

Emerging Personalization Elements in Health Service Delivery: A Case Study in the Finnish Primary Healthcare

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ABSTRACT

Healthcare emphasizes the importance to treat each healthcare user as a unique individual. This paper reports a case study, where we asked healthcare professionals to rationalize their work practices and the role of information technology (IT) once they meet with a healthcare user seeking for help. In the interviews with the healthcare professionals, aspects of personalization elements emerged without being prompted. We analyzed these emerging elements and categorized them thematically to provide insights to the technology-driven field of personalization with a service-level perspective. Our results provide understanding that can be used in the design of IT solutions that can support personalization of services in healthcare.

CCS CONCEPTS

• Human-centered computing → User studies

KEYWORDS

Personalization, Healthcare, Service Design, Case Study

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1 Introduction

Personalization is an integral part of healthcare. Each healthcare user is a unique person whose characteristics, medical condition and personal preferences can drastically vary [5], and who is likely to expect to be treated as individuals [20]. The diversity of healthcare users highlights the importance of personalization in the health service delivery.

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Health services are often delivered in close interaction between the stakeholders, the healthcare professional and the healthcare user who is seeking for help [5]. Both these stakeholders can use IT to support the service delivery process [35]. IT can support the process in many ways. Electronic health records (EHR) can capture, store and process the healthcare user data [11]; different technologies can offer automatic healthcare recommendations [27]; and data visualization support (e.g. graphs and color codes of the healthcare user data) [16]. IT can also provide a general communication support for the stakeholders [17,22]. In this sense, healthcare is widely integrated to different technologies that vary from EHR and different standardized healthcare systems to third-party healthcare technologies that can be used in the health service delivery. Collectively, these technologies can act as a great facilitator for personalization of services in healthcare.

Personalization in healthcare follows the idea that the individual healthcare user may have varying medical conditions, but also personal preferences that need to be considered in the health service delivery [5,20]. User-related data, such as individual characteristics, motivation levels, and medical history can be extracted from various data sources [9,11] and the data can be complemented with other context-dependent information, such as location-based and weather-based information. For example, personalization technologies such as recommender systems can automatically collect data about the healthcare user and his/her context and use these data sources to provide personalized recommendations [24,32]. IT solutions can also provide different types of support for the stakeholders, the healthcare professional and the healthcare user to be used in making personalization related decisions in healthcare [16,17,19]. Recently, some authors have suggested that personalization could be considered as a form of empowerment, where the healthcare professional can support the healthcare user to realize what really matters to them [19]. In this manner, the concept of service design integrates the possibilities and means to perform a service while having the stakeholders, context and other service development challenges at its heart [6]. Some work has been done regarding personalization frameworks for service levels in healthcare [16], but these studies are scarce.

As part of a project that took place in Finland to study the perspectives of healthcare professionals on the design of health behavioral change supportive technologies, a series of qualitative

studies were conducted [22]. The interviews centered on the design of health services for behavioral change and the combination of social environment and individual user preferences. During the study, aspects of personalization elements emerged without being prompted and have now been analyzed to produce further insights. The present paper presents and categorizes these elements to provide understanding to the technology-driven field of personalization with a service level perspective [3,12].

2 Related Work

2.1 What is Personalization?

Personalization is an interdisciplinary concept that has its background in business and marketing [21,32]. Service providers, such as marketers have used personalization to interact with their customers individually and to produce and deliver personalized products and services to their customers [32]. Along with the rapid development of technologies such as World Wide Web (WWW), IT soon became the main enabler of personalization [21,31]. In contrast to the human actor, IT as a powerful tool was soon able to collect, store and process data for personalization and to filter and deliver personalized services more effectively [10].

Personalization is often designed and implemented to different technologies by using two different personalization approaches. First approach emphasizes the role of the service provider/system in performing personalization. As an example, IT solutions can, follow the user's online behavior implicitly (e.g. by automatically following user behavior, like clicks on a website) and provide personalization for the user without actively involving the user in the personalization process [10,24]. Second personalization approach emphasizes the role of the user in performing personalization. Following this approach, the user is explicitly allowed to choose from certain options that have been set by the service provider [7]. The distinction between performing personalization for the user or by the user [21] highlights the two main personalization approaches. Either personalization is done automatically for the user by the service provider or system (System/Service Provider), or the user is the one that actively performs personalization (user personalizes) as described in Table 1.

System/Service provider personalizes	User personalizes	Reference
System-driven	User-driven	[19]
System-initiated	User-initiated/customer-initiated	[18,30,31]
Implicit	Explicit	[10]

Personalization	Customization	[21]
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Table 1. Two main personalization approaches in IT

System-driven versus user-driven [19] and system-initiated versus user/customer-initiated [18,30,31] are both referring to the distinction between the two main approaches where personalization is performed by the system/ service provider or by the user. Implicit and explicit [10] refer to performing personalization without involving the user actively to the personalization process (implicit) or allowing the user to be active in contributing to personalization (explicit). In broader sense, this distinction is also described using the broader concepts personalization versus customization [21]. Following this distinction, personalization is takes place once personalization is targeted for the user, whereas in customization user is the one actively performing personalization [21]. These two approaches are widely used in conceptualizing personalization and in the design and implementation of technologies that can support personalization [10]. However, these approaches may not be adequate to consider personalization in the level of a service.

2.2 Technology-Supported Health Services

Health services alike any other services are intangible by their nature and are delivered in collaboration between the stakeholders, such as the healthcare professional and the healthcare user [3,5]. Service economy as a whole is one of the fastest growing economies in the world and novel services that integrate with technologies are increasingly delivered across the society [34]. Service design integrates the possibilities and means to perform a service while considering the stakeholders and the context where the service is delivered [6]. This means, that service design considers the stakeholders who can use different IT solutions to support the service delivery process [12], but recently scholars have suggested that the viewpoints of the relevant stakeholders are often not considered in the design of novel healthcare technologies [13].

Healthcare is increasingly using different IT solutions. Collectively, these IT solutions can capture, store, process and communicate timely information for the stakeholders to make personalization related decisions regarding health service delivery [11,27]. In addition to EHR and other IT solutions that are widely used in healthcare, there are more and more third-party IT solutions on the market that can support the health service delivery for different health conditions. These technologies can broadly be categorized to technologies for health prevention and promotion (which includes primary care [38], and technologies for disease management [23]). These technologies can vary from applications that act as a mobile coach for menopause [29] or provide support for sedentary workers to organize walking meetings [1] to technologies that target more severe chronic conditions [13].

2.3 Primary Healthcare and Behavior Change

Primary healthcare is the part of the healthcare system that focuses on health prevention and promotion. Health promotion and prevention include the supportive services to change one's behavior

[38], for example to quit smoking. According to World Health Organizations (WHO) smoking, physical in-activity and unhealthy diet along with harmful use of alcohol are the four leading behavioral risk factors [37]. Changing behavior is described as a process [14,26,36] in which the person passes through different psychological and physical stages with a big risk of relapse [14]. As such, people who desire to change may need more than one session with the healthcare professional to achieve their goal.

Even the healthcare users may have similar types of goals regarding to e.g. nutrition in relation to weight loss or smoking cessation, the varying medical conditions, social environment and personal preferences of each healthcare user can make the process different for each user. In behavior change, many theories take into account the sociocultural environment of the people wishing to change [2,4,8,14]. This makes behavior change a different experience for each individual as the combination of the personal life and social environment are unique.

3 Methods

This section presents the research setting, the primary healthcare, and the data collection and analysis methods. A qualitative approach was chosen as it allows us to understand a phenomenon from the perspective of people experiencing it [33]. We conducted semi-structured interviews with healthcare professionals who were working in Finnish primary healthcare. Healthcare professionals were considered as the key informants [39] to describe and rationalize the role of technology once they meet with a healthcare user who is seeking for help.

3.1 Research Setting

The case took place in the Finnish primary healthcare, both private and public. By primary healthcare, we mean the part of the healthcare system that focuses on health prevention and management of chronic condition rather than treating specific diseases [38]. The participants were a convenience sample, gathered through the authors' connections in the Oulu University Hospital and private settings. A total of 6 individuals were interviewed: 1 nurse, 2 medical doctors (MD), and 3 nutritionists. All of whom had over ten years of work experience with healthcare users and in different levels of primary healthcare. The participants, their occupation and description are shown in Table 2.

#	Occupation	Description
Healthcare professional 1	MD	Pulmonary Physician
Healthcare professional 2	Nurse	Specialized in heart diseases & surgery. Additional education in psychology & public health
Healthcare professional 3	MD	Head of a primary care unit. Education focused on cardiovascular diseases.

		Extensive experience on primary healthcare and as head of the MDs
Healthcare professional 4	Nutritionist	Coordinator of health promotion in higher levels of healthcare Education in nutrition & health promotion
Healthcare professional 5	Nutritionist	Registered dietitian Education in nutrition & diet
Healthcare professional 6	Nutritionist	Education in nutrition & health

Table 2. Description of the study participants

The first participant was specialized in lung conditions as pulmonary physician. The second participant was a nurse who had high administrative position in addition to her work as a nurse. The third and fourth participants were in high level of the primary care managing healthcare in a big area and had experience with healthcare users. The fifth and sixth participants were nutritionists who worked with the healthcare users.

3.2 Data Collection and Analysis

The qualitative method used for the data collection was semi-structured interview [25] (average 60min). The guide of the interview had three main areas: participants background, work practices, and the use of IT. IT questions explored participants' views on commercially available technologies and potential needs for technology-enabled health services. The interview guide had no mention of personalization elements. A more comprehensive description is available in [22].

The data was analyzed with thematic analysis, a qualitative descriptive approach used to identify, analyze and report themes within the data [33]. All interviews were audio recorded and transcribed afterwards. In the analysis process, authors first familiarized with the data independently to form an understanding of the initial themes. These high-level themes were extensively discussed and refined among authors to create the final categories. As a result of the inductive and iterative analysis process, the emerging personalization elements are described and categorized next.

4 Findings

This section presents the results of our thematic analysis process that form the main findings of this study. Personalization elements that emerged in the interviews were categorized inductively under three categories: Enablers, Service Delivery and User Characteristics. Our results, these three categories and their sub-categories are illustrated in Figure 1 and described in the following sections.

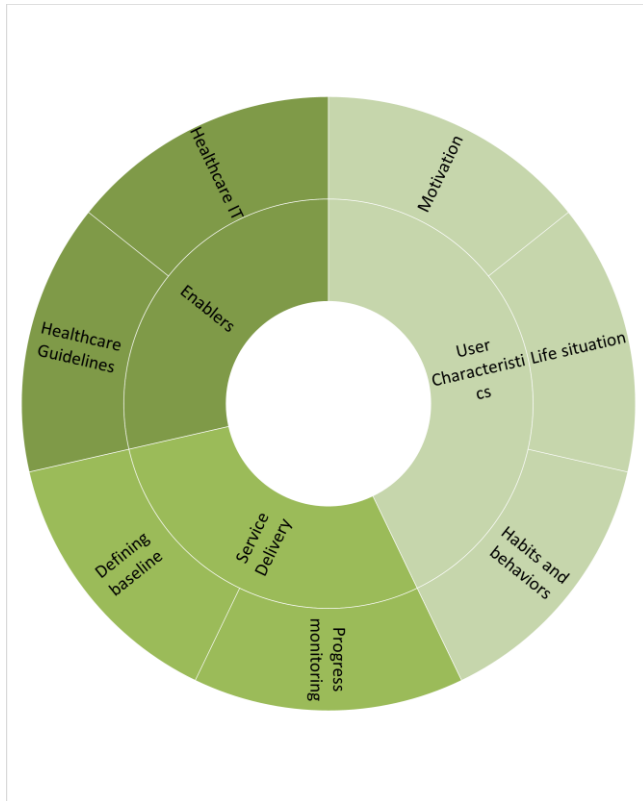


Figure 1: Emerging personalization elements in the interviews

4.1 Enablers

Enablers for personalization refers to predetermined regulations and medical technologies set that have an impact on personalization of health services. In the setting of the case study we can see two types of personalization enablers. First, the healthcare professionals used different IT-solutions offered by the Finnish primary healthcare system, such as EHR and other standardized systems. This category is referred as healthcare IT. Secondly, healthcare professionals were working based on established guidelines and regulations on how to treat a healthcare user that is referred as healthcare guidelines.

4.1.1 Healthcare IT. Within the interviews, healthcare professionals referred to the personalization enablers implicitly as the support systems and restrictions that were placed on their daily work. This includes the IT solutions, such as EHR that aggregates the healthcare user data. This healthcare user data, such as medical history is aggregated automatically and is available for the healthcare professional as s/he meets the healthcare user at the appointment. This was illustrated by a healthcare professional:

“Usually, I do not have much information about the healthcare user (before the first consultancy). I know if they are male or female, their age, if they are young or old. Also, the Body Mass Index (BMI).” (Healthcare professional 5).

Healthcare IT and other standardized systems represent the tools that were set to support the healthcare professional in the service delivery. Enablers for personalization means that these IT solutions were set for the healthcare professionals and they supported and enabled them to deliver health services in personalized manner.

4.1.2 Healthcare Guidelines. The second form of personalization enablers were the different guidelines and regulations on how to treat a healthcare user who is seeking for help. Healthcare guidelines displayed the best care practices and the care procedure on how to treat a healthcare user in a certain condition. The role of healthcare guidelines as part of health service delivery was illustrated by the one healthcare professional:

“We have different guidelines for health promotion. For example, how to treat obesity and guidelines to support exercising. Then there are of course guidelines for how to treat different diseases.” (Healthcare professional 4).

Whether the healthcare user’s goal was to lose some weight or to quit smoking, the healthcare guidelines set the premises for the health service delivery (i.e. the care procedure and types of health services to treat obesity). These guidelines were followed by the healthcare professionals and they supported them in delivering health services according to the best care procedure.

4.2 Service Delivery

Service delivery refers to the use of different IT solutions and the IT enabled data that can be interpreted and used in making personalization related decisions. Here, we categorized the service delivery under two sub-categories: Defining baseline and progress monitoring. First category refers to the IT enabled data that supported the healthcare professional in understanding the healthcare user’s condition at first and how far the healthcare user’s behavior potentially was from the optimal behavior. Secondly, progress monitoring refers to the use of different IT solutions to support the evaluation of the care progress, e.g. to measure an impact of the intervention.

4.2.1 Defining Baseline. Healthcare professionals commonly used different types of IT solutions to represent illustrative cases for the healthcare user. For example, nutritionists may use different data sheets and pictures to illustrate the optimal behavior. The illustrated data were then discussed and sometimes compared with the data from the healthcare user to form a baseline of the healthcare user’s situation.

“Taking a picture of the meal helps the healthcare user to estimate the portion size and to see if there are enough vegetables in the portion. This picture can also be used in the discussions (between the healthcare professional and the healthcare user).” (Healthcare professional 5).

The idea in defining the baseline was to find out what is the actual behavior of the healthcare user and how far it is from the optimal behavior that was illustrated. Different data sources, varying from automatically generated IT data, such as EHR reports compared with the discussion at the appointment helped both the healthcare professional and the healthcare user in understanding the condition

and in defining the baseline. The defined baseline may, for example mean for the healthcare user to eat less cakes and pastries, as it can be more realistic start for eating healthier than changing the whole diet at once. Similarly, the comparison of data sets to set the baseline (such as the picture of the optimal meal versus actual meal of the healthcare user) may act as a triggering point for the discussion. It may be that the healthcare user cannot invest for healthy portions and therefore, it may not be realistic to expect him/her to be following a certain type of a diet. Therefore, the compilation of IT enabled data and discussion helps in defining the baseline for each healthcare user.

4.2.2 Progress monitoring. Healthcare professionals also used different forms of IT solutions to monitor the progress of the healthcare user. This was seen especially in the case of keeping motivated, which in behavior change can be challenging. Healthcare professionals reported that many times, there may be relapses, but in such a case, constructive discussion between healthcare professionals and users with the supportive data enabled by IT were considered to be helpful. Healthcare professionals stated that by focusing the discussion on why the plan was not followed accordingly instead of criticizing the actions supported the healthcare user in continuing the health behavioral change process. Typically, different forms of reports (such as nutrition or training diaries, both digital and paper-based) were used to support the conversation:

“I ask the healthcare user to write a diary for themselves, not me. I ask them to, for example, to consider what the healthcare user has been eating, thinking while eating, their mood and stress level, but also notes about how the day has been.” (Healthcare professional 2).

“I would be asking you about what you are eating or, maybe before you came to me, you have filled a diary, food diary that I can see what you eat.” (Healthcare professional 6).

The IT enabled data helped the healthcare professional in monitoring the progress and in evaluating the impact of the intervention. Monitoring each healthcare user and reacting to potential changes and anomalies in the data (anomaly may be related to a drastic change in the data) may lead to consideration whether the defined baseline needs to be adjusted. For example, the healthcare user may have been asked to keep a food diary, but after some time the food diary reveals that the healthcare user’s eating habits have changed. With the supportive data aggregated, the healthcare professional may ask the healthcare user to come for an appointment in order to discuss whether there are challenges or needs to adjust the defined baseline to match with the healthcare user’s current condition better.

4.3 User Characteristics

As third category, healthcare user characteristics refer to IT supported personalization between the stakeholders, the healthcare professional and the healthcare user. Healthcare user characteristics are mainly generated verbally through the process of the healthcare user interview and consultation but counted with the support from

various technologies like the EHR. In this study, we categorized healthcare user characteristics under three sub-categories: habits and behaviors, life situation and motivation.

4.3.1 Habits and Behaviors. Habits and behaviors, whether related to eating, smoking, or exercising habits were discussed to provide information about the healthcare user’s current and past behavior for personalization. Understanding these habits and behaviors were important information for the healthcare professional to treat the healthcare user individually. That was illustrated in the case of smoking cessation, where the health services could vary for healthcare users whose smoking is related to habit, comparing to healthcare users who suffer from nicotine addiction.

This dichotomy between nicotine addiction and habit was often unclear, but that if smoking was mainly, for example, related to drinking alcohol, it may indicate towards habit, but if smoking starts immediately at the morning, it was more likely to be nicotine addiction. Understanding this dichotomy was important information for the healthcare professional as in the case of nicotine addiction, healthcare professionals preferred health services that are targeted at nicotine addiction, such as nicotine gum and patches, whereas in the case of habit, healthcare professionals emphasized the supportive services (such as encouraging talks and guidance) to change the habit:

“Healthcare users often say that it (smoking) is not the nicotine, but habit. Once I ask when they smoke the first cigarette, and if it is within 30 minutes [after they woke up], it is certainly nicotine. If it is at lunchtime, it may not be nicotine, but habit. (Healthcare professional 1).

In addition to smoking, nutrition related habits were equally discussed once healthcare users had nutritional problems. Healthcare professionals stated the importance to detect potential eating disorders from the nutritional problems, like unhealthy eating. Some nutritional habits and behaviors may have been learned from childhood and these unhealthy habits have remained since. Understanding this helps the healthcare professional in planning the health services and in finding the common agreement with the healthcare user:

“After I have met you and examined you, we make a plan about what kind of diet you should have or whether you should just continue eating your normal food, but maybe just half amount of it.” (Healthcare professional 2).

Habits and behaviors were often described by the healthcare users, but IT and other artefacts were used to support the reflection. Different types of applications and paper leaflets can provide supportive data for the discussion.

4.3.2 Life Situation. Healthcare user needs in personalization were also discussed to understand the context of the healthcare user, his/her life situation, and the social surroundings (family members and friends). It may be that the healthcare user is going through an exhausting time period, which is not optimal for drastic behavioral changes. This is illustrated by a healthcare professional:

“At first, we should discuss about your daily habits, and your situation of life and whether it is a right time for you to start losing weight. If you are, for example, in the middle of graduating and very busy and stressed, it may not be the best time to start losing kilos.” (Healthcare professional 2).

Healthcare user’s life situation also included the social surroundings, such as family members and friends who may influence and be influenced by the potential behavioral changes. For example, changes in nutrition, will have an impact on the family members who are influenced by the new dietary restrictions and may resent them. As social surroundings may vary between people, each person needs to be considered individually. diet at once. Two different healthcare users may have similar goals, such as to lose a few kilos, but the varying life situation and social surroundings can make the behavior change process, such as weight loss process drastically different.

4.3.3 Motivation. As the third type of the healthcare user needs in personalization healthcare professionals reported, that the healthcare users’ motivations typically vary. For some, the motivation can be related to an outcome, such as to lose a few kilos or to quit smoking, but the change can also be related to be healthier. However, in some cases the motivation to change was unclear at the appointment. Unclear motivation appeared in the context of smoking cessation, where the social circle of the healthcare user may have put pressure for the healthcare user to quit smoking, but where the healthcare user him/herself may be demotivated to do so:

“Mostly I want to know if there is any motivation for the cessation. Sometimes there are men who come here and tell that their wife told them to quit smoking, but actually they may not have any motivation to quit.” (Healthcare professional 1).

Finding out such a (de)motivation helps healthcare professional to understand the case as it may be challenging, if not impossible to try to change behavior of a person who is demotivated to change. However, many times healthcare users were motivated to change, but keeping the motivation was challenging. One healthcare professional illustrates this with an example:

“Most of the healthcare users try to meet the goals that have been set, but its challenging at times. For example, the goal of one healthcare user was to eat less cakes and pastries, but as the healthcare user came to the appointment, birthday party and Mother’s Day had prevented the healthcare user to meet the goal set. For me, this is fine, and I think it is always important to discuss the goals and reasons why the goal was not reached.” (Healthcare professional 5).

Keeping motivation can be challenging. In the case of potential relapses, healthcare professionals were eager to discuss about the reasons behind relapses in constructive manner. For example, the discussion on why the goal was not reached was not about criticizing but about supporting the healthcare user to carry on the behavior change process.

5 Discussion

The present paper analyzes the work practices of healthcare professionals and how personalization elements spontaneously emerged from discussions with them. The main contribution of the present study is the analysis of the different types of personalization elements in health services, which are generated within interaction with the healthcare system. The findings of this work are categorized thematically under three main categories: Enablers, Service delivery and User characteristics.

Service design is not a common practice in healthcare [15], in which quantitative approaches with statistically significant outcomes are valued more than qualitative methods [28]. In this way, the present work tries to address an important gap in the literature. By understanding the viewpoints of different stakeholders, healthcare professionals and healthcare users regarding personalization helps us in designing better IT solutions that can support personalization of health services. Different types of personalization technologies, such as recommender systems are powerful tools that can provide personalized recommendations from the available options [32], but they may not be sufficient in the case of healthcare. The support of human actors like healthcare professionals for decision-making may be needed [7,17,19], but the healthcare users may also have their own preferences on how they would like to receive a health service [5].

With the present study, we explored the practices of the healthcare professionals once they met with a healthcare user seeking for help. The study revealed personalization elements that the healthcare professionals initiated further. Based on the results, we suggest that the service personalization process is complex and involves different stakeholders. Personalization of services intertwines the IT solutions, guidelines and multi-stakeholder interaction between the stakeholders. First, enablers, IT elements that can aggregate the healthcare user data automatically and guidelines that can display the best care practices for the healthcare professional [Healthcare IT, Healthcare Guidelines] form the basis for personalization in the health service delivery. Secondly, the healthcare professional as a medical expert can use different IT solutions to understand the healthcare user’s situation better and to evaluate the care progress and impact of the interventions [Defining Baseline, Progress Monitoring]. Thirdly, personalization includes the healthcare user characteristics that are aggregated verbally in the multi-stakeholder interaction, which is supported by IT [Habits & Behaviors, Life Situation, Motivation].

Here, we suggest that all these elements need to be considered in the design of personalization of services. Traditional personalization approaches, system/service provider personalizes, or user personalizes [10,18,31] can help in the design and implementation of technologies that can support personalization, but in the service delivery there are needs to understand the perspectives and expectations of the different stakeholders [13] who are using IT as part of the service delivery. More studies are warranted to analyze personalization in the service level, e.g. in

medical care pathways, in order to explore ways to design future IT solutions that can support personalization.

5.1 Limitations

This study has limitations that are inherent to qualitative research methods. A potential limitation of this study is the recruitment method as participants responded to a sample of convenience. Further, the study was conducted in a highly developed country such as Finland, levels of education, economic status, etc. will surely be different in a sample from a different center in another country. Healthcare providers had different backgrounds, so the resulting views represent an interdisciplinary perspective and not those of a single discipline in particular. Cultural differences and differences between healthcare systems are beyond the scope of this study. Finally, the relatively small number of interviewees can also be considered as a limitation, but they were chosen to be key informants and thus able to represent individuals from a primary healthcare setting.

6 Conclusion

Here we reported a case study, where we analyzed healthcare professionals' work practices and the role of IT once they meet with a healthcare user who is seeking for help. During the study and without being prompted, personalization elements emerged in the interviews and were analyzed further. We categorized these emerging personalization elements thematically to provide understanding on a service-level perspective for personalization. Our findings provide understanding that can be used in designing better IT solutions that can support personalization of health services.

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