Multi-Touchpoint Design of Multimodal Healthcare Services

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Abstract

The purpose of this paper is to identify research themes and outline a research-through-design project that will explore opportunities and challenges in human-centred multi-touchpoint design for multimodal emergency calls, healthcare counselling, and elderly patient monitoring. Relevant research areas for the project include multimodal user interfaces and interaction, transmodality, accessibility, and multi-touchpoint user experience (UX) and service design. Research questions will primarily focus on opportunities and challenges of interaction and visualisation; dialogue and communication; and operations and organisation. On a higher level, beyond the specific case, the overarching research questions concern what roles modalities play in multi-touchpoint UX and service design. The knowledge contribution is a better understanding of how different modalities can be designed, employed, combined, and transduced in and between multiple touchpoints.

Author Keywords

Multi-touchpoint design; Experience design; Service design; Multimodality; Transmodality; User experience.

Introduction

In Sweden, 3.8 million calls are made every year to the emergency number 112. The health counselling service 1177 Vårdguiden has 7 million visits every month at their website and about 500.000 phone calls. The sheer volume indicates that there are large benefits to be made with improvements to the existing services. The ubiquity of smartphones and tablets provides opportunities to improve counselling and decision making in emergency response, healthcare, and monitoring of elderly patients. One such opportunity is to use video and photos as well as wearable Internet of Things (IoT) devices, including sensors, and integration with smartphones and online services. It could provide possibilities to better counselling, and provide valuable information to make a better dispatch decision, and more effective information while the patient awaits an ambulance. A related area is manual and automatic monitoring of alarms in elderly care, especially in such situations that require a decision of appropriate procedures and whom to alert.

We are currently participating in a distributed research environment that aims to study how the multimodal functionality of smartphones can be used, in integration with information on the web, and personal contact with voice and image. We are looking into image-supported and video-based emergency calls, video-based health counselling with sign language interpretation, and IoT solutions including different sensors and actuators to support chronically ill patients in their homes, by for example making it possible to asses vital parameters such as breathing and degree of consciousness. We need to develop a human-centred design approach for the development of new functionality in this area. Such solutions are today largely technology-driven, because of the rapid technological development. This kind of safety critical technology should, however, build on an overarching idea of needs among multiple stakeholders (service providers and citizens alike) that interact at multiple touchpoints, and through various channels that allow for different sensory modalities (i.e. sound, sight). It should allow for dynamically adapting services to new technological possibilities and actual user and consumer experiences and behaviours, while taking multiple touchpoints, stakeholders, and channels into the account.

The purpose of this paper is to identify research themes and outline a research-through-design (RtD) project that will explore opportunities and challenges in human-centred multi-touchpoint design for multimodal emergency calls, healthcare counselling, and elderly patient monitoring.

Survey

Relevant research areas for the project include multimodal user interfaces and interaction, transmodality, accessibility, and multi-touchpoint user experience (UX) and service design.

User interfaces (UIs) are today primarily visual, but in the area of emergency calls, healthcare counselling, and elderly patient monitoring the phone has been the main channel of communication. This means that audio plays an important role. Smartphones can also offer haptic feedback through vibrotactile feedback. The interaction that humans have with the world and with other people has always been multimodal [1]. User studies have been made to test combinations of graphics, audio, and haptics to measure changes in user proficiency or satisfaction [2]. A working hypothesis is that content across modalities generally is complementary rather than redundant [3]. However, the exact semantics of cross-modality content is poorly understood.

UIs that can be transformed into different modalities without losing meaning, and where users can move between modalities along the course of interaction, can be said to have a *transmodal design* [4]. Safety-critical interaction, such as emergency calls, require rapid comprehension of unforeseen chains of events, for which a transmodal design offer opportunities. Such design plasticity also requires preservation of the usability in the shifts [5]. That adaptation involves deciding what modalities that can be used [6]. There are however asymmetrical difficulties related to information available in transitions between modalities [7]. This gives rise to modulations of meaning as the interaction moves between modalities [8]. This implies that inter-modal transformations are necessary as a user move between modalities [9, 10]. How to design such transformations remain unclear.

Making emergency calls, health counselling, and elderly patient monitoring multimodal has the potential for more efficient communication, but it can also improve or enable communication for people with sensory impairments. Accessibility can hence be seen as a multimodal design issue [9, 11]. People with blindness often use Braille displays and display magnification. Video calls that offer possibilities to use sign language, lip reading and facial expressions for people who hearing loss. People with hearing and speech impairment often also use texting applications (instant messaging), and text telephony. Interpreters at a relay service play an important role in communication with people without impairments. The term *total conversation service* is sometimes used, and it is defined as: "An audiovisual conversation service providing bidirectional symmetric real-time transfer of motion video, text and voice between users in two or more locations. [12]" If only video and voice are supported, then it would instead be called a *videophone service*.

Designing applications and services for emergency calls, health counselling, and elderly patient monitoring involves not only multiple channels with multiple modalities, but also multiple touchpoints, and multiple stakeholders. A design approach needs to take such a constellation, or ecosystem, of services and touchpoints into account. This is a non-trivial issue and it is not linear, which makes value chain analysis difficult. It requires instead stakeholder mapping of value constellations [13]. The introduction of a new technology to the value constellation can propagate effects for the entire constellation. The relations between stakeholders can explain resistance to adoption, as well as provide opportunities co-creation of value.

As a citizen experiences a health issue, he or she will approach one of the service providers in the value constellation (i.e. make a health counselling call), but his or her journey will not end there. The call is but one touchpoint in the journey. Customer journey mapping will be important to understand the context and of changes made in one touchpoint in relation to other touchpoint, to make sure that the experience harmonize throughout the journey [14]. Service blueprints will be useful to describe all components, actions and interactions involved in the service delivery, back office as well as frontstage.

Particular touchpoints can be designed using roleplaying and prototypes of various fidelity, but other design techniques such as scenarios and storyboards may also fill a role.

Research Themes
With this paper we wish to discuss emerging research themes in relation to multi-touchpoint design of multimodal emergency call services, health counselling services, and monitoring of elderly patients in the home. The planned

- How are work processes and operators work environment affected?
- How should difficult clients and potential threats be managed in different channels?
- How do communication impairments affect the dialogue, and what are the consequences for design?
- Are there communication problems that are associated to critical situations?
- What are the consequences of using and synchronizing different modalities within and between touchpoints?
- Are there differences in the customer journeys for different kinds of cases and kinds of user groups?
- How are the expectations on and experiences of counselling, diagnosis, and treatment affected by a multimodal service?

project will focus on opportunities and challenges. In the sidebar, examples of potential research questions are presented. On a higher level, beyond the specific case, the overarching research question is what roles modalities play in multi-touchpoint UX and service design.

Method
Research-through-design will be the overarching approach. The cases will be selected to cover the three domains: emergency call services, health counselling services, and monitoring of elderly patients in the home. This research is still not performed, which means that our descriptions of the method remain quite abstract.

Preliminary Results
A stakeholder mapping of value constellation will include the relations between policymakers, technology businesses, citizens (including patients and their relatives), patient monitoring services, health counselling providers, emergency call providers, ambulance operators, primary healthcare, and emergency healthcare. Such a large constellation of stakeholders points towards the complexity of the domain. All these different stakeholders bring value-in-use to the citizens, and there are dependencies between them. The introduction of a new technology to this constellation will most likely propagate effects. The question is how.

A customer journey can take multiple paths through touchpoints including IoT devices, smartphones, tablets, webpages, phone calls, and video calls. The development we plan for builds on the need to efficiently manage personal contact touchpoints over the internet in emergency situation. These situations are unfamiliar for the person contacting the service, and he or she needs a secure and personal contact. The person who makes the call is often a first-time user of

the service, is stressed and nervous, and may have a permanent or temporary impairment. There is potentially a need to be able to visualize an injury or symptom. Emergency calls require rapid decisions, while health counselling can be slower. Monitoring solutions can be tried out without time-pressure in the home.

Standard solutions should be used that can be adapted to the developments on the market and the prioritisations of the customers for the envisioned services to work. Different touchpoints need to be integrated so that people in less acute situations can search for help on the web, and perhaps employ chat and personal contact if necessary. A customized customer journey could include documentation of answers, and personal emails, or links to information on the web.

It is important for the frontline staff that answers an emergency call that the call gives a solid foundation for decisions. It also has to be efficient, so that the call does not take too much time because of the load of calls. Systematic conversation protocols (i.e. a template to structure the conversation) give better possibilities for traceability of decisions. There may be a trade-off between impersonal contact with a focus on facts, and the establishment of a trusting relation required to give counselling.

We have, in relation to emergency video calls and health counselling, identified a set of challenges where potential solutions need further studies. The challenges belong to the following three categories:

- Interaction and visualisation
- Dialogue and communication
- Operations and organisation

Future Work

The project will be organised as part of a distributed research environment, it will complement existing pilot projects with field testing at 1177 Vårdguiden and 112 emergency calls. We will build knowledge by investigating how users and service providers react in emergency or counselling calls, given effects on work organisation, roles, technical solutions, and interaction between stakeholders. The results will consist of a series of design cases that are analysed with a focus on how different modalities are employed in multiple touchpoints and how they can facilitate communication in emergency calls, healthcare advice, and monitoring of elderly patients. The knowledge contribution is a better understanding of how different modalities can be designed, employed, combined, and transduced in and between multiple touchpoints in the healthcare domain.

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