underlying perception and attitude (Ruyter and Scholl, 1998, p. 8; Miles et al., 2014, p. 11). The objective of this study is to understand individual values, expectations, fears and attitudes when using wearable devices offered by a health insurance company. In order to get a holistic understanding we used an purposeful sampling methods (Patton 2015), that included user (n=20) and non-user (n=7) of fitness tracker as well as experts (n=5) from insurance companies in our qualitative sample. In a first study, we used personal in-depth interviews with a semi-structured interview guideline to collect our data. As we included user, non-user and experts in our study, we prepared three different interview guidelines. Interview partners' age ranged from 22 years to 52 years (see Table 1 in Appendix for an overview of all interview partners); the interview lasted between 55 to 95 minutes, were audio recorded and transcribed afterwards. To independent researchers coded the interview material using the qualitative software NVivo (Richards 2002), which is widely used and accepted amongst IS-researchers (Abdul et al. 2016; Bandara et al. 2011; O'Flaherty and Whalley, 2004).

For the qualitative analysis of this work, the software NVivo was chosen due to its structured coding approach and comparability of results (Richards, 2002). First, the project folder was applied in NVivo, where all transcriptions of the interviews were uploaded. Afterwards, a code system was established by using 'nodes' from NVivo as coding categories. The coding system was built inductively based on the in-depth text analysis and in general, it was applied to the structure of the coding manuals, which allowed to better organize the qualitative data according to particular questions. The nodes by NVivo are organized hierarchically in the shape of a code-tree. The main ten codes or also called parent nodes covered the general information like demographics, the level of sporty activity, level of technical affinity, mentioned definition of fitness trackers, and the four research areas. Additionally, the parent node 'interesting findings' was built to collect further findings which were not intended initially, but delivered interesting insights. The last node was created to code the interviews by the experts since they had a different structures and could not be applied to the recent nodes without losing content. A short overview shows the main nodes (see Figure 1):

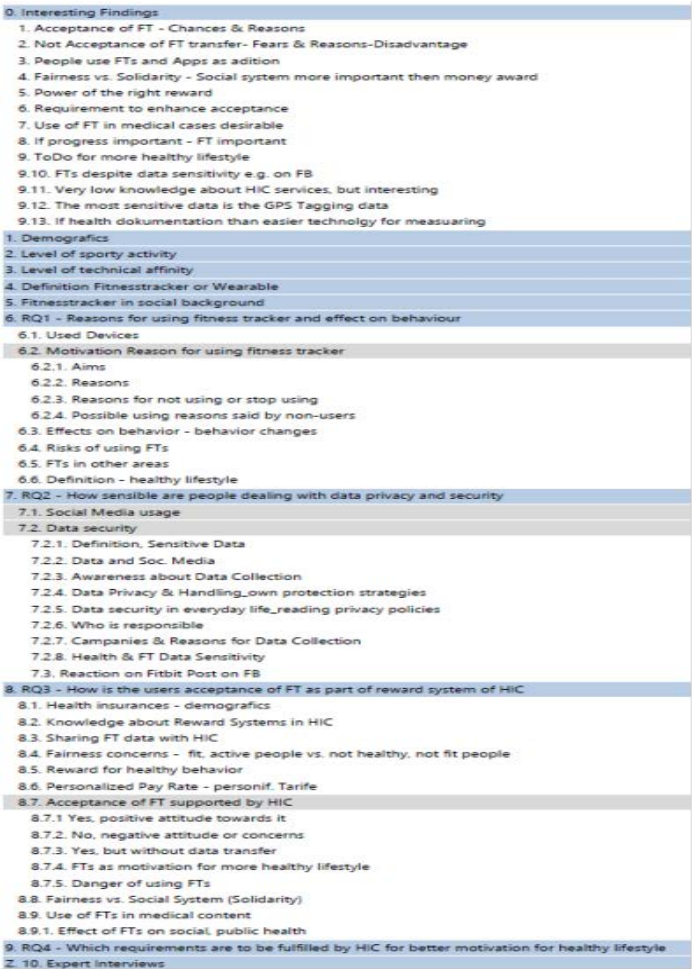

Figure 1. The code-tree in NVivo.

The interview material reveals valuable insights on how individuals perceive smart wearables. Apparently, individuals are already beyond the adoption phase of fitness trackers, as individuals have now accepted fitness trackers as an vital part of their daily live. Fitness trackers are used to record the personal sleep conditions, physical activity, and nutrition levels. Furthermore, individuals' do actively collect, evaluate, structure, and share the collected vital values with other individuals or on social networks. This is a strong indicator that fitness trackers are already a part of individuals' daily routines. Most active users (Interview Partner (P) 1, P5, P6, P7, P13, P14) reported behavior changes like walking more instead of taking a car, going up the stairs instead of riding the lift or going outside for a walk or with a dog one additional time in order to achieve their daily targets. Reaching daily goals that was often rewarded with a ribbon or medal made the users to feel good and keep motivated and was helpful to achieve their long-term goal like losing weight (P4, P6, P14). Based on the findings from the qualitative analysis, we propose:

Proposition 1: *Individuals are willing to use fitness trackers if insurance privacy policies are transparent about the data collection and storage*.

Proposition 2: *Individuals are willing to use fitness trackers as accompanying tools during a treatment if insurance policy regards fitness trackers as useful tools to improve individuals state of health and individuals' individual health outcomes.*

The most sensitive data for users are the health-related data (P1, P2, P3, P7 P8, P11, P12, P13), the data from bank accounts (P1, P2, P3, P5, P11, P14) and GPS-location data (P1, P12, P14, P15), because these data can harm individuals and have dangerous consequences for them, if they get to wrong people. Participants are afraid that they become 'transparent' (P4, P8, P13) and that based on their data and profile building they will be become predictable (P2, P13), manipulative (P6, P12), observable (P2, P6) and rated (P6, P13, P15). If insurance companies offer open privacy policies and control entities for the collected information, where individuals are empowered to control which information is collected and what is it used for, then individuals are more likely to adopt fitness trackers and to use them over a certain period of time. Individuals' are more willing to use fitness trackers to improve their state of health and to obtain rewards from insurance companies for a healthy lifestyle. However, individuals' positive intention to use a fitness tracker and to share the collected information with an insurance company is mostly limited to a short period of time. Individuals do not want to use fitness trackers for longer periods of time and to share the collected information with insurance companies due to high privacy risks and violation concerns. Often, individuals suspect insurance companies to abuse the intended usage purpose of individuals' personal information, but instead using it to control individuals' motion profile and to use this information to adjust insurance premiums. Against this background, we propose:

Proposition 3: *Individuals are more willing to use fitness trackers if individuals are empowered to control the data collection and the information flow.*

Proposition 4: *Due to the privacy concerns, individuals are afraid to use fitness tracker for a longer period of time.*

In general, users as well as non-users have a positive attitude towards statutory health insurance companies (SHIC) who support the usage of fitness trackers in order to do preventive measurement and so to increase the level of physical activity (P2, P3, P11). However, some users doubt that fitness trackers will lead to this effect, because a fitness tracker alone is not enough to change individuals´ habits in order to adopt healthier lifestyle (P6, P9, P15). *"I am not sure how this helps? If you lie on the sofa for 12 hours a day with a fitness tracker. Do you see a result? NO! The insurance cannot force you to move your ass. Normally only people who are active already and do sports regularly, they wear such trackers.." (P6, 30, user).*

Proposition 5: *In general individuals have a positive attitude towards statutory health insurance companies (SHIC) who offer fitness tracker as a professional service.*

Additionally, people are afraid that the wearing of fitness trackers will become compulsory and people who do not like to use them will be discriminated and punished with higher insurance rates (P1, P9, P14). They like the idea as long as the users are not obligated to transmit the data to SHIC (P11, P12, P13).

"If there are people out here who wants to share their data with the insurance it's OK. But not for me. Ist out of question. I am against a connection between fitness tracker and health insurance. That's nothing for me."(P13, 26, user).

Proposition 6: *Wearing a fitness tracker offered by the insurance company must be on a voluntary basis.*

It is an additional interesting finding that even if the users would be in favor with rewards for healthy behavior, e.g. having advances by lower personalized insurance rates, they state the social equality is more important than their individual advantages. They would prefer to pay higher rates in order to stick to the solidarity principle because the social equality and a fair access to the health care system plays a more important role to participants. However, the personal dilemma between personal fairness (I care for my health actively and I do not want to pay for someone who is living very unhealthy) and solidarity (I care for older, weaker and ill people by paying higher rates) is still present.

I believe in the solidary principle. I think a society can only work if the strong support the weaker people. That is my strongest believe. If the is somebody in a society who is not able to restrain, than he or she is weak and then there are stronger souls who will take the responsibility. […]." (P11, 43, non-user).

" For me personally, I would take improvements but the solidary principle must remain as a fair solid base in the system. Otherwise it won't work out." (P4, 43, user).

***Proposition 7:** Insurances offering individual rates based on the data of the fitness tracker, force user into a moral dilemma as the solidary principle (the strong support the weaker) can no longer work out.*

4 Initial Conclusion and next Steps

Overall, user of fitness trackers appreciate insurance companies' reward offers, based on their preventive measures but still have concerns about information privacy and violation of usage purpose for the collected information. Fitness trackers motivate individuals to change their attitude to have a healthy lifestyle through physical activity. However, sharing individuals' personal information is a very sensitive topic to individuals. Individuals in our context seem to be very conservative, regarding disclosure of personal information, but the results of this study show that the threshold where individuals disclose their personal information to insurance companies, depends on the value of the reward the individuals receive. One contradictory result of this study is that individuals claiming to demand full control over their personal information and to be informed on every possible usage of their personal data, but are not are inclined to read the provided privacy policies or to review usage restrictions during mobile app installation on their devices. This is the complete opposite of the above-named individuals' demands for insurance companies' openness on information collection, usage, and disclosure. One explanation for that behaviour might be the intransparent, complex, and large amount of vendors' privacy policies. Clarification of insurance companies' and vendors purpose of information use may change individuals' intention to read vendors' privacy policies and empower individuals to take informed decisions regarding the protection of their own privacy (De Mooy and Yuen 2017). Nevertheless, individuals expect a positive influence of fitness trackers on their behaviour intention regarding physical exercises and support insurance companies' initiatives on reward programs in return for individuals' preventive actions. Although insurance companies are able to use fitness trackers to assess individuals' physical activity and to adapt insurance premiums according to individuals' intention to conduct preventive actions, most of the survey participants refuse these type of premium calculations in favour of the principle of solidarity. The health care system intends to distribute the health care costs to all health care system participants equally, and hence, all citizens – regardless of extant diseases or other diminishing factors causing additional costs – are obliged to pay the same premium. The results of the study show that study participants rather pay a higher premium instead of contributing to injustice or inequality at both, the health care system and social composition.

As this paper is work in progress, our next step will be to develop a research model based on the qualitative findings and derive hypotheses regarding individual perception and adoption of smart wearables. We could use the propositions from the qualitative study to set up a structural equation model that not only includes these propositions but also possible moderators and context factors (compulsory usage, length of usage, age, gender, user- non-user, moral dilemma). We will validate the findings in a large scale quantitative survey. All results will be available at the time of the conference.

Participant Number	Classifica-tion	Used Device	Sex	Age	Education	Job	Fitness Conditions	Technical Affinity	Knowledge about Data Security	Data Sensitivity at FB	Progress Important	On Social Media
P1	User	Samsung Gear Fit	Female	25	High school, Traineeship as Children Nurse	Full time job	Very sporty. 4-5 times per week	medium	no	high	high	yes
P3	User	Apple Watch	Male	49	High School, Traineeship IT	Full time job, IT Consultant	Very sporty bicycle and diving 2-3 times per week	high	yes	low	moderate	yes
P4	User	Unknown brand & Garmin Vivo Fit	Female	43	High School, Study of Law	Full time job, Patent Consultant	Sporty 2-3 times per week fitness workout at home, 2-3 times per week bicycle	medium	yes	medium	high	yes
P5	User	Fitbit HR & Smart Watch	Male	34	High School, Study of Engineer-ing	Full time job, Project Engineer	very sporty, 4-5 times per week, fitness center, outdoor, Judo	high	No	high	high	yes
P6	User	Fitbit HR	Female	30	High School, Study of Economics	Full time job, Business Analytics	very sporty, 4-5 times per week, fitness center, outdoor	medium	yes	high	high	yes
P7	User	Fitbit HR	Female	25	High School, Study of Business	Full time job, Junior Consultant	medium sporty, 2-4 times per week or less	medium	no	high	less	yes
P12	User	Smart Watch	Male	32	Traineeship	Trained Retail Salesman	less sporty, 1-2 times per week, often no fitness at all	medium	no	high	low	yes
P13	User	Fitbit HR	Female	26	High School, Study of Business	Student	less sporty. 1-2 times per week, often no fitness at all	medium	no	high	moderate	yes
P14	User	Fitbit HR & Fitbit One	Female	27	Middle School Traineeship as Optician	Full time job, optician	less sporty, 2-3 times per week or less	low	no	high	high	yes
P15	User	Apple Watch	Male	30	Full time job, Research Assistant	Full time job, Research Assistant	medium sporty, 2-3 times per week or bicycle	high	yes	high	low	yes
P2	Non-User	-	Male	52	High school, Study of Physics and Law	Full time job, Patent consultant	not sporty now, but very sporty earlier	high	yes	high	low	no
P8	Non-User	-	Female	22	High School, Study of Math and German Language	Student	very sporty. 4-5 times per week, fitness center, outdoor	medium	no	medium	high	yes
P9	Non-User	-	Male	39	High School, Study of Business	Full time job. Patent consultant	medium sporty 2-4 times per week or less	high	yes	high	moderate	no
P10	Non-User	-	Female	26	High School. Study Economics	Student	less sporty. 1-2 per week, often no fitness at all	low	yes	medium	low	yes
P11	Non-User	-	Male	43	High School, Study Law	Full time job. Patent consultant	medium sporty, 2-3 times per week outdoor	medium	yes	high	low	yes
P16	Expert	-	Male	30	High School, Study Computer Science	Research in Field ot Data Privacy	medium sporty, 2-3 times per week outdoor and fitness center	high	yes	high	moderate	yes
P17	Expert	Polar	Male	47	High School, Study Economics	Communication Expert Health	very sporty, 4-5 times per week, fitness center, outdoor	high	yes	medium	high	yes
P18	Expert	-	Male	45	High School	Insurance A	medium sporty, 2-3 times per week outdoor and fitness center	low	yes	high	low	no
P19	Expert	-	Male	50	Midlel School	Insurance B	less sporty, 2-3 times per week or less	low	no	high	low	no
P20	Expert	-	Female	28	Middle School	Insurance A	sporty 2-3 times per week fitness	medium	yes	low	high	yes
P21	Expert	Apple Watch	Male	42	High School	Insurance A	medium sporty 2-4 times per week or less	high	yes	moderate	high	no

Table 1. Overview of Study Participants and Characteristics.

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