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IDENTIFYING PERSONALIZATION IN A CARE PATHWAY: A SINGLE-CASE STUDY OF A FINNISH HEALTHCARE SERVICE PROVIDER

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IDENTIFYING PERSONALIZATION IN A CARE PATHWAY: A SINGLE-CASE STUDY OF A FINNISH HEALTHCARE SERVICE PROVIDER

Research paper

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Abstract

Personalization has been extensively studied by scholars both in information systems and business. With a strong technological emphasis in mind, personalization techniques are widely applied in web context for recommending appropriate products and services for users. Typically, personalization has remained marketer-oriented, where service provider makes the decision of suitable products or services that are recommended for users. That viewpoint follows the goods-dominant (G-D) logic principles, where service providers use personalization to deliver services for the customer. In this paper, we examine personalization of entire service process, not only the technical interfaces used as service touchpoints. We focus our study on personalization in the healthcare service processes by using service-dominant (S-D) logic as our analytical lens. A case study was conducted by analyzing the depression care pathway of a Finnish healthcare service provider. As a result, we recognized different categories of service personalization, which were supported and mediated through information systems. We recognized three primary categories of personalization: coercive personalization, data display personalization, and collaborative personalization. In all these service personalization categories, information technology played a role, which could range from fully automated personalization to support provided for the physician and the healthcare user for collaborative decision making. The present results are well aligned with findings of other researchers on role of technology in personalization, and provide additional insight on role of information systems in service level personalization.

Keywords: Personalization, Service design, Healthcare service, Care pathway, Case study.

1 Introduction

Personalization has remained an interdisciplinary concept that denotes diverging meanings for different scholars (Fan and Poole, 2006). Personalization is primarily studied in the fields of information systems, computer science, and marketing (Kwon and Kim, 2012; Salonen and Karjaluoto, 2016); however the diversity of those fields, mixing technological solutions, and one-to-one marketing, have made the concept somewhat ambiguous (Sunikka and Bragge, 2008). According to Montgomery and Smith (2009) information technology (IT) is a primary enabler for delivering personalized services. Congruent to that idea, Sunikka and Bragge (2012) advocate that technological solutions are widely applied for personalizing services that fulfil users' needs. In addition to a strong technological emphasis, another focal characteristic for personalization is the heavy emphasis on service provider, who personalizes the services for the users (Montgomery and Smith, 2009). Decisions to personalize services are typically based on the data gathered from the user, who then further interacts with these personalized services in the form of recommendations, for example (Adomavicius and Tuzhilin, 2005; Krishnaraju, Mathew and Sugumaran, 2016). In other words, service providers analyze user preferences based on the prior information gathered, and utilize technological solutions to personalize their services for those preferences.

Over-emphasis on technological solutions solely for recommending items based on user preferences has been criticized in the personalization literature. Personalization could be understood as a broader concept used to individualize services in domains other than the web (Schubert, Uwe and Risch, 2006). One domain that underlines the importance for personalization is healthcare, as personalization is pivotal when delivering e-health solutions (Grasso and Paris, 2011), and healthcare services always need to be personalized for individual conditions. In this study, we examine personalization in the context of healthcare services, and look at entire service pathways where several information systems support the delivery of the service. In order to understand the complexity of service characteristics, we applied the service-dominant (S-D) logic viewpoint from Vargo and Lusch (2004), where the authors describe the transformation from goods-dominant (G-D) logic to S-D. Instead of providing tangible goods, where value is bound to the concrete product, services are intangible by their nature and are occasionally supported by tangible goods. Furthermore, the value is bound to knowledge and skills that are delivered in exchanges between service provider and customer. Traditional service concept shares commonalities with healthcare services as both are intangible by their nature, whereas healthcare services have their own characteristics that are predominantly related to temporary impaired health conditions of a healthcare user, and the knowledge disadvantage between the healthcare user and the healthcare service provider when delivering the services (Berry and Bendapudi, 2007).

In healthcare services, personalization is provided as a premise as individual conditions and needs vary between healthcare users (Berry and Bendapudi, 2007). As physicians are specialists in the healthcare domain, the services are typically personalized based on their professional knowledge for individual healthcare users, with support from IT and other tangible technology (such as laboratory measurement devices). In other words, IT is used as an artefact to provide the right information for the right person, in the right format (von Thiele Schwarz, 2016). In our study, we aimed to examine the ways in which IT supports the personalization of service delivery with the specific focus of our research on the question: *How can information technology support personalization of healthcare services?* To answer to this question, we conducted a case study with a Finnish Healthcare service provider. Our research contributes to personalization literature by focusing on the role of IT in personalization of the entire service pathways, not only the technical components used in the service. The results illustrate that personalization intertwines automatized support from IT with a more collaborative nature where service personalization occurs in co-creation and interaction between actors. These dimensions complement each other, as service delivery requires collaborative activity between all actors, whereas IT provides the mainstay for service delivery.

The rest of this paper discusses the related work in personalization and services (Section 2). Section 3 describes the case organization, focus, and methods of this study. Section 4 presents the findings of this study, and personalization types in a care pathway. Section 5 presents the discussion, and conclusions are drawn in Section 6.

2 Personalization and Services

For over a decade, personalization has raised interest in different research disciplines (Fan and Poole, 2006; Kwon and Kim, 2012; Salonen and Karjaluoto, 2016). Mostly, personalization research has been of interest for the disciplines of information systems and marketing, the former focusing on technological aspects and the latter covering targeted and one-to-one marketing. In a study by Sunikka and Bragge (2012), the examination of personalization was conducted through the aforementioned fields and determined that personalization has a strong emphasis on technology (especially in the era of the internet) where the aim of personalization has remained understanding users' needs and personalizing the offerings based on those individual needs (Sunikka and Bragge, 2012). Salonen and Karjaluoto (2016) had congruent findings in their literature review, examining personalization in the web context. Personalization requires a combination of understanding customer needs and using technological methods to personalize the services for those needs (Kaptein and Parviainen, 2015). Due to its interactive characteristics, the web has remained the most fertile platform for personalizing the services when

compared to more traditional media, such as radio, television, or newspapers (Schubert et al., 2006). Web platforms provide unique opportunities for delivering appropriate services to the right person at the right time, and companies have utilized this technology broadly for personalizing their services for customers (Ho, 2006). Personalization of services can improve customer satisfaction and loyalty for retaining customers (Ball, Coelho and Vilares, 2006), however personalization has to be done carefully, as misusing personalization technologies and providing inaccurate personalization is likely to provide opposite results (Shen and Ball, 2009) or no impact on the business outcomes (Kaptein and Parviainen, 2015).

Among scholars, personalization is often used interchangeably with another closely related concept, customization that stems from the manufacturing industry (Sunikka and Bragge, 2008). Both aforementioned concepts are forms of one-to-one marketing. Personalization is service provider-led, where the service provider decides the suitable services for an individual customer based on the prior information. On the contrary, customization is user-led, where a customer proactively “personalizes” the service elements from the marketing mix to match customer’s own preferences (Arora et al., 2008; Kwon and Kim, 2012; Salonen and Karjaluoto, 2016). In this study, we adopt the viewpoint from Sunikka and Bragge (2008), who define personalization as an umbrella term, including other closely related concepts, like customization.

In this study, we applied the comprehensive classification scheme for personalization from Fan and Poole (2006) to understand the concept in detail. The authors define personalization through three primary dimensions: 1) the aspect of the system that is manipulated to provide personalization (what to personalize) that is categorized into four sub-dimensions: content, user interface, channel, and functionality. 2) The target of personalization (whom to personalize?) that can be either a specific individual or a particular category of users. 3) Who performs the personalization? This dimension refers to automatization levels of personalization and the data collection method for personalizing services. It has two sub-dimensions: implicit and explicit personalization. Implicit personalization is based on user behaviour, like usage of clickstream data, where the user does not knowingly participate in to the personalization process. In explicit personalization, the user is actively participating to the personalization process by providing their own interests and preferences. The original classification scheme (Fan and Poole, 2006) is revised by more recent personalization studies. Sunikka and Bragge (2008) suggest that the target of personalization should be replaced by more descriptive terms, like one-to-one for the individuated, and micro personalization for the categorical. Kwon and Kim (2012) see that third dimension, explicit and implicit personalization should be replaced with user-initiated and system-initiated personalization as system-initiated personalization does not always use implicit methods. In our study, we will use micro personalization and personalization for a particular user group interchangeably. We also use implicit and explicit personalization concepts as those are primarily related to data collection methods from users and the awareness level of users during that process.

Aforementioned implicit and explicit concepts are widely applied in companies for delivering personalized services and underline the service provider viewpoint, where companies decide the suitable marketing mixes for individual users (Adomavicius and Tuzhilin, 2005). Service provider-led principles have commonalities to G-D logic, where companies produce (create) value and customers consume (destroy) that value (Lusch and Vargo, 2014). Distinction between companies and customers has remained wide and companies focus on analyzing the needs of customers and respond to those needs with their own marketing offerings (Lusch and Vargo, 2014). However, transformation in marketing from G-D and tangible products, to S-D and intangible, where relationships and exchange processes have emphasized the concept of service as a unit of analysis (Vargo and Lusch, 2004). The authors define service as “the application of specialized competences (knowledge and skills) through deeds, processes, and performances for the benefit of another actor or the actor itself” (Vargo and Lusch, 2004). The fundamental purpose of an enterprise is to serve itself by serving others (Lusch and Vargo, 2014) and therefore, any act done intentionally for benefiting an actor can be considered as a service. In healthcare services, the shift from G-D to S-D can be illustrated with a healthcare example, where the primary purpose of a healthcare company is not to sell tangible goods for healthcare users, but

servicing the healthcare users' needs through service pathway collaboratively with by the healthcare user. This service can be supported by tangible goods, like monitors for self-measurements, and electronic health records.

3 Research Methods

A case study approach was selected for collecting evidence for the ways IT supports physicians in the healthcare service personalization process. In other words, our aim was to interpret and construct understanding of the situation where the phenomenon takes place (Klein and Myers, 1999). In this study, we examined healthcare service delivery through analysis of a depression care pathway of a Finnish occupational healthcare provider called Terveystalo. In this section, we present the case company, the examined care pathway, and the data collection and analysis methods.

3.1 The case company and its operations

Terveystalo is a Finnish healthcare service provider that started its operations in 2001 after a fusion of two Finnish healthcare service providers. Subsequently, after 130 small- and medium-sized enterprise acquisitions and two larger coalitions, the company has grown into one of the largest healthcare service providers in Finland. Currently, the company operates in over 70 localities, has 170 offices, 17 medical centres, and employs over 6,800 healthcare professionals - numbers which make the company the 15th largest employer in Finland. The company provides healthcare services for diverse customer segments, including the private sector, single individuals, insurance companies, public sector and organizations, with whom the company provides occupational healthcare services. Our case study was performed in the context of Terveystalo's occupational healthcare services. In occupational healthcare services, the company serves over 16,000 employers and around 500,000 employees from various industry levels, from small- and medium-sized enterprises to large enterprises, also covering the public administration and communities. The company places a strong emphasis on customer-orientation and delivery of personalized healthcare services for answering its customers' needs. In the meantime, the company invests heavily in research and development (R&D); in 2015, nearly 69 million euros were invested in developing healthcare services in Finland.

3.2 Depression care pathway

Care pathways (also known as a clinical pathway, care map or critical pathway) are longitudinal and multidisciplinary treatment plans that describe all desired diagnostic and treatment steps for ensuring coordination and continuity of care (De Bleser et al., 2006; Kinsman et al., 2010). Care pathways are typically static and used for documentation purposes among healthcare personnel (Gand and Schlieter, 2016). In other words, they display all available healthcare services, targeted for a certain disease.

Terveystalo has designed several care pathways for guiding the treatment of the most common and harmful diseases and disorders. In this study, our focus was in one care pathway of Terveystalo: the depression care pathway. The depression care pathway consists of four different phases and it is elaborated in collaboration with various healthcare professionals; occupational physicians, occupational nurses, occupational psychologists, and occupational physiotherapists. It is further used for assisting depression care, showing the responsible areas and available healthcare services in different phases of care. High-level depiction of four phases of depression care pathway are presented in Figure 1.

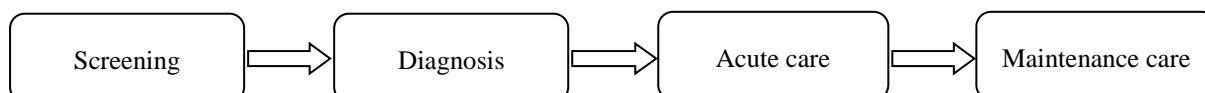


Figure 1. High level process diagram of care pathway phases

“Screening”: The first phase consists of the screening and recognition of potential risk factors that derive from healthcare user data with an aim on prevention. Screening is done automatically by IT and data is either provided, displayed or highlighted for physicians in various forms to interpret. As the data from healthcare users accumulates, physicians are informed by IT, once the data is abnormal, beyond the pre-set limits. Screening aims in prevention and rapid reaction and IT screens different types of healthcare user data, related to absences from work, previous or current depression symptoms, heavy usage of healthcare services, highly stressed or exhausted people, or people with a heavy usage of alcohol, for example. The screening phase is represented as its own step, but screening also occurs in the other phases of the care pathway as IT provides the mainstay for the actual service delivery. The first arrow (after “Screening”) indicates abnormal values that IT has highlighted for occupational physicians, who initiate the interpretation of the collected values.

“Diagnosis”: The second phase consists of the actual consultation between the physician and the healthcare user. During the consultation, the healthcare user’s current health state is evaluated and outcomes from the consultation, combined with the screened data IT has provided are taken into account when forming a diagnosis. The diagnosis actuates the care process and is always required for carrying out treatments. If depression is diagnosed, the care process starts with the settings of the depression care pathway. The second arrow (after “Diagnosis”) indicates a situation where depression diagnosis is formed and a healthcare user is moved to the “Acute care” phase to receive healthcare services.

“Acute care”: The third phase includes the available healthcare services and treatment steps for the first six months from formed diagnosis. The aim in acute care is to start delivering healthcare services that support healthcare users in their care process in an acute manner. In the depression care pathway, that care may consist of possible sick leave, group or individual therapy, medicine and other supportive functions, like web-based therapy or physical guidance that could support healthcare users in their care process. The primary focus is on evidence-based care and on using methods that are widely accepted and effective in depression treatments. The occupational physician is responsible for the overall care and IT supports that service delivery. This phase after the second arrow (“Acute care”) is triggered after six months of care have passed. The healthcare user is automatically moved to “Maintenance care” phase, based on the time period.

“Maintenance care”: The fourth phase covers the maintenance healthcare services that are available starting from six months after the diagnosis. The aim of the maintenance care phase is twofold, to deliver healthcare services that support healthcare users’ recuperation and to prevent the potential recurrence of depression disorder. Available healthcare services are overlapping with the services delivered in the acute care phase, but are also based on healthcare users’ situation and condition, where the focus shifts towards supportive care that expands to working conditions. In an ideal situation, the healthcare user would be able to return to work life and therefore healthcare services include the support for coping with the workload and for giving guidance related to conflict management at workplaces. Like in acute care, IT provides automatic screening for supporting occupational physicians in service delivery, but as the care proceeds the collaboration between healthcare service provider and the healthcare user is emphasized.

As it is not possible to measure ‘ending-time’ for depression, maintenance care does not have a direct ending phase. Occupational physicians are responsible for monitoring the healthcare user for the whole maintenance care phase and that monitoring occurs mainly through screening, provided by IT. Screening also continues years after depression symptoms, so that the potential recurrence of disorders are detected as rapidly as possible for delivering supportive treatments.

3.3 Data collection and analysis

Data collection occurred in three different phases and data was analyzed iteratively throughout the study using qualitative data analysis approach (Miles and Huberman, 1994). First, we conducted focus groups for getting an overview of the problem area. As a result of focus groups, we identified the unit

of analysis (the occupational health depression care pathway), and the company provided us with the care pathway documentation to be used in the document analysis process. The findings from the focus groups were used to formulate the themes for the semi-structured interviews (the second phase). Later, validating interviews (the third phase) were conducted for clarifying the findings from those semi-structured interviews. Interviews were done in Finnish and the quotes are our translations. Supportive documents of the care pathway are also written in Finnish.

Phase 1. Focus groups. Data collection started in February 2016 with two focus groups. The purpose of those focus groups was to form a comprehensive picture of the case and to determine the key people, requirements, and demands (for personalization in our case), and to choose the care pathway to be analyzed in our case study. Two researchers took part in these focus groups, one focusing on questions and another taking field notes. The occupational physician who had been designing the depression care pathway and another care pathway designer participated in both focus groups. Both focus groups lasted for 60 minutes and field notes were transcribed after focus groups for further analysis. Case documentation was also received after the first focus group and that documentation remained static throughout our study. Therefore, the output from the first data collection phase was a semi-structured interview template.

Phase 2. Semi-structured interviews. Two semi-structured interviews were conducted in June 2016 for providing more detailed information related to personalization in healthcare services and for validating our preliminary findings from the focus groups. During the interviews, we presented different types of IT supported personalization, based on focus groups and prior literature. These types were related to 1) strict restrictions, like personalization based on contractual situation or workplace conditions, 2) individual data, like personalization based on healthcare user's history or age, 3) co-creation, like personalization based on collaboration between actors or healthcare users' own preferences. From each of those personalization types, we inquired about the feasibility level, and the potential hindrances of each type of personalization.

Semi-structured interviews were open-ended by their nature and by adopting the conversational nature of interviews, occupational physicians presented their own insights related to the preliminary findings (Yin, 2003). Both of these interviews lasted around 90 minutes. One researcher took part in these interviews and the interviews were recorded. Before the interviews, physicians were asked to sign an informed consent letter giving their permission for their interviews to be recorded. Output from the second phase was the taxonomy of personalization types that was further validated in the validating interview phase (3).

Phase 3. The validating interview. One semi-structured interview, called the *validating interview* was conducted in November 2016 for validating our preliminary findings and personalization taxonomy. During the validating interview, an occupational physician who had been interviewed earlier in the year validated our findings and provided more details about issues that remained vague from semi-structured interviews. The validating interview lasted for 60 minutes. Therefore, our analyzed material consisted of:

- Focus group 1 – field notes – 2 A4 pages
- Focus group 2 – field notes – 2 A4 pages
- Documentation 1 – the depression care pathway – 1 A4 page (table)
- Documentation 2 – national guidance of depression care – 34 A4 pages
- Semi-structured interview 1 – transcription – 14 A4 pages
- Semi-structured interview 2 – transcription – 17 A4 pages
- The validating interview (semi-structured interview 3) – transcription – 12 A4 pages

Documents remained static during the study and mainly depression care pathway (Documentation 1, also depicted in Figure 1) was used as a supportive document for our analysis. The depression care pathway documentation did not specifically discuss personalization, therefore interviews and focus groups were central to identifying IT supported personalization in care pathway.

4 Findings

The examined depression care pathway was generic and it displayed all available care options in different phases of care. The care pathway description did not provide specific support for personalization per se; instead, the occupational physician had the responsibility to make the decisions to personalize services for a healthcare user within the options available in the care pathway description. We found that personalization in the care pathway was technology-led in a sense that IT automatically provided and displayed personalized data for physicians to interpret. However, the automation level for personalization of healthcare services varied. In the most automated cases, the information system automatically limited certain care choices depending on a contract or regulatory restrictions. In other cases, occupational physicians interpreted the data and then made the choice of appropriate services, often in interaction with the healthcare user. Therefore, personalization in the care pathway comprises of technological elements, where IT provides personalization automatically and implicitly, with collaborative elements, where personalization is co-created continually in exchange between actors. For illustrating our findings, we categorized different personalization types under three main categories, based on the automatization level provided by IT: 1) Coercive personalization is automatized and does not allow interpretation of the human actor, 2) Data display personalization is automatized, but interpreted manually by physicians, 3) Collaboration-based personalization is supported by automatization, but the emphasis is on interpretation and co-creation between actors. Characteristics of those personalization types are presented in the following sections.

4.1 Coercive personalization

Coercive personalization is personalization of services that are influenced by predetermined regulations, typically ones agreed upon beyond daily care practices. We identified two types of coercive personalization: contract-based and law-regulated personalization. They had similar elements as both are fully automatic, predetermined and relatively static in their nature, with the difference being that, contract-based personalization is negotiated on a case-by-case with employers, whereas law regulations are non-negotiable and remain in the hands of external stakeholders.

Contract-based personalization. Occupational healthcare services are always based on contracts that are carried out on a case-by-case basis between Terveystalo and employers. For Terveystalo, the aim is to understand the characteristics of each industry sector and the employers' healthcare service needs, in order to deliver personalized services to match those needs. Screening healthcare users' health conditions is obligatory for every contract, but some other occupational healthcare services are optional and employers can decide whether to include those under contract:

"We create a strategy with each employer that is based on the information related to characteristics of that sector" (Occupational physician 2).

In practice, IT automatically displays the services that are included in the contract. Once certain services are excluded, they cannot be used to construct a care pathway for employees of that specific company, as IT prevents the physician from delivering such a service:

"The system displays automatically if a certain healthcare service is not included under contract. It works automatically and well" (Occupational physician 1).

Another physician verified that IT does not only display available services, it also prevents occupational physicians to deliver a service that is excluded from a contract by displaying a note:

“The system prevents us from offering a certain healthcare service for the costs of an employer, if it is not in the contract” (Occupational physician 2).

Personalization based on contracts is pellucid in the sense that care services that are included in contracts are delivered and vice versa. In the interviews, a hypothetical situation was discussed whereby an individual healthcare user’s health condition would require some specific care, but a necessary healthcare service is not included in the contract between Terveystalo and the employer. In such cases healthcare users are not left without care, but alternative ways to deliver healthcare services are discussed, as the care cannot be delivered amongst the costs of an employer:

“In the case that something comes up that needs to be treated, we offer alternative options to fund the care of disease. The employer may have insurance, the healthcare user may move under public healthcare or the care can be paid for by the healthcare user themselves as it is not included under the contract” (Occupational physician 2).

Terveystalo also collaborates with other healthcare service providers, in order to deliver healthcare services that require special facilities. As Terveystalo operates in over 70 localities, facilities to provide special services in each location may differ and upscaling therefore requires joint service delivery with other healthcare service providers:

“We do not have all the treatment facilities in our rooms. For example, electrotherapy; if a healthcare user needs that service, it is delivered through the university hospital. Those services are available for us, but also vice versa (with some other services). There always needs to be a way to do the care” (Occupational physician 3).

In such cases, other stakeholders, like insurance companies, and the public healthcare sector can be involved, in order to organize the delivery of services that require special facilities. These services can also be funded by the healthcare user themselves, but if the service is not included in the contract, it is not covered in the costs of an employer.

Law-regulated personalization. Law regulations oblige Terveystalo to provide certain healthcare services for certain employers. Screening is law-regulated and offered to every employer as a premise, but different sectors have different characteristics that are regulated to be measured and checked:

“Screening and certain medical checks are typically law-regulated, but delivery of actual healthcare services are often not” (Occupational physician 3).

Law-regulations are firmly integrated into work conditions as different industries have different characteristics and therefore issues that need to be tested:

“Law regulations demand certain tests to be done in certain industrial sectors” (Occupational physician 2).

Law-regulations take into account the special circumstances of industries and therefore certain tests are targeted at those industries:

“Workplaces have different risks and conditions. For example, people that work with asbestos are required by law to have different tests and follow-ups than people doing office work” (Occupational physician 1).

Basically, law-regulated personalization demands that certain tests be done and those tests vary between sectors and workplaces. Like in the above-mentioned asbestos case, delivering the same healthcare services for employers working in completely different environments does not serve any actor properly. An office worker may not benefit from tests like an asbestos test, whereas people working with asbestos may greatly benefit from an asbestos targeted test.

4.2 Data display personalization

Data display personalization is personalization where IT provides personalized data for healthcare service actors, but that data is interpreted manually, in order to deliver appropriate healthcare services. IT provides data automatically and dynamically, throughout the care process. We identified two types of

data display personalization; the first one focuses on individuals in a one-to-one manner, whereas the second one is tailored to a particular user group called micro-level data display personalization.

One-to-one data display personalization. Screening data from individuals is a basic intervention that is performed for every healthcare user. IT screens the data from single individuals automatically and by providing, displaying, or highlighting specific values from that individual data, it supports the delivery of appropriate services. Screening occurs throughout the care as well as, in prevention, when there are no particular needs for healthcare interventions:

“IT does the screening automatically and it is done constantly, throughout the care” (Occupational physician 3).

In practice, IT screens the healthcare user data continuously and once abnormal values emerge, they are highlighted (for instance with different colors) in data summaries and related periodic reports for indicating the abnormality of levels between values. IT provides the data and indicates whether data is abnormal, whereas the interpretation of that data is left for physicians:

“In basic medical questionnaires, information system displays answers using green, yellow and red for classifying the results. If numbers are low, the information system displays those with red color. For us, it indicates that the situation may need tackling or at least some reaction” (Occupational physician 2).

As abnormal values are tackled, IT supports physicians by providing personalized data from individuals in a graphic form. The graphic form includes historical healthcare user data, a current situation and also upcoming treatments, in order to supplement physicians in understanding the situation in a more comprehensive manner:

“Our system displays the healthcare user data in graphic form. It is possible to check the previous treatments and measures while viewing the upcoming, planned care events in the same view” (Occupational physician 2).

Basically, one-to-one data display personalization consists of different techniques that IT provides for supporting physicians in delivering the right services to the right individual within a short appointment time with a healthcare user.

Micro-level data display personalization. Instead of screening data from individuals, IT screens the data concurrently on a higher level, from a perspective of a particular user group. IT provides physicians the comprehensive data from a particular employer. With the screening function, IT lets physicians interpret and compare the data between offices and employers, in order to offer personalized services for a certain employer or office:
“Between offices, different values can be compared. For example here, one office has greatly reduced the number of musculoskeletal disorders, whereas in this other case, we can see that the numbers have increased dramatically” (Occupational physician 1).

The aforementioned example illustrates micro-level data display personalization, where the values between offices vary. One office may have reduced the absences, whereas in another office the number of absences may have increased. Therefore, physicians can tackle the work conditions between offices and study what is behind the varying numbers by switching from micro-level data to one-to-one data:

“As we collaborate with employers, the data from that employer is visible to us. For example here, the system displays that there are 94 employees, 5 of whom have a diabetes and 11 of whom have the risk for it” (Occupational physician 2).

Therefore, by displaying data from particular user groups, personalized services can be targeted at the user group that benefits them the most. For example, if employees in one office are suffering from back problems, the personalized services can be offered to that office and its work conditions only. In practice, those services can consist of physiotherapist services or guidance for sedentary work. The aim is to provide care for individuals, but concurrently provide guidance for employers' level so as to prevent the back problems in the future.

4.3 Collaboration-based personalization

Collaboration-based personalization is personalization wherein IT supports the healthcare service delivery that occurs between a healthcare service provider and healthcare user. This personalization type is emphasized in the actual service delivery phase (acute care and maintenance care), where suitable services for a single healthcare user are constructed in interaction between actors. The premise for collaboration-based personalization is law-regulation that demands that all actors mutually agree to the service delivery:

“It is measured in the law that the delivery of healthcare services requires the mutual agreement from all the actors that are involved” (Occupational physician 3).

In Terveystalo, the company relies on evidence-based care, with an aim of providing the most effective healthcare services for tackling certain diseases. Physicians have professional competence for care work and IT provides screening data for supporting the delivery of appropriate services. Then the services are constructed and discussed in collaboration with healthcare users:

“In many cases, it is about interaction, where we try to make the healthcare user realize that this particular treatment is the right option at this phase. Especially if the symptoms are more severe, the importance to deliver appropriate care increases” (Occupational physician 3).

Physicians can offer different types of services and those are discussed with the healthcare users. Healthcare users cannot demand a certain type of service, but they can take an active role in deciding the most suitable services:

“Healthcare users can decide what type of care they are willing to have and so on care can be personalized.” (Occupational physician 2).

As the focus is on evidence-based care, contracts, law-regulations and available healthcare options reduce the level of personalization options in the care process. Some services are primary for care, but some supportive services can be negotiated, once those are seen as beneficial to the actors. For example, the depression care pathway includes web-based therapy and physical guidance support which are utilized for supporting the primary care, like medicine or psychotherapy. Within certain circumstances, in collaboration, healthcare users can influence whether one of those can be included for supporting the care.

4.4 Personalization in care pathway

The three aforementioned three personalization types and their characteristics are classified based on the automatization level that IT provides for supporting the service personalization process (Table 1).

Personalization type		Nature	When	How	Example
Coercive personalization	Contract-based personalization	Predetermined automatized static	Prerequisite for service delivery	Contracts guide the service delivery	Negotiate services for a target sector
	Law-regulated personalization	Predetermined automatized static	Prerequisite for service delivery	Law-regulations guide the service delivery	Law-regulated medical checks
Data display personalization	One-to-one data display personalization	Automatized, but interpreted dynamic	Throughout the service delivery, emphasis in screening	Provide personalized data about individuals.	Individual blood values
	Micro-level data display personalization	Automatized but interpreted dynamic	Throughout the service delivery, emphasis in screening	Provide personalized data about particular user group	Absences between different offices

Collaboration-based personalization	Services are co-created in exchange	Co-created, but supported by automatization dynamic	Emphasis in service delivery process	Both actors participate in creation of services	Mutual agreement on services delivered
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Table 1. Identified personalization dimensions in care pathway.

Coercive personalization consists of two categories, contract-based and law-regulated personalization. That personalization is predetermined and automatized by IT, and the data cannot be interpreted by physicians as they are pre-set. Data display personalization consists of one-to-one data displays and micro-level data displays. That personalization is automatized by IT as systems are constantly screening the healthcare user data for providing personalized data and highlighting abnormal values for physicians to interpret. Data display personalization is dynamic, as data is generated in a continuous manner and interpreted by physicians concurrently. Collaborative personalization is co-creation of personalized services. That personalization is supported by the data IT provides when delivering appropriate services; thus, the service delivery occurs in exchange between actors.

5 Discussion

Delivering personalized healthcare services is a premise for healthcare service providers, since individual characteristics and needs between healthcare users drastically vary (Berry and Bendapudi, 2007). In healthcare, IT often acts as an artefact, allowing the right information to be accessible by physicians and to provide support for the service delivery (von Thiele Schwarz, 2016). In this study, we investigated how personalization carried out by physicians is supported by IT when delivering healthcare services. Prior personalization literature is mostly studied web context for delivering appropriate services for individuals with a strong technological emphasis (Sunikka and Bragge, 2012), but personalization can also be understood as a broader concept than a single technology (Montgomery and Smith, 2009), such as recommender systems (Schubert et al., 2006). Here, we examined how IT supported the delivery of healthcare services that consists of several different components and phases. By applying personalization classification and its dimensions from Fan and Poole (2006) with more recent revisions (Sunikka and Bragge, 2008; Kwon and Kim, 2012) we found that IT supported the actual service delivery, where services are personalized in co-creation between actors. Therefore, personalization of healthcare services intertwines 1) IT support that is primarily automatized 2) interpretations from physicians and 3) a co-creation component whereby personalized service creation occurs in collaboration between actors. Our three major findings from the field were categorized by the automatization level IT provided for supporting the service delivery.

Coercive personalization, where contracts and regulations guide the care was predetermined and fully automatized. This personalization type was not dynamic; therefore, it only partly follows the traditional personalization definitions that emphasize the creation or continuous adjustment of services for fitting the individual requirements (Ball et al., 2006; Shen and Ball, 2009). Coercive personalization was found to be a prerequisite for care processes, and while regulations between conditions and industries vary, same services were neither planned nor delivered for all employers. Due to its static nature, coercive personalization is not suitable for dynamic environments where the demands and requirements change rapidly. However, it provides the mainstay for the service delivery.

Data display personalization consisted of providing, displaying, or highlighting data for physicians for supporting the service delivery. IT personalized the data automatically and physicians interpreted the data for delivering the appropriate services. This personalization type was dynamic, as data was generated and analysed concurrently, and it follows the traditional personalization definition where service providers personalize the services for individuals, based on the data gathered (Adomavicius and Tuzhilin, 2005; Kaptein and Parviainen, 2015). Therefore, the data supported the service delivery, as the

medical interventions based on the healthcare user be conducted ‘at the right time for a right person’, a definition often used with personalization in the web context (Ho, 2006).

Collaboration-based personalization was supported by IT, which personalized the data automatically for physicians and supported the actual service delivery that occurs in exchange between actors, healthcare service providers, and the healthcare user. This personalization type was dynamic, as supportive data was generated constantly during the service delivery, but instead of being strictly led by service providers, healthcare users participated in co-creation of personalized services. In other words, the physician and the healthcare user collaborate to personalize the care, with support provided by IT (von Thiele Schwarz, 2016). IT provides data automatically and that data is taken into account and interpreted by physician in the interaction between the physician and the healthcare user.

Overall, by applying the S-D logic viewpoint (Vargo and Lusch, 2004) we observed that traditional personalization has continued to be led by service providers and follows the value models of manufacturing, wherein the focus is on the production of goods. Information technology has been adopted to understand user needs, and service provider utilizes this information to personalize their offerings to match those needs. However, as services are mostly intangible and co-created between actors, service level personalization is carried out in collaboration of actors during service delivery. That motivated us to study how personalization carried out by physicians is supported by IT when delivering healthcare services. As a result, we present three types of personalization: coercive personalization, data display personalization, and co-created personalization; these all have an impact on the personalization of healthcare services. By discussing the characteristics of each of these types, our aim is to increase the knowledge around personalization and to provide understanding on how service personalization is broader than the usage of a single technology (Montgomery and Smith, 2009). Recently, in the healthcare domain for example, there has been interests to design IT-supported personalization for static care documents, such as care pathways (Gand and Schlieter, 2016), and to provide personalized patient reports for enhancing the communication between actors, physicians and healthcare users (Lederer et al., 2016). In services, personalization research has been emphasizing technical viewpoints, but as co-creation is focal for services, studying personalization with S-D and covering the viewpoints from different actors remains scarce and needs to be examined further. Recently, Lee (2013) has provided three different dimensions for co-created personalization, whether co-creation can be user-led, equally co-created, or service provider-led depending on the situation. We find that categorization inspiring for bringing understanding to personalization of services in a technology-based context. Our results support findings of other researchers on the role of information technology as an enabler for personalization (Sunikka and Bragge, 2012; Salonen and Karjaluoto, 2016). IT can provide continuous support for the personalized service delivery (Shen and Ball, 2009), for example, by assisting physicians in decision making. As services are co-created between actors, our study provides new insights on the versatile role of IT in service personalization. Healthcare context is an illustrative example of service delivery where personalization is an integral part of the service and it is done collaboratively during the service process (Berry and Bendapudi, 2007). Personalization based on user data (“Screening”) forms the basis for the service delivery and follows the traditional personalization viewpoint (e.g. Kwon and Kim, 2012) where services are personalized automatically to match the user needs. However, in the actual service delivery (“Diagnosis”, “Acute care”, and “Maintenance care”) phases, the role of IT supported personalization varies from automatic to supportive, where the personalization is interpreted and discussed between actors taking part in the service delivery.

There are several limitations in this study. First, we reported a single case study from one country. Terveystalo is one of the biggest healthcare service providers in Finland, but on a global level it is still a relatively small actor. Second, by conducting a single case study, differences of culture, care pathways, and between healthcare service providers were not considered in this study. Therefore, the findings cannot be assumed to be widely applicable to different contexts, and if applied in other contexts (countries, service providers, or care pathways) the results may differ. Nonetheless, this study enhances the understanding towards personalization in healthcare services, and by using a case study, we illustrated how IT supports personalization in a Finnish occupational healthcare service provider.

In summary, information technology supporting personalization has remained an intriguing topic in the fields of HCI and computer science. With a strong emphasis on technology, personalization is studied mostly in the web context, for the delivery of appropriate services for the right person at the right time. This paper provides insights of personalization in the healthcare service context, where personalization intertwines IT components and a collaborative component for the service delivery. IT exploits different technologies that support the service personalization process that occurs collaboratively, and in exchange between actors. By conducting an interpretive case study (Klein and Myers, 1999), the present study focused on identifying how IT supports the personalization of healthcare service delivery in certain conditions. The findings from this paper will be utilized in the future to understand how personalization can be viewed from the perspective of other actors, such as employers, healthcare users, or healthcare service providers; by applying the S-D logic lens, all actors involved should benefit from the personalization of services.

6 Conclusion

Being a technology-centred concept, personalization has been widely applied in the web-context for providing appropriate services for individuals. Primarily, personalization has emphasized automatic recommendations based on users' prior behaviour. The healthcare industry views personalization of care as a premise, as the individual needs and conditions between healthcare users may drastically vary. This study reports a case study of a Finnish healthcare service provider, with the aim of understanding how personalization is carried out by physicians, which in turn is supported by IT when delivering healthcare services. We found that IT plays a versatile role in supporting personalization of healthcare services. The support varies from automatic personalization to collaborative forms of support, where IT provides, displays, and highlights personalized data for actors to interpret and discuss. In the present study, we evaluated three different types of personalization, coercive personalization, data display personalisation, and collaboration-based personalization; these all have an impact on the actual personalization of services, which consists of multiple components and phases.

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