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The MINDS Method: Integrating Management and Interaction Design Perspectives for Service Design

Jorge Grenha Teixeira[1], Lia Patrício[1], Ko-Hsun Huang[2], Raymond P. Fisk[3], Leonel Nóbrega[4], and Larry Constantine[4]

Abstract

As technology innovation rapidly changes service experiences, service designers need to leverage technology and orchestrate complex service systems to create innovative services while enabling seamless customer experiences. Service design builds upon contributions from multiple fields, including management, information technology, and interaction design. Still, more integration to leverage the role of technology for service innovation is needed. This article integrates these two service design perspectives, management and interaction design, into an interdisciplinary method—the Management and INteraction Design for Service (MINDS). Using a design science research approach, MINDS synthesizes management perspective models, which focus on creating new value propositions and orchestrating multiple service interfaces, with interaction design perspective models, which focus on technology usage and its surrounding context. This article presents applications of the MINDS method in two different service industries (media and health care) to demonstrate how MINDS enables creating innovative technology-enabled services and advances interdisciplinary service research.

Keywords

technology-enabled services, service design, interaction design, customer experience, design science research

Introduction

Technology is considered a ''game changer'' for service (Ostrom et al. 2015). Innovations such as social networks improve the communication among customers and with firms, enabling new ways to cocreate value (Martins and Patrício 2013). New technologies such as the Internet of Things and mobile and context-aware service interfaces bring new, smarter service that can enhance customer experiences (Wünderlich et al. 2015).

From a service-dominant logic perspective, technology and service innovation are interlinked (Lusch and Nambisan 2015). Technology enables new configurations of resources and the reshaping of roles, fueling service innovation (Lusch and Nambisan 2015; Ordanini and Parasuraman 2011). With the help of technology, the traditional dyadic relationship between consumer and service provider has changed to a dynamic, many-to-many landscape (Gummesson 2007; Michel, Brown, and Gallan 2008; Pinho et al. 2014). In this new landscape, value is cocreated by a network of interwoven actors that collaborate and integrate resources (Ordanini and Parasuraman 2011; Vargo and Lusch 2011). This dynamic and open context supports a richer and denser cocreation of value between a larger number of actors.

In this complex reality, enabling seamless customer experiences becomes increasingly challenging for service firms. Customer experience is holistic, encompassing every contact with a firm, so all service encounters need to be seamlessly orchestrated (Banerjee 2014; Meyer and Schwager 2007; Sousa and Voss 2006; Zomerdijk and Voss 2009). Creating innovative services thus requires an integrated approach like that offered by service design (Mager 2009).

Service design is a human-centered, holistic, creative approach for creating new services (Blomkvist, Holmlid, and Segelström 2010). Following a design thinking approach, it involves an iterative process of exploration, ideation, reflection, and implementation (Brown 2008). Both technology and service design are considered two interlinked service research priorities and strong enablers of service innovation (Ostrom et al. 2015). Service design integrates multiple contributions

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from service research fields such as service management, marketing, and operations as well as from technology-related fields, such as information systems and interaction design (Patrício and Fisk 2013). However, service design lacks integrated, cross-disciplinary models and frameworks (Clatworthy 2011; Ostrom et al. 2010, 2015),that could support the design of technology-enabled services.

Three challenges for service research and service design arise in seeking to design technology-enabled services. First, while technology brings great promise, it needs to be adequately deployed to support service innovation and to enable seamless customer experiences. Second, to support the orchestration of technology-enabled services, service design multidisciplinary contributions need to be further integrated. Finally, the integration of multiple perspectives on service design will advance service research as an interdisciplinary field.

To address these challenges, this article presents the Management and INteraction Design for Services (MINDS), an interdisciplinary method that integrates two service design perspectives to support the design of innovative technology-enabled services. The management perspective encompasses contributions from service management, marketing, and operations. This perspective brings process-oriented models that are well structured and systematized. Also, the management perspective supports creating innovative value offerings and orchestrating multiple interfaces and actors across front and backstage. The interaction perspective encompasses contributions from interaction design, a design-oriented technology field. Interaction design makes important contributions to service design by focusing on understanding human engagement with digital technology and on designing useful and pleasing technology artifacts (Kaptelinin and Nardi 2006).

The development of MINDS followed design science research (DSR), a well-established methodology in the information technology field (Kuechler and Vaishnavi 2008; Winter 2008) that is now spreading to service research (Beloglazov et al. 2015; Ostrom et al. 2015). DSR is a methodology for understanding organizational phenomena in context and advances research by creating and evaluating artifacts (e.g., models and methods) that solve organizational problems (Hevner et al. 2004). Using the DSR knowledge contribution framework (Gregor and Hevner 2013), MINDS can be classified as an improvement over current methods and models by integrating management and interaction design approaches to support designing technology-enabled services across different service design levels: service concept, service system, and service encounter. MINDS is validated through two applications in distinct service industries: creating a new football (soccer)-watching service in a media company and a new health-care service for skin cancer prevention and monitoring. The structure of this article is aligned with the guidelines for presenting DSR and qualitative work (Gioia, Corley, and Hamilton 2012; Gregor and Hevner 2013). In the first section, the different service design perspectives are reviewed. In the second section, the DSR methodology is detailed. The third section presents MINDS method and respective models. In the fourth section, the two applications of MINDS are presented. The fifth section evaluates MINDS. The sixth section considers the research contributions of MINDS.

Different Perspectives on Service Design

Service innovations can be defined as offerings not previously available for a firm's customers (Menor and Roth 2007; Ordanini and Parasuraman 2011). However, from a service-dominant logic perspective, service innovations are the rebundling of resources to create new resources (Lusch and Nambisan 2015). Service design is paramount to service innovation because it brings innovative service ideas to life (Ostrom et al. 2010). Service design is traditionally viewed as a stage of the new service development process concerned with bringing ideas to the specification stage (Edvardsson et al. 2000; Goldstein et al. 2002). However, service design has broadened its role and is increasingly recognized as a cross-cutting approach to innovation (Evenson 2008; Patrício et al. 2011). Service design involves understanding customers and service providers, their context and social practices, and translating this understanding into the development of evidence and service systems interaction (Holmlid and Evenson 2008; Yu and Sangiorgi 2014).

The wider scope for service design and the challenges posed by technology require integrating methods and tools from various fields. Contributions to service design can be traced to management-oriented fields, such as marketing and operations management (Bitner, Ostrom, and Morgan 2008; Cook et al. 2002; Goldstein et al. 2002; Johnston 1999; Sampson 2012; Shostack 1984; Verma et al. 2002). Technology-oriented fields also contribute to service design, namely, interaction design (Evenson 2008; Holmlid 2009; Kimbell 2011; Mager 2009; Pacenti and Sangiorgi 2010; Sangiorgi 2009), information systems, and software engineering (Glushko 2010; Ordanini and Pasini 2008; Tuunanen and Cassab 2011).

Contributions from management-oriented disciplines are focused on designing value propositions and orchestrating multiple interfaces and actors to enable value cocreation and seamless customer experiences. Models from this perspective are process oriented (e.g., service blueprint) or have a network structure (e.g., customer value constellation). These methods have clearly defined structures and are well documented in research literature. They also provide a robust backbone for supporting the collaboration between multidisciplinary actors (Diana, Pacenti, and Tassi 2009). However, models from a management perspective do not address in detail the aesthetic and technology aspects of the service experience, such as the environment in which the service takes place, the interaction between actors and technologies (Morelli 2002), or the service attractiveness and atmosphere (Diana, Pacenti, and Tassi 2009).

Interaction design has made important contributions to addressing technology challenges in service design (Holmlid

2007). Both interaction design and service design share a design thinking approach, where the holistic understanding of underconstrained problems is favored (Forlizzi, Zimmerman, and Evenson 2008). Compared to the management perspective, the interaction perspective is mostly concerned with the frontstage interaction and experience with technology. It provides a richer view of the context surrounding service provision, a critical feature to understand the perception of value propositions (Vargo and Lusch 2015). It is also less structured, more emphatic, and well suited for creative exploration.

Ensuring consistency from the strategic to the service encounter level is considered a major challenge for service organizations (Goldstein et al. 2002). To address this challenge, *multilevel service design* (MSD) systematizes the design process across three levels, linking the strategic and operational levels: service concept, service system, and service encounter (Patrício et al. 2011). Following this approach, the literature review and the integration of management and interaction-design perspectives were structured according to these three levels, highlighting the contributions of the two approaches and the rationale behind the models that were integrated in the MINDS method.

Designing the Service Concept

The service concept is the key driver for service design decisions at all planning levels (Goldstein et al. 2002). Edvardsson and Olsson (1996) define service concept as the benefits provided to the customer, which can go beyond the services internally offered by the firm to include other service offerings in the customer value constellation (Patrício et al. 2011). From a management perspective, models for designing the service concept are focused on portraying the firm's value proposition, either as a set of core and supplementary offers (Lovelock and Wirtz 2011) or as a constellation of offerings and relationships (Normann and Ramirez 1993). Customer experience modeling systematizes customer information so that it supports designing the service concept (Teixeira et al. 2012). The customer value constellation portrays service offerings and their relationships from a customer point of view, focusing on the services that support a customer's overall activity independent of the service provider (Patrício et al. 2011). The service delivery network encompasses the organizations that, in the eyes of the customer, are responsible for the provision of the overall service (Tax, McCutcheon, and Wilkinson 2013). At the service concept level, management perspective models are structured and focused on the development of new value propositions. Still, they do not allow further specification of service characteristics such as those supported by technology, which are left out of this strategic level.

From an interaction design perspective, models supporting the design of the service concept are scarce because interaction design is not usually focused on the strategic level. Affinity diagrams, also known as the KJ method, are useful to creatively explore new concepts through brainstorming (Beyer and Holtzblatt 1997). These diagrams enable a common understanding about complex problems through aggregation in homogenous categories. Affinity diagrams are open and support the creative generation of new ideas and concepts. Still, they do not consider the business environment surrounding these new concepts.

Designing the Service System

Service systems are configurations of people, technologies, and other resources that interact with other service systems to create mutual value (Maglio et al. 2009). As such, designing the organization's service system requires the definition of a mix of interfaces, tangible evidence, processes, people's roles, and technology (Patrício and Fisk 2013). From a management perspective, models at the service system level support orchestrating this mix across the customer journey. Service blueprinting was introduced by Shostack (1984) as a flowchart that adopts a customer perspective by separating what customers see from what they do not see while orchestrating frontstage and backstage activities. Additional research evolved this model (Bitner, Ostrom, and Morgan 2008; Goudarzi et al. 2011; Lovelock and Wirtz 2011; Patrício, Fisk, and Falcão e Cunha 2008; Shostack 1987), making it the best-documented service design tool. Process–Chain–Network Diagrams also follow a flowchart, process-oriented structure that defines categories of processes according to the types of interactions established with other actors (Sampson 2012). In MSD, the service system navigation establishes the set of customer activities and how they are supported by different service interfaces (Patrício et al. 2011). These models are well structured and allow the understanding of the implications of design decisions at the frontstage on backstage operations. However, they provide an incomplete view of the service experience because they do not represent the intended look and feel of a new service and its context.

At the service system level, interaction design models are more focused on depicting customer activities and their surrounding context, being less structured but visually richer than models from the management perspective. Storyboards (which originated from screenplay techniques) are graphical representations of interaction sequences that can be accompanied by a narrative (Newman and Landay 2000; Truong, Hayes, and Abowd 2006). Scenarios, which are story narratives about people and their activities, can be combined with storyboards (Carroll 2000; Preece, Rogers, and Sharp 2002). Contextual Design's Work Models describe actors and their surrounding context and relationship through several network, process-oriented, and graphical models (Beyer and Holtzblatt 1997). Interaction design models provide a rich visual depiction of the service provision and its context, thus supporting the design of seamless customer experiences across technology-enabled, multi-interface service systems. However, they do not address important managerial concerns, such as the orchestration between frontstage interactions and backstage operations.

Designing the Service Encounter

Service encounters can be defined as moments of interaction between the customer and the firm (Bitner, Booms, and Tetreault 1990). Service encounters can also be seen as touchpoints and can take place face-to-face or through various communication technologies.

At this level, models from a management perspective detail how the service unfolds at each service encounter, such as service blueprinting. To design technology-enabled services, some adaptations were made to better integrate management and technology perspectives (Patrício, Fisk, and Falcão e Cunha 2008). Still, these models do not visually depict the desired look of each service encounter and technology interface.

From the interaction perspective, service design tools at the service encounter level are focused on depicting the aesthetics and interactions of service interfaces, especially those that are technology enabled. They support service designers' creative efforts by offering a canvas for low-fidelity prototyping of interfaces. Sketches (Buxton 2007) are the least structured models, followed by wireframes (Garrett 2011), and the artifact model (Beyer and Holtzblatt 1997), which has a more lifelike representation. These interaction models are suitable for visually representing the desired look of each service interface, but their loose structure does not address operational concerns for service provision.

To effectively leverage technology and enable a seamless customer experience across interfaces and systems, service design and implementation must be carefully managed. Service design handles this challenge by including multidisciplinary contributions that address different aspects of service. Contributions from management disciplines are focused on designing value propositions and orchestrating frontstage and backstage processes, while contributions from technology-oriented disciplines, namely, interaction design, are focused on frontstage interactions and experience with technology. However, these contributions are not integrated, which hampers the potential of technology to support customer experience and value cocreation, emphasizing the importance of interdisciplinary integration for the evolution of service research (Ostrom et al. 2015).

The preceding review of the management and interaction design perspectives examined their contributions to service design and their shortcomings. The next section details the methodology behind the development of the MINDS method.

Methodology

The MINDS method was developed following a design science research approach (Walls, Widmeyer, and El Sawy 1992). DSR originated in the information systems field and is considered a valuable method to advance service research and innovate technology-enabled services (Ostrom et al. 2015; Beloglazov et al. 2015). This article addresses the complexity of technology-enabled services by integrating management and interaction design perspectives for the development of an interdisciplinary service design method (MINDS). As such, DSR was considered a suitable methodology because of its technology background and its focus on developing models and methods that address complex and ill-defined problems (Hevner et al. 2004).

DSR concentrates on understanding the context of organizational phenomena and creating and evaluating artifacts that solve organizational problems (Hevner et al. 2004). These artifacts can be constructs, models, methods, and implementations that are innovative and valuable in such a way that they advance the field (March and Smith 1995). While service design practice may generate new services that solve specific problems, DSR creates novel models and methods that advance the service design and the service research fields through an iterative process of conceptualization and validation.

The DSR method comprises two main activities that are iteratively performed: build and evaluate (Hevner et al. 2004). Building is the process of constructing an artifact for a specific purpose (creating the MINDS method), whereas evaluating is the process of determining how well the artifact performs (in the two applications). This process requires an iterative dialogue between design science (to create new concepts and methods) and social science (to explore and validate the concepts and methods in social contexts; Buchanan 2001; Peffers et al. 2007). Qualitative research can be used as part of the overall DSR method to explore and understand the context and evaluate artifacts (Hevner et al. 2004; Peffers et al. 2007). As such, MINDS applications for designing two new technology-enabled services used a qualitative research approach, based on Corbin and Strauss (1990), both to study the customer experience and to evaluate the method usefulness. Peffers et al. (2007) elaborated on the DSR method and developed the DSR process we used to develop MINDS:

1. Identify problem and motivation: A literature review on service research supported the problem formulation and motivation for developing MINDS, namely, technology as a fundamental factor in value creation (Lusch and Nambisan 2015; Ordanini and Parasuraman 2011) and the importance of connecting technology and service design for service research (Ostrom et al. 2010, 2015).
2. Define objectives of a solution: MINDS research objectives were defined as the development of an interdisciplinary method that integrates two service design perspectives (management and interaction design) to leverage the role of technology, fuel service innovation, and enhance the customer experience.
3. Design and develop: Development of models and methods must follow appropriate theoretical foundations and research methodologies to ensure that these artifacts address the identified challenges and research is rigorously pursued. In the development of MINDS, theoretical foundations presented in the literature review supported the integration of complementary contributions from management and interaction design

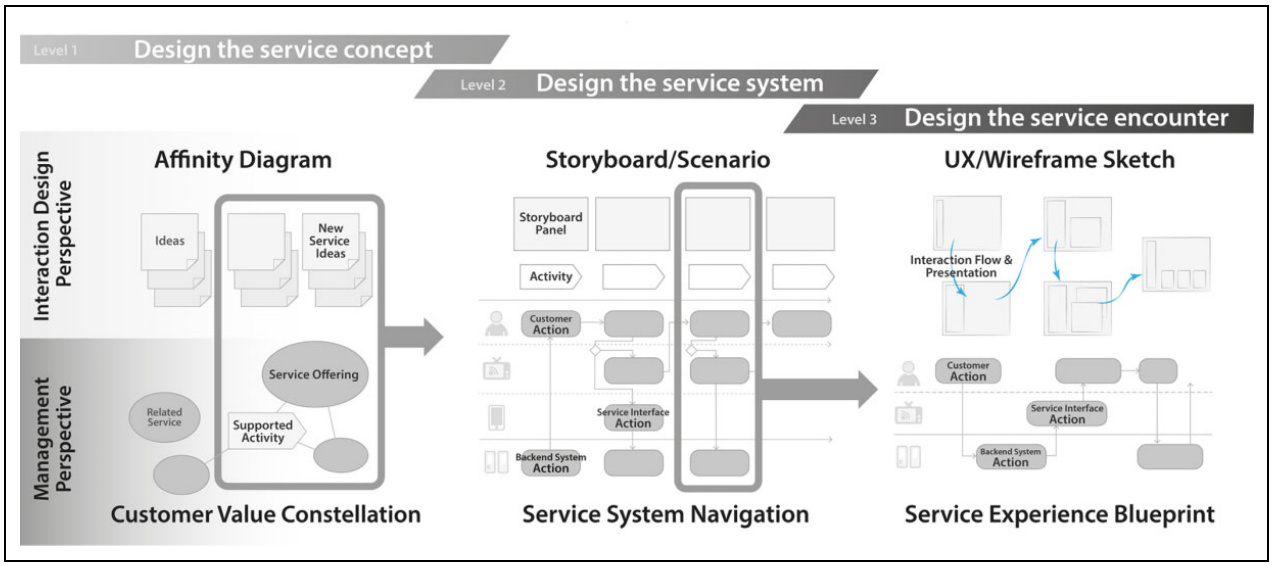

Figure 1. Management and INteraction Design for Service method conceptual structure.

perspectives in the development of MINDS methods and models. Regarding research methodology, DSR was followed throughout this research with the support of qualitative research for developing the applications and evaluating the models and method.

4. Demonstrate by using the artifact to solve the problem: Two applications in distinct service industries (media and health care) were undertaken, showing how MINDS is able to support the design of complex technology-enabled services and provide new contributions over dispersed models. Following DSR's iterative dialogue between design science (creation of new artifacts) and social science (exploration and evaluation), these applications used qualitative research tenets to study customer experience and support the creation of innovative technology-enabled services (Charmaz 2006; Corbin and Strauss 1990).
5. Evaluate: MINDS was evaluated using criteria from DSR (Hevner et al. 2004; Peffers et al. 2012) and interaction design (Forlizzi, Zimmerman, and Evenson 2008) such as process, invention, relevance, and extensibility. Following Gregor and Hevner (2013) guidelines, evaluation is discussed after presenting the applications in the evaluation section.
6. Communicate through scholarly and professional publications: MINDS method was regularly discussed with both practitioner and academic audiences in meetings and at research conferences and in publications.

Having described how DSR was applied to develop MINDS, the next section introduces its conceptual structure, followed by the two applications. Later, the artifacts are evaluated and research contributions are detailed.

MINDS—Management and Interaction Design for Service

The MINDS method integrates and leverages management and interaction design perspectives to innovate technology-enabled services. The management perspective comes from service marketing and operations management and is focused on creating new value propositions and orchestrating multiple interfaces and backstage support processes to enhance the customer experience. The interaction design perspective builds upon a technology background that is more visual and loosely structured, depicting customer interaction with technology.

MINDS is structured along MSD's three levels, integrating contributions across the service concept, service system, and service encounter. With models at these three levels, MSD ensures that design decisions are consistent from the strategic to the service encounter levels, which is considered a major challenge for service organizations (Goldstein et al. 2002). MSD's models portray the management perspective by incorporating some operations and technology components of service design. These models are then integrated with other models from the interaction design perspective that are focused on the experience with technology and the design of technology-enabled interfaces.

Figure 1 illustrates MINDS conceptual framework through the three levels of service design. At the highest level (depicted on the left side), the service concept defines the benefits the service provides to support a given customer activity. In MINDS, designing the service concept combines the customer value constellation (Patrício et al. 2011) with affinity diagrams (Beyer and Holtzblatt 1997). The customer value constellation enables the definition of the service concept. Following human activity modeling notation (Constantine 2009), it depicts in the center of the model the customer activity that is going to be

supported by the service design process and the related value network. For example, to design a travel service, the design team should start by focusing on the activity (e.g., going on vacation) and map the different services that customers use to cocreate their value constellation experience (airlines, hotels, transfers, travel insurance, etc.). This enables designing the service concept by positioning it in the value constellation of offerings. On the other hand, affinity diagrams, due to their inherent structure, enable creative exploration of new concepts through brainstorming and organizing the outputs in the form of coherent value propositions. In MINDS, affinity diagrams are developed over the customer value constellation to brainstorm new service ideas for the value network that supports the chosen customer activity. The integration of these two models supports service innovation and brings technology design decisions to the strategic level.

While the service concept defines the service benefits that form the value proposition to customers, the service system defines how people, frontstage and backstage processes, technology support, and other elements will be orchestrated to support the service concept and enable a seamless customer experience. To design the service system (the middle section of Figure 1), MINDS combines the service system navigation and storyboards. The service system navigation orchestrates multi-interface services and informs design decisions regarding specific customer activities and how each should be supported by each interface, including frontstage and backstage processes and technology. Storyboards contribute with their strong visual element, illustrating the intended customer experience and technology usage. It is also useful to combine them with scenarios (Carroll 2000) since these reinforce the storytelling aspect of storyboards. These models from the interaction design perspective enrich the view of the service process and the customer experience depicted by the service system navigation. Together, service system navigation and storyboards enable the orchestration of service provision across service encounters and provide a holistic perspective of the service system.

After defining how the different components of the service system will be orchestrated to enable a smooth customer experience across service encounters and interfaces, the process drills down to the detailed design of each service encounter at each interface. For designing the service encounter (on the right side of Figure 1), MINDS combines service experience blueprints from the management perspective with interaction sketches from the interaction design perspective. Service experience blueprints detail the frontstage and backstage processes that support specific customer actions in specific service interfaces. The interaction sketches combine other interaction design models, such as wireframes and sketches, to visualize the technology-enabled interfaces of the service encounter and systematize the disposition of interface elements for software engineering development. Together these models define the set of customer and service interface actions, draft the visual aspect of the technology interfaces, and bridge service and technology-enabled interfaces to enhance the customer experience at the service encounter level.

Applications of the MINDS Method

Following the DSR approach, the MINDS method was applied to the design of two new services in very different contexts: a new multimedia service for watching football and a new service for supporting skin cancer prevention. The objective of both applications was to create innovative value propositions and leverage multiple technology-enabled service interfaces. These applications, performed in collaboration with firms in media and health-care sectors, enabled testing the usefulness of MINDS in real-world service design projects. They also demonstrated how MINDS facilitates the joint work of multidisciplinary teams when designing technology-enabled services and how it surpasses what existing models can do in isolation. The two applications provided rich settings for MINDS development and validation as each was a service design effort from initial customer experience analysis to service prototyping and deployment of the new services.

To provide an in-depth understanding of the customer experience that supported the building of MINDS models, a qualitative approach was followed (Charmaz 2006; Corbin and Strauss 1990). This included semistructured interviews with customers and other value network actors in the early stages of the applications. Sampling proceeded on theoretical grounds, a common approach in qualitative research that guides data collection toward adequately developing the relevant concepts and categories (Charmaz 2006; Corbin and Strauss 1990; Marshall 1996). This means that new data should be collected until theoretical saturation is achieved, that is, when new data does not lead to new theoretical insights or new properties of the relevant concepts and categories. For example, in the first application of MINDS, a second round of data collection was needed to develop categories for watching football, such as sharing or seeking information. In the second application of MINDS, additional data on private practices was collected and reinforced the same categories found in the public service, such as the need for a fast diagnosis. Afterward, interviews were literally transcribed and coded segment-by-segment in NVIVO 8. At the end of the design process, focus groups involving the design team were used to validate the models and the method.

Designing a New Service for Watching Football

MINDS was first applied as part of a 3-year project involving the design of new services for a leading Portuguese multimedia group that provides cable TV, Internet, mobile phone, landline phone, and other associated services. The company and the research team joined together in a project to explore how service design approaches could improve their services, with the focus on enhancing customer experiences. The number of technology-enabled interfaces of this industry, associated with a multidisciplinary service design team that included the research team and professionals with competences in service marketing, service design, interaction design, and software engineering, provided a fertile ground for the development and evaluation of MINDS.

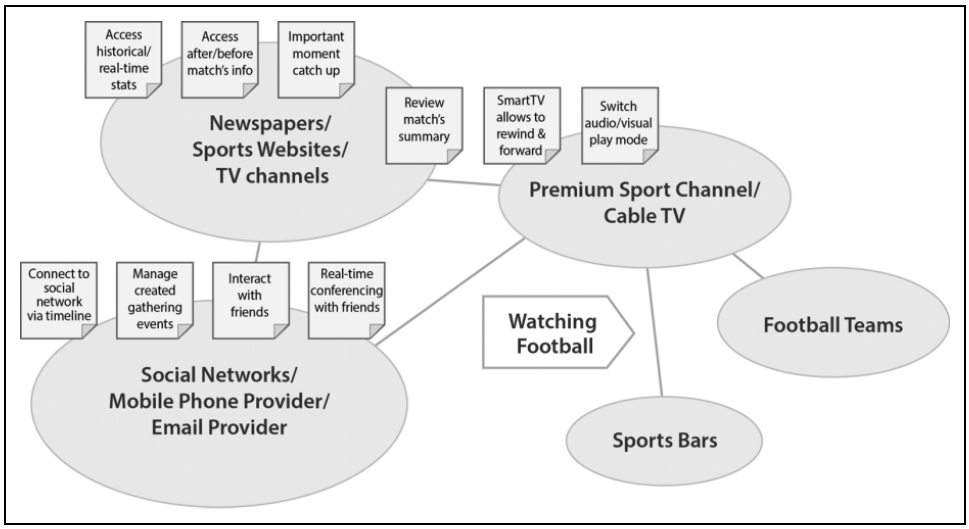

Figure 2. Football-watching service concept with customer value constellation and affinity diagram.

The project followed a service design process, starting with an exploration phase that involved 17 in-depth interviews with residential customers. Building upon this initial study, the service design team and the media company decided to pursue a service concept dedicated to improving the experience of watching football since it had a wide audience and provided a rich ground for innovation, which could then be expanded to other services. This prompted a return to the field for further data collection. A second qualitative study involved a round of 18 interviews focused on the experience of watching football as well as the application of contextual inquiry (Beyer and Holtzblatt 1997) and observation (Adler and Adler 1994) on three football matches. Field notes were taken and included in the analysis.

The outputs of the customer experience study were the basis for the application of MINDS. The analysis of interviews and field notes taken during the observation showed that watching football was a very social activity with fans watching matches in groups and sharing match occurrences through social networks.

> Watching (a match) at home, especially when you are alone, is not that interesting, the interaction is missing. (Female, 21 years)

Football fans also searched information before and during the match about team, league, and player statistics, using different sources. Finally, fans complained that busy work and family schedules sometimes interfered with watching matches, making them lose important match moments or the entire match.

> Used to follow all games and a lot of statistics and information . . . but (now) I have no time. (Male, 42 years)

Football-Watching Service Concept

The customer experience study results were used to create a new service concept for watching football with the support of MINDS models. As shown in Figure 2, the customer value constellation depicted the services that support the activity ''Watching Football,'' including the ones offered by other organizations in the value network, such as social networks. This enabled the exploration of new service concepts and understanding how new value propositions would be positioned in the current value constellation of offerings, namely, possible partnerships with other service providers. With the affinity diagram, the design team brainstormed over the customer value constellation and developed an innovative service concept. This included technology features, such as integration with social networks and sports websites, thus bringing technology design decisions to the strategic level. Other value offerings, such as those provided by sports bars or provided directly by the football teams, were not pursued because the focus was on developing a new multimedia service. The integration of these models supported service innovation by leveraging at the outset the contribution of technology to enhance the customer experience. The models also strengthened the communication between multidisciplinary team members and were shown to the company for initial validation and feedback. Incorporating this feedback, namely, concerning technology infrastructure capabilities and broadcast rights, the team was able to prioritize concepts, selecting those that had more value cocreation potential for both the service provider and its customers.

After several iterations, a new service concept was created. This new value proposition offered a richer and more interactive football watching experience in terms of both the interaction with the service provider and the many-to-many interactions through social networks. This new service concept had three main novel components: (1) information related to teams and tournaments, (2) social networking capabilities including videoconferencing, and (3) interactive in-match features, with multiple device support, dynamic timeline, and commenting features.

Football-Watching Service System

After the definition of the service concept, the design drilled down to the service system. People, processes, and technology were orchestrated at the service system level to enable the customer to navigate across the different service interfaces and cocreate a smooth service experience. To design the service system, a scenario was initially developed to describe the most representative customer journey, showing how the service system should support the customer experience. The customer journey and the service system were then modeled through the service system navigation and storyboard. Figure 3 illustrates how customers alternate between service interfaces along the customer journey. They first invite friends through social media and then watch the match while accessing different contextual information, such as the most important moments, player's statistics, or different audio commentaries. Finally, customers also use social media to comment on their team's performance. The storyboard on the top provides a richer visual description of the customer journey, adding the relevant contextual elements and background information. Alternatively, the service system navigation provides a more systematic view of how the service system at the frontstage and backstage supports the desired customer experience.

Combining the service system navigation and storyboards provides richer contextual information, leading to new opportunities to enhance the customer experience through innovative context-specific service interfaces (Teixeira et al. 2013). For example, since customers routinely use tablets and smartphones, these interfaces were combined with the television (TV) service. Interacting with this service through a tablet or smartphone is much easier than through the TV remote control. This created a new form to leverage technology to enhance the service experience.

Overall, at the service system level, MINDS gave a systemic view of the service system that operationalizes the service concept, illustrated the intended customer journey, and supported the orchestration of multiple elements of the service system. This enabled a more holistic understanding of the intended customer experience, supporting the detection of potential problems or opportunities based on the richer contextual information. Such problems or opportunities might include inconsistencies between customer activities and service interfaces (e.g., writing social media posts with a remote control) or new ways to combine interfaces (e.g., using a smartphone as an input device for a TV).

Football-Watching Service Encounter

After designing the service system to support the customer journey across multiple touchpoints or service encounters, the

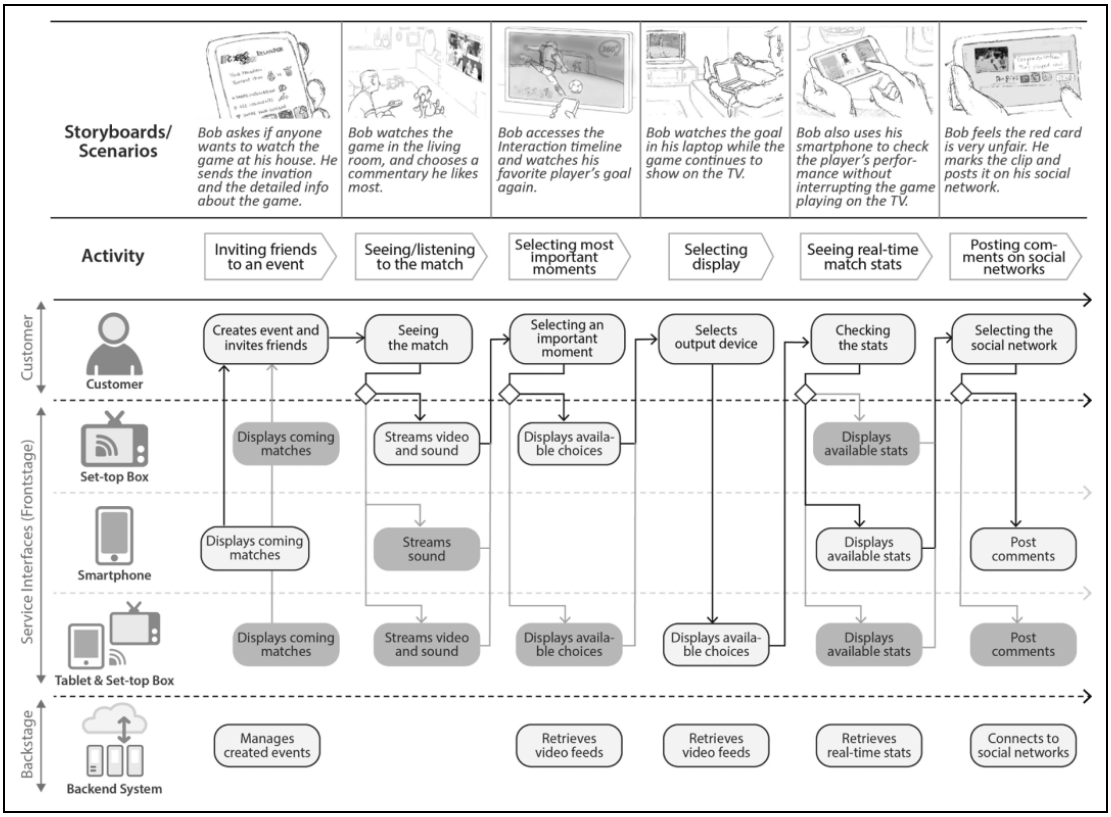

Figure 3. Football-watching service system with service system navigation and storyboarding.

design drilled down to each service encounter. At this level, contributions from the management and interaction design perspectives were integrated with service experience blueprints and interaction sketches. The interaction sketches offered a detailed view of how customers interact with the service interfaces, highlighting the visual look of the interface. Complementarily, service blueprinting described the frontstage and backstage operations that support that experience. Figure 4 shows one of such integrated models depicting the service encounter of ''Seeing and selecting match most important moments.'' This integrated model ensures that frontstage and backstage are properly aligned, such as designing match features that are effectively supported by the technology backend. In the case shown in Figure 4, the match information made available by the technology backend was portrayed in the sketches. By doing this, the model facilitates the connection with the software development team so that it can begin development with a good illustration of the desired look and functionality of the interface.

The end result of this process across the different service design levels was a new football-watching service that enabled new forms of value cocreation among the customer, the service provider, and its partners as well as among customers through social networks. By strengthening the integration between management and interaction design contributions to service design, the MINDS method facilitated the development of an innovative technology-enabled service, opening new possibilities for the design team (e.g., social networks integration). MINDS supported the orchestration of service interfaces, with a seamless transition from TV, smartphones, and tablets while also exploring new forms of simultaneous multi-interface interactions with joint use of TV and smartphones. Finally, MINDS enabled the traceability of service design decisions throughout the three service design levels, supported the collaborative work of the multidisciplinary team, and facilitated developing a service prototype (as shown in Figure 5). This service prototype received positive feedback in two rounds of user testing and in five presentations to the company during the design process, including one to prepare for implementation.

Designing a Service for Supporting Skin Cancer Patients

The second research project focused on creating a new technology-enabled service for supporting skin cancer patients and health-care practitioners. This project involved three partners: a research institution responsible for the service design, another research institution in charge of setting up the technological infrastructures and systems, and a software development company that implemented the service and integrated it into its portfolio. A broad set of stakeholders (patients, dermatologists, and primary care physicians) also participated in the different studies and in participatory design sessions.

Data collection started with a preliminary identification of key stakeholders, followed by eight in-depth interviews with dermatologists in a private clinic, a general hospital, and a

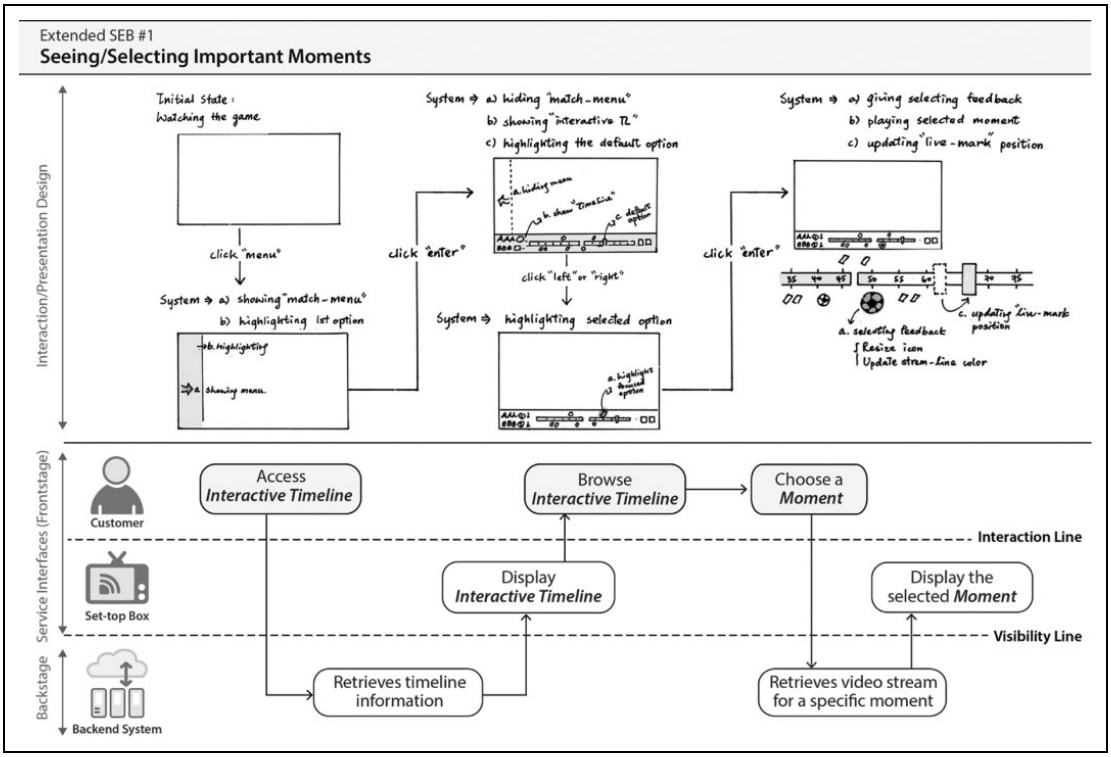

Figure 4. Service experience blueprinting and interaction sketches for the activity "seeing/selecting important moments."

Figure 5. Screen captures of the working prototype of the new football watching service.

cancer hospital. Additionally, 12 interviews were conducted with skin cancer patients and patients at a screening facility, prior to any diagnosis. MINDS enabled the development of a technology-enabled service that improved communication between patients and dermatologists by allowing patients to create and manage historical records of their moles while making them available to dermatologists. This service facilitated data collection and information sharing among patients, general practitioners, and dermatologists, enabling new forms of cocreation through these health services. Following the MINDS method, a total of three workshops were hosted at each phase of the design process and involved service designers, interaction designers, and software engineers. These meetings and workshops were documented through personal notes, versioning of the models, and photos. At the end of the project, a focus group evaluated the usefulness of MINDS.

Supporting Skin Cancer Patients Service Concept

The qualitative study enabled an in-depth understanding of the customer experience from both the patient and the physician perspectives and how these were interconnected. More specifically, it showed that fast and accurate diagnosis was the main requirement for both patients and dermatologists and significant information was missing for initial triage.

> An immediate appointment, in this kind of situation, gives a great peace-of-mind to the patient. (Patient, screening appointment at an NGO)
>
> We have lots of requests, and as our triage is based on a description of the (skin) lesion, it doesn't offer us an accurate description . . . if we received an image we could reassure (the patient), and speed up triage . . . . The most important thing is speed . . . (Dermatologist, Public Hospital)

Patients at risk of developing skin cancer needed to have regular checkups with dermatologists and follow-up on their moles in the meantime to ensure that any mutation was rapidly spotted.

> There must be more information . . . more self-assessment. (the patient) needs to know what is new, what has changed . . . sometimes we advise (the patient) to take photos (of the skin moles). (Dermatologist, Public Hospital)

The service design effort was focused on improving this routine and also ensuring that the dermatologists remained constantly updated on their patient's status. Based on the study of the patient and health-care practitioner experience, MINDS was used to create a new technology-enabled service at the service concept level. This new value proposition offered a service to support patients in their follow-up routines and to facilitate the process of sharing medical information with dermatologists and primary care physicians. New service concepts focused on facilitating information exchange to speedup triage from primary care to dermatologist treatment, improving patient self-checkups to detect early signs of cancer and facilitating relevant information exchange within the national health service through the electronic health record. As seen in Figure 6, the customer value constellation encompasses both primary and specialized care, public and private care, and support services like nongovernmental organizations that provide free cancer screening or hardware and software manufacturers. The use of the customer value constellation allowed for the visualization of the complex, many-to-many constellation of value offerings in this health-care setting. The affinity diagram was used to explore innovative service concepts that combined technology and different actors, such as sharing images with the electronic health record. With the combined use of the customer value constellation and affinity diagram, the research team was able to develop a service that integrated private and public health-care providers as well as primary care and hospital services. This was accomplished through the use of technology-enabled interfaces such as electronic health records and Web portals.

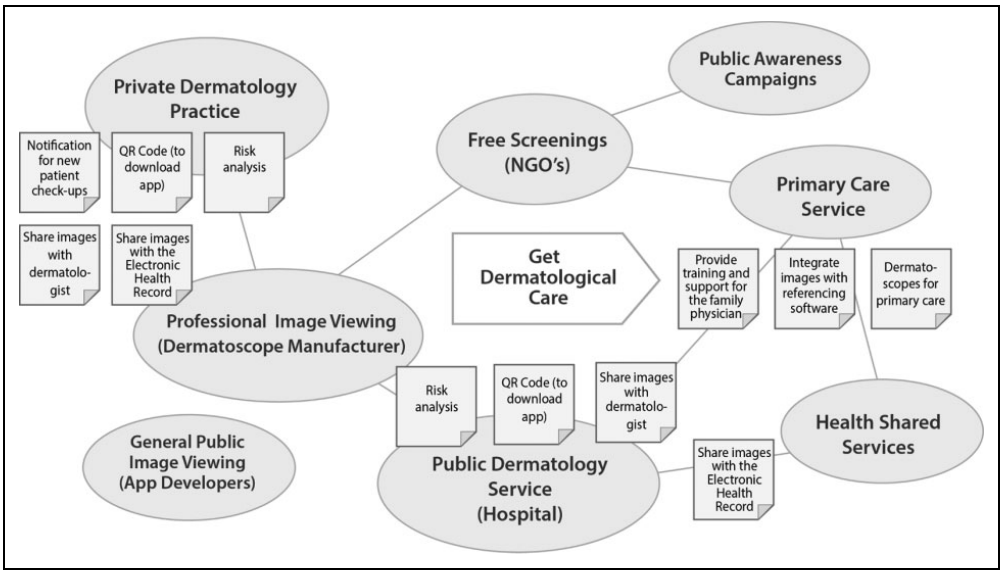

Figure 6. Skin cancer service concept with customer value constellation and affinity diagram.

Supporting Skin Cancer Patients Service System

Having defined the service concept, the service system level was designed with MINDS integration of service system navigation and storyboards. Figure 7 depicts a customer journey for a patient who monitors his or her moles for any abnormal development. According to the customer experience study, it was vitally important that such developments were quickly reported to a dermatologist to make a diagnosis.

> The patient can do the self-assessment, if the dermatologist tells him to pay attention to this or that one (skin moles) . . . and patients show up with photos and I tell them (if the development is dangerous or not). (Dermatologist, Private practice)

The service system navigation began when patients first consulted a dermatologist about a mole and continued as the patients monitored their moles regularly, sharing their photos with the specialist. This model helped the research team evaluate the multiple service interfaces and how they would support customer and health-care practitioner interactions. Taking advantage of the visual richness of the storyboard, these models were used as a communication tool among the design team as well as with a broader set of stakeholders, including dermatologists and patients. The discussion over the storyboards and the service system navigation was fundamental for orchestrating the technology and interaction aspects of the customer journey and for understanding how they connect to the other components of the service system. To ensure a timely connection between primary care physicians and dermatologists, the new service included a link to an electronic health record that shared clinical information between these health-care practitioners.

Supporting Skin Cancer Patients Service Encounter

After designing the service system across the different service encounters, the process drilled down to designing each service encounter. MINDS models at the service encounter level acted as initial low-fidelity prototypes and were used to discuss process and interaction issues, to communicate with software engineers, and to do initial user testing. Figure 8 provides an example of the service experience blueprint and interaction sketches for the service encounter of "Describing a mole" (in the smartphone interface). This service encounter includes supplying information about the mole that is important for the diagnosis. More importantly, it includes the connection to the electronic health record, which shares information between patients and dermatologists. This ensures that any dangerous change in the skin moles are detected early and acted upon by dermatologists. Finally, service prototypes were developed to engage in user testing. Figure 9 shows a service prototype of one service interface (smartphone application).

This application shows how MINDS supported the design of a technology-enabled service in a health-care setting. By integrating perspectives from different fields, MINDS acted as an interdisciplinary and cross-organization communication tool, energizing idea sharing, and ensuring that all stakeholders had a common vision about the service. Overall, this application of MINDS fostered a change from the dyadic patient–dermatologist perspective in the beginning of the project to a service system perspective where the roles of many-to-many interactions between patients, general practitioners, and dermatologists were emphasized.

Evaluation

Following a DSR approach, MINDS and its models were evaluated on their usefulness for supporting the design of

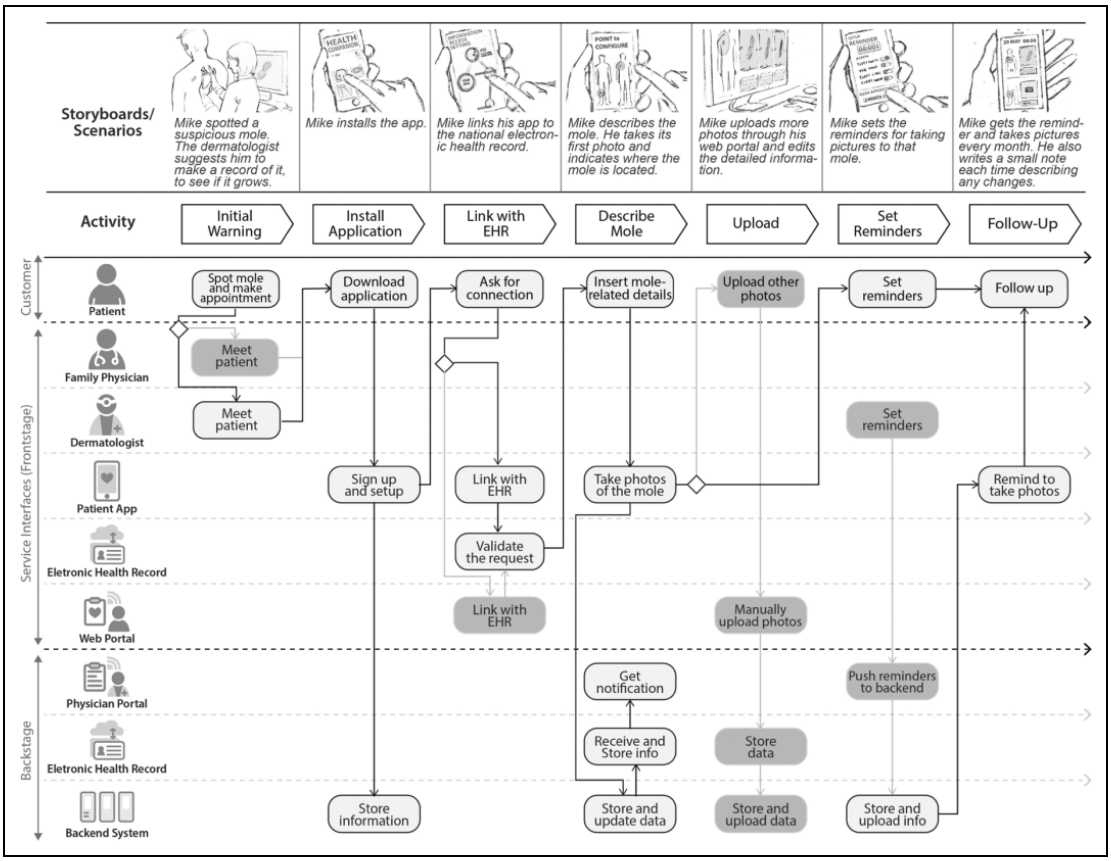

Figure 7. Skin cancer service system with service system navigation and storyboarding.

technology-enabled services in real-world contexts. First, following recommendations from Hevner et al. (2004) and Peffers et al. (2012), MINDS was validated through two applications, which show that this framework can be applied in different service contexts. These applications provide a market-based validation as a "weak market test," where companies apply the developed artifact but the artifact is still not widely adopted (Kasanen, Lukka, and Siitonen 1993). The development of the MINDS framework also follows Forlizzi, Zimmerman, and Evenson (2008) design research criteria of process, invention, relevance, and extensibility. First, regarding process, this article details the design process so that it can be replicated and improved upon and also explains the rationale for integrating service design perspectives and models. Concerning invention and relevance, the literature review shows that there is a lack of interdisciplinary models to integrate knowledge from distinct perspectives and support the design of technology-enabled services. This highlights the relevance and novelty of the MINDS method since it bridges the gap between service design's management and interaction design perspectives. The MINDS applications showed it can be used in real-world settings and supported the design of innovative technology-enabled services that create value for both companies and customers. Finally, extensibility means that knowledge created by MINDS can be leveraged and extended to different challenges. These two distinct applications with different design team structures in different service industries suggest that MINDS can be extended to other contexts.

Process, relevance, and extensibility were also evaluated through the feedback received by stakeholders and design teams. This evaluation focused on the outcome of the MINDS application (relevance and extensibility) and on the method and models characteristics (process). This continuous assessment of progress, both ex ante (process) and ex post (application) is in accordance with the Sonnenberg and vom Brocke (2012) DSR evaluation principles. As such, both applications were evaluated in a stepwise fashion throughout the process and to their end result.

The football-watching application was evaluated by three different sets of stakeholders; the service design team evaluated the method and models, customers evaluated the outcome, and the partner company evaluated the method, model, and outcomes. The partner company evaluated MINDS and the project outcomes, with a team of six people including the regional CEO, marketing, software engineering, and new product/service development departments. This company team participated in the design process and provided feedback at five different moments. After the data collection and analysis, this

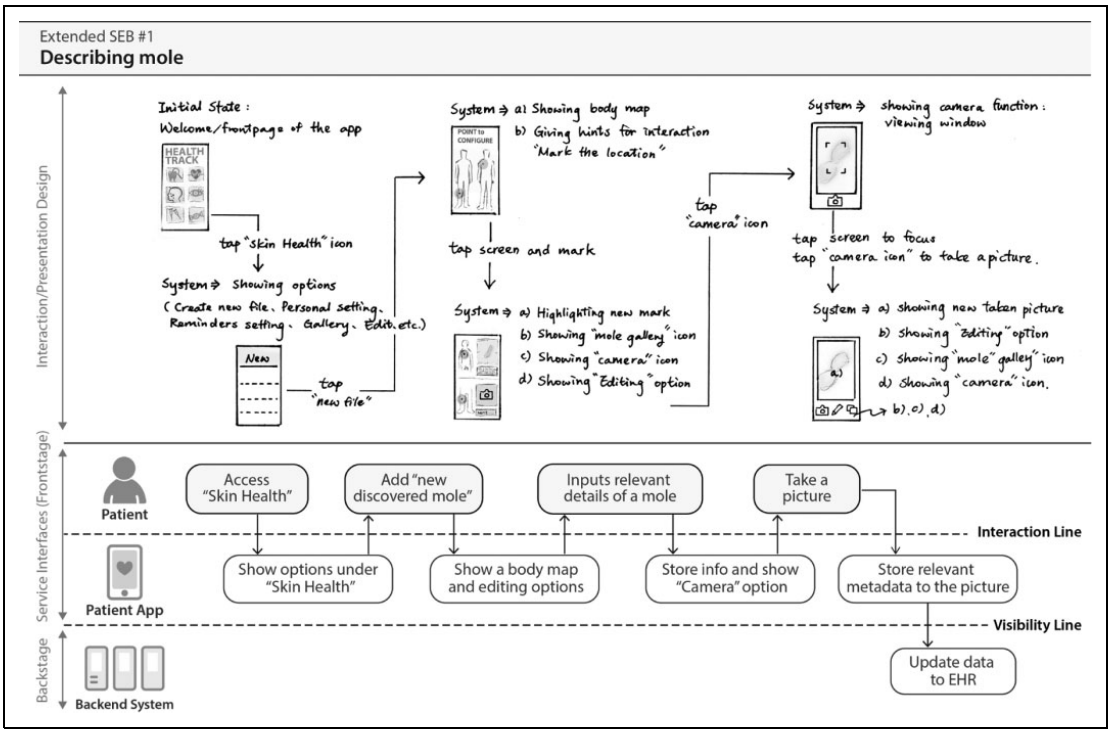

Figure 8. Service experience blueprint and interaction sketch for the activity "describing a mole."

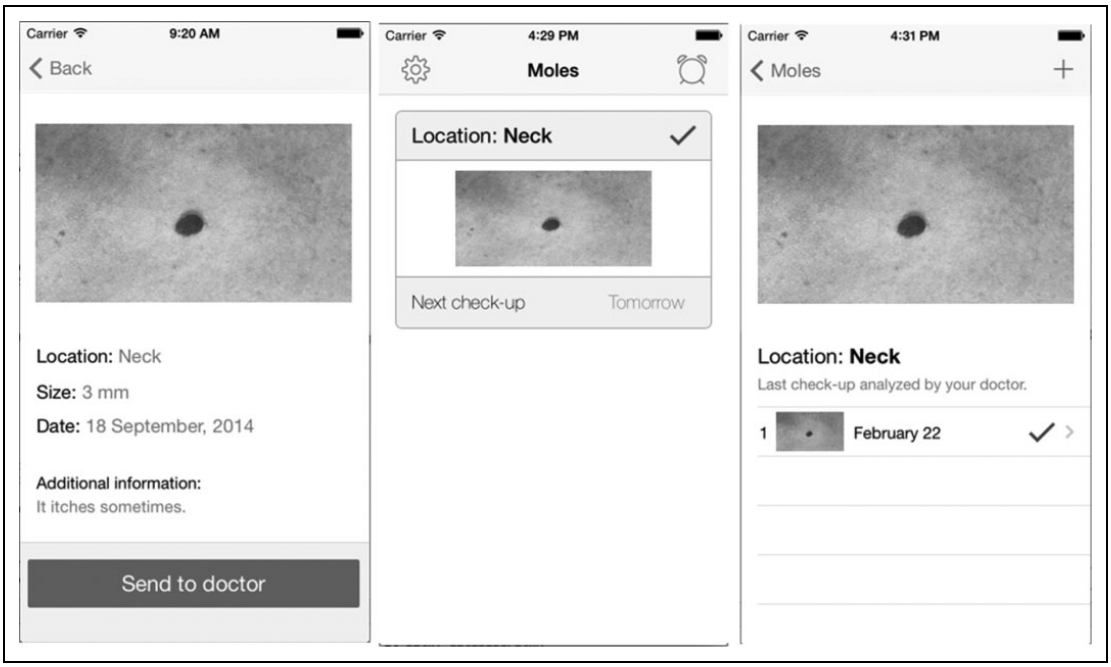

Figure 9. Screen captures of the working prototype of the service to support skin cancer patients.

team assessed the customer experience information collected and supported the definition of the new service concept. In this stage, the partner company wanted to ensure the customer experience was accurately captured and depicted, emphasizing the need for having structured models to guide the process. This led to the initial focus on service design models. The definition

of the new concept with the company team followed a rather haphazard process at first, prompting the need to seek more systematic alternatives, such as affinity diagrams. The company team later provided feedback on the service prototype at the regional and corporate level. Finally, in a workshop with the new product/service development team, the service design architecture and blueprints were discussed, and the need to have more details on the interaction process was emphasized. This was to ensure, for example, that the process was simple enough to be carried out with the set-top box remote. This feedback led to integrating the interaction sketches with the service experience blueprint.

The service design team held a focus group to discuss the strongpoints and shortcomings of the models, resulting in changes in their structure. These included reflections on using affinity diagrams over other alternatives and their integration with the customer value constellation. Finally, customers were involved in three rounds of user testing that evaluated the service prototypes. This evaluation resulted in changes to the interaction process and interfaces across different channels (tablet, smartphone, and set-top box). The focus of this user testing was on MINDS' outcome, but it also validated the usefulness of its models for documenting and providing version control across the various changes suggested.

In the skin cancer service project, MINDS structure and process was already mature, so its main contribution concerns its extensibility to other contexts and its ability to drive interdisciplinary work. In this project, the service design team met monthly with the other partners during 18 months to facilitate each step of the service design process. Adding to these meetings, three workshops were done to design the service concept, design the service system, and assess the usability of the service prototypes. MINDS was used throughout these meetings and workshops and adequately supported the design process by allowing a common understanding of the problem and a way to discuss the possible solutions. For example, at the workshop dedicated to discussing the service system (after analyzing the set of customer activities), it was decided to include an activity for giving useful skin cancer information across the different interfaces. After ample discussion, the storage of the skin mole photos was changed from a dedicated cloud storage space to a nationwide electronic health record. Discussion of these issues was done through MINDS models. In the end, a focus group with 10 participants from the three participating partner institutions was held to evaluate the use of the models. They were found to be integrative, easy to understand and use, and a great communication tool for involving numerous stakeholders.

> I found it interesting (the method) . . . it enabled the participation of all stakeholders . . . We usually say that we study, analyze, etc. but we don't actually reach towards the users. . . . (In that meeting) we contributed with new ideas which are, in fact, being implemented. (Director of the software development company)

MINDS was positively evaluated regarding its context of implementation and its utility for the service design process. Its contributions are discussed in more detail in the next section.

Research Contributions

This article presents MINDS, a new interdisciplinary method that improves service design and service research by advancing the design of technology-enabled services through the integration of management and interaction design perspectives, using DSR methodology.

According to Gregor and Hevner (2013) DSR contribution framework, MINDS contribution can be positioned as an improvement, that is, a better solution for a known problem and context. The challenges addressed by MINDS were identified along with an assortment of models with different but complementary characteristics that are often used in isolation. MINDS offers an improvement over these models, namely, MSD and interaction design models by integrating them. This holistic approach makes technology more visible, enables better orchestration of interfaces, facilitates better integration with backstage processes and network partners, and advances service design as an interdisciplinary field.

From a service research perspective, MINDS integrates service design multidisciplinary contributions across the three levels of service design introduced by Patrício et al. (2011), bringing a holistic and system thinking perspective so that technology effectively enables value cocreation. At the service concept level, it employs the customer value constellation to explore new forms of value cocreation and affinity diagrams to brainstorm and detail new service ideas. This integrated model supports creating new value propositions in creative and structured ways, which contribute to service innovation. The inclusion of the interaction design perspective also brings technology to the strategic level.

At the service system level, this method integrates service system navigation with scenarios and storyboards to illustrate the customer experience with different service interfaces and actors. The integration of these models handles the complexity of designing service systems with multiple technology-enabled interfaces for a seamless customer experience and enables tighter connection between frontstage design and backstage operations.

At the service encounter level, MINDS synthesizes service experience blueprints and interaction sketches, thus providing early low-fidelity prototypes that are linked with the service provision process. This model ensures that technology-enabled interfaces follow appropriate interaction design guidelines and fit backstage operations and system architecture. Due to its stronger visual elements, it also supports and improves communication with stakeholders and other fields, namely, software engineering.

This article presents service design applications in two different industries that show MINDS method and models' applicability and ability to solve organizational problems. These applications in media and health care show how MINDS is able to build upon customer experience information and design

innovative service concepts that leverage technology to cocreate value: (1) a football-watching service that improves experience by combining information, social, and interactive features across several service interfaces and (2) a skin cancer prevention service that goes beyond the dyadic relation between patient and physician to establish a network of actors (patient, primary care physician, and dermatologist) that share information and are able to diagnose early signs of skin cancer. These applications had different design team configurations and addressed different challenges in distinct industries. In both applications, MINDS supported the design of the service system to orchestrate people, technology, and other resources to create value and support a seamless customer experience across service encounters and interfaces. Also, the MINDS method supported stakeholder involvement and communication by offering a structured design process and a set of models that highlight the interplay between strategic and operational levels and between service process and aesthetics. These characteristics (the structured design process and the set of models that are accessible to different stakeholders) make MINDS potentially extensible to many other contexts.

By integrating perspectives from different areas, MINDS advances service research as an interdisciplinary field. Originating from different areas, models from service design's management and interaction design perspectives have distinct but complementary characteristics. When combined through MINDS, these models provide a holistic approach to the design process and offer a shared language for multidisciplinary design teams. Such shared models improve team communications and outcomes (Griffin and Hauser 1992; Sarin and O'Connor 2009).

Finally, this article contributes to service design research by applying a novel methodology recently introduced to service research by Beloglazov et al. (2015) and considered valuable for this field by Ostrom et al. (2015). From a DSR perspective, MINDS can be positioned as a nascent design theory that introduces new methods and models that are abstract and generalizable, along with representations that show the models ability to solve real-world problems (Gregor and Hevner 2013). Overall, MINDS leverages technology and service design to advance service, support service innovation, and enable a seamless customer experience.

Conclusion

MINDS integrates complementary perspectives (management and interaction design) and advances service design as an interdisciplinary field. MINDS also has limitations and offers opportunities for future research that require discussion.

Regarding limitations, the MINDS method and models are not optimized as the best possible combination of methods and models. Instead, MINDS provides an improvement over existing methods and models that advance research and solve organizational problems. Also, Gregor and Hevner (2013) emphasize that evaluating improvement contributions is a challenge and requires a deep understanding of the problem so that new solutions are genuine advances to the field. Evaluation was also a challenge for MINDS. This required a solid theoretical background and a strong involvement of all stakeholders during the application to reflect on the outcomes and on the method and models that were being developed. Due to the iterative and participatory nature of the service design process, it was sometimes difficult to understand and fully document how these contributions evolved. As such, further research using DSR methodology should carefully develop an iterative evaluation throughout the research process (Sonnenberg and vom Brocke 2012).

Regarding future research, applying MINDS in other service industries and contexts can strengthen the method by identifying potential extensions such as the conceptualization of additional perspectives (e.g., information technology architecture, software engineering) and integrating other models by substituting, adapting, or extending the current proposal. For example, while MINDS focuses on integrating management and interaction design perspectives, it provides contact points with software development at the service encounter level by specifying interfaces through interaction sketches. An expansion of these models toward software engineering could facilitate the deployment of designed services.

New challenges posed by emerging technologies, such as the Internet-of-Things and context-aware systems, can also stimulate further improvements and adaptations of MINDS. Smart service (Wünderlich et al. 2015) involves context-aware systems that are able to read, interpret, and adapt their operation without human intervention to provide the most appropriate service and the best experience for each situation (Baldauf, Dustdar, and Rosenberg 2007). These context-aware service interfaces, or dynamic service interfaces (Teixeira et al. 2013), will require appropriate models that can leverage their abilities, ensuring that their autonomous operations provide seamless customer experiences. In addition to exploring further connections with technology, better integration of employees and customers can render important inputs for further extensions of this method, especially as understanding how technology changes the role of customers and employees in service provision becomes more important (Ostrom et al. 2015).

Finally, MINDS stresses the applicability of the DSR methodology in service research and opens the field for more research using this methodology. As service research and service design better integrate multidisciplinary contributions, new opportunities for the development of new methods and models arise. DSR can bring the necessary structure and rigor to these efforts while retaining a design thinking approach.

The MINDS method bridges management and interaction perspectives and provides structured, systematized, and visually rich models for designing technology-enabled services. Also, two applications of MINDS to very different service industries support the potential robustness of this method in other service settings. Hence, the MINDS method is well positioned to leverage the value-creating capabilities of technology and fuel service innovation. Future research

can apply MINDS to enable such technology-enabled service innovations.

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