Health Is Silver, Beauty Is Golden?

How the Usage Context Influences the Acceptance of an Invasive Technology

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Abstract. The acceptance of novel technology is one if not the most decisive component of the success of the technology rollout. Though, acceptance criteria differ not only across the diversity of users, but might also differ across the different usage context. This is especially valid for technologies in the health and beauty context, in which the balance between pro-using arguments and contra-using arguments is especially fragile. This paper focuses on the impact of the context towards the motivation to use an invasive technology. A survey was conducted in which 170 participants of a wide age range (17-89 years) took part. In the study, three different usage scenarios were presented (medical scenario, preventative healthcare scenario and beauty scenario). After an introduction into each scenario the participants had to evaluate usage motives and barriers. The results corroborated the impact of the situational context and the dependency of acceptance outcomes on the reasons for which technology might be used. Overall, acceptance was highest for medical technology and lowest for the beauty context. Considering the single reasons for or against the technology, we find that nature and weighing of perceived barriers and concerns are quite similar, independently of the context.

Keywords: invasive, usage context, motives and barriers, medical technology, beauty, cosmetic surgery.

1 Introduction

Acceptance is indispensable for a successful technology implementation in society. Therefore, technology acceptance research has become very important in the last years, especially in the healthcare section [1, 2].

The healthcare context is very sensitive for people, as it is connoted with attributes such as vulnerability and illness. Especially in times of demographic change, the need for technical and medical assistance is increasing. Due to increased life expectancy, more and more old and frail people will need medical care in the near future, while increasingly fewer people are able to take over the nursing [3, 4]. Thus healthcare devices have to meet many more requirements compared to e.g. conventional ICT-devices. Integration of the user in the development process of such technologies is indispensable for a successful implementation of a medical device.

So far, acceptance research has provided rich information regarding the question under which circumstances users might accept information and communication technology in the working context. Regarding medical technology acceptance, there is much less information available, relating to the fact that the acceptance decision comprises more sensitive facets [5, 6]. Recent work in this area revealed that medical technology acceptance is a fragile concept, relying not only on individual factors (e.g. age, gender, culture, health status and technology experience), but also on the trade-off between perceived benefits and barriers [7-10].

Not only user aspects and perceived benefits and barriers are important to understand users' acceptance towards a technology. As several studies have shown, also the type of technology influences acceptance [11]. For example, very recently it has been shown that medical devices worn close to the body (e.g. wearables) or even implemented within the body (e.g. medical stents) are perceived controversial. One of the major reasons is a global fear of surgery and the concern about physical vulnerability [5]. When looking at the increasing frequency of cosmetic surgery, and the high willingness – especially among women – to accept surgeries for cosmetic and beauty reasons it is not easy to understand why the risk of surgery is so negatively biased in the medical invasive technology sector. It is therefore worth investigating in how far the usage context determines the refusal of invasiveness.

2   Questions Addressed

The empirical study dealt with in this paper reports on the impact of the situational usage context on technology acceptance, focusing on body-related invasive medical technology as an example. Different from previous studies, which showed the impact of user diversity [7-10], type of technology [11] and the difference between medical technology and information and communication technology [12], this study focuses on impact of using medical technology in a beauty contrasted to the health context. The aim is to show how the using context influences the evaluation of using motives and barriers taking an invasive chip as example.

Based on the fact that there is a global fear of surgery and the concern about physical vulnerability in the context of medical technology on the one hand, and an increasing frequency of cosmetic surgery on the other hand, three scenarios were chosen, in which participants had to evaluate the usefulness of one and the same technology in different scenarios: a medical scenario, second a scenario of preventative healthcare and third a beauty scenario.

Concerning the validity of the finding, it is of pivotal importance whether the acceptance towards a technology is examined in a sample with people who have already had a cosmetic surgery, because one could otherwise argue critically that people without would evaluate an invasive technology in a beauty context in a different way. This refers also to chronically ill patients, or patients who already use (invasive) medical technology. In order to get a valid sample, healthy people, people with a chronic disease and people that already have experience with cosmetic surgery

were included in the sample. Thus the influence of users experience could be controlled.

3   Methodology

3.1   Procedure and Approach

A survey was conducted to evaluate the influence of different usage contexts on the motivation to use a medical device. Three scenarios relating to different situational contexts were introduced, in which participants had to evaluate the benefits and barriers of the same technical device in the respective using situations.

In the first scenario (medical scenario), participants were asked to assess their motivation to use an invasive medical stent to assist them in case of a chronic disease. The second scenario related to preventative healthcare. The participants were asked to imagine the use of an invasive chip for medical monitoring. In the third context the technology was used for beauty purposes. In this context the chip had several features for beauty purposes, e.g. to control weight or prevent hair loss.

3.2   Sample

170 participants (60% female) of a wide age range (17-89 years) took part in the survey. They responded to 16% of the participants had already had a cosmetic surgery and 17% of the sample reported to be chronically ill. The participants—invariably native German speakers—were recruited by means of posters in public places and partially by word of mouth using our existing social networks. Even though education levels across participants varied, the majority of the sample reported to be well-educated (high school level and above).

3.3   Questionnaire

The original questionnaire included a larger number of items. Here, just the relevant variables will be presented.

Independent variables The independent variables included mainly the demographic data, including age, gender, level of education, chronically diseases and if one has already had a cosmetic surgery.

Dependent variables The dependent variables consisted of using motives and barriers. The section 'using motives' comprised 14 statements that had to be answered on a six-point-scale Likert-scale (1 = total disagreement to 6 = total agreement). Items regarded different motives for the use of a chip in each scenario (e.g. absolute necessity, quality of living, staying mobile and safety aspects).

The section 'using barriers' comprised 13 items, which also had to be answered on a six-point-scale (1 = total disagreement to 6 = total agreement). The using barriers included a wide range of different aspects against the use of an invasive chip, such as

worries about side effects, the fear of increasing dependency on the technology, and long-term risks.

The different motives were taken from focus groups interviews, which were carried out prior to this study. As the sensitive topic might be very controversial, evoking both, benefits and barriers at the same time, we were interested in gathering deeper insights in order to reveal individual argumentation and cognitions, which are more likely to be reflected in focus groups barriers [5, 7].

4   Results

The results of this study were analyzed by multivariate analyses of variance with a level of significance set at 5%. In order to control the influence of experience with cosmetic surgeries and chronic diseases, these two subgroups were compared with the results of the whole sample. For this reason, an analysis of variance was conducted. Comparing the results of evaluation of motives and barriers between the subgroups and the whole sample, results revealed no significant differences. Because of that, in the result section the whole sample is considered.

The result section has three main parts: at first, using barriers and motives were analyzed for the whole sample for which we summed up the single items of each context. Second, the single items of using motives and barriers were considered. Third, the influence of age and gender was assessed for all contexts.

4.1   Motives and Barriers

For the analyses of the using motives and barriers, first the sum of the single items was calculated for each context (see fig.1).
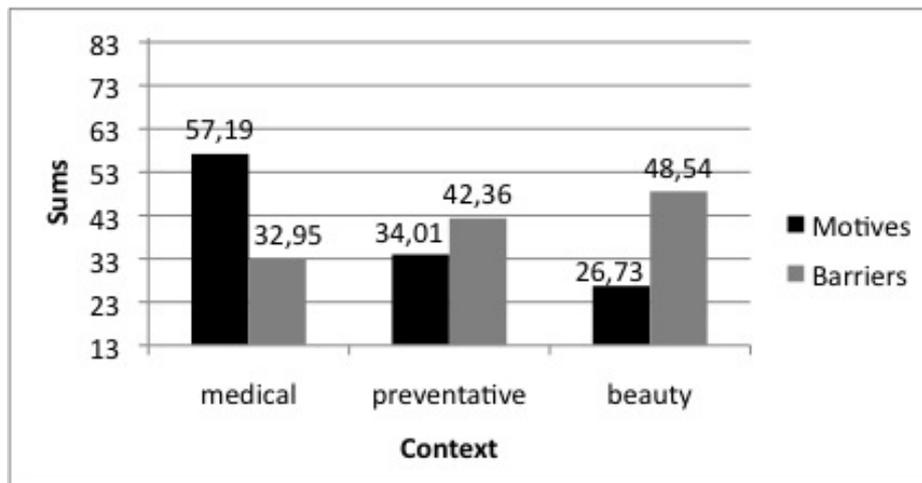

Fig. 1. Sums of motives and barriers in all contexts

As can be seen there, the using motives in the medical context show the highest agreement in average (M = 57.19; SD = 11.1), while the beauty context shows the lowest agreement (M = 26.73; SD = 13.0; N = 137). On the other side, the refusal as measured by the agreement to the barriers is highest in the beauty context (M = 48.54; SD = 13.3 N = 118) and lowest in the medical context (M = 32.95; SD = 10.3; N = 107). It therefore follows, that the using motivation in total is highest for the medical context and lowest in the beauty context.To answer the question if there is a general tendency to agree to the motives or the barriers independently of the context, an ANOVA (repeated measurements) was performed, showing a significant difference in the using motives depending on the context $F(2,117) = 194.38$, p =.00). The same significant result was obtained for the barriers $F(2,120) = 71.37$,p = 00).

4.2   Single Reasons for and against the Technology

Considering the single reasons for or against the technology, we find that nature and weighing of perceived barriers and concerns are quite similar, independently of the context (see fig. 2).
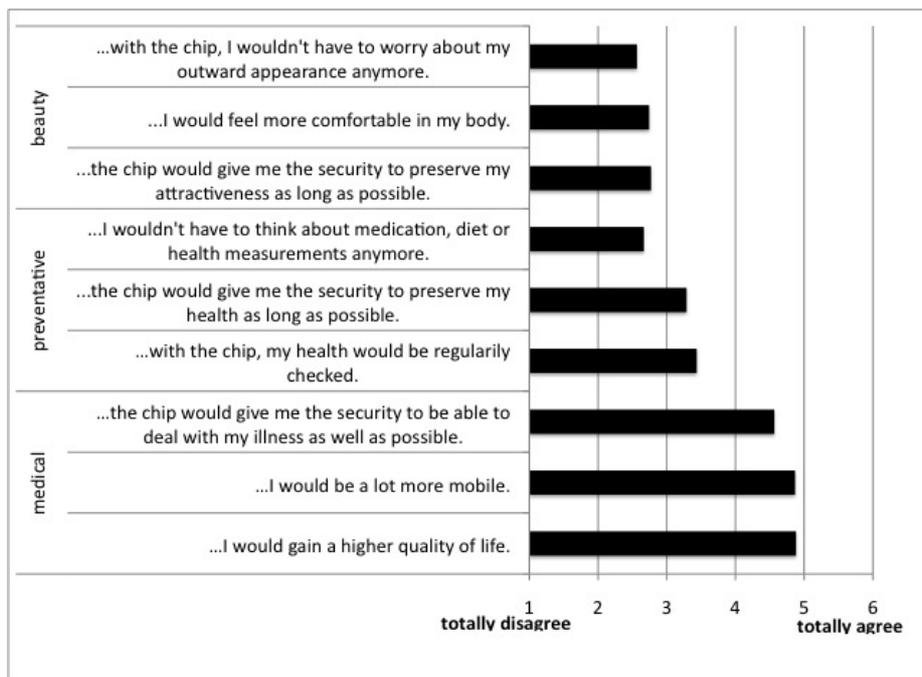

Fig. 2. Most important barriers

Across all contexts, it appears that worries about side effects (medical: M = 3.6, SD = 1.27, N = 137; preventative scenario: M = 4.1, SD = 1.31, N = 118; beauty scenario: M = 4.6; SD = 1.36, N = 107) and assumed long-term risk (medical: M = 3.4, SD = 1.36, N = 137; preventative scenario: M = 4, SD = 1.35, N = 119; beauty

scenario: M = 4.5, SD = 1.36; N = 107) are the strongest arguments against using the chip. In the beauty and preventative scenario, another important using barrier is the fact that the chip is not evaluated as especially useful (preventative scenario: M = 4.56; SD = 1.35; N = 117; beauty scenario: M = 4.9; SD = 1.26, N = 107). In the medical context the fear of dependency on the technology is an important barrier for the test persons (M = 3, SD = 1.31; N = 136).

In contrast, the perceived benefits and hopes for technology usage differed considerably across using contexts. While in the medical context the most important using motives relate to the quality of living (M = 4.8, SD = 0.89; N = 136), staying mobile (M = 4.8, SD = 0.9; N = 136) and safety aspects (M = 4.66, SD = 0.96; N = 136), in the context of preventive healthcare health control (M = 3.44, SD = 1.51; N = 117) and the decreasing need of thinking about healthcare monitoring (M = 3.44, SD = 1.51; N = 117) are most important (see fig. 3).
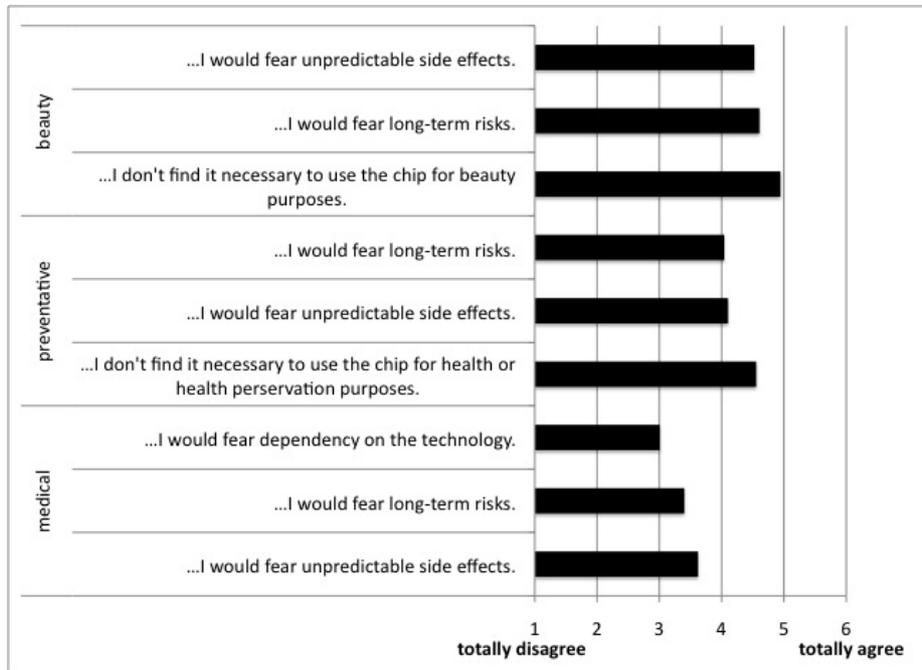

Fig. 3. Most important motives

Finally, in the beauty context, the most important usage motive are safety aspects (M = 2.77, SD = 1.62; N = 105), well-being (M = 2.74, SD = 1.66; N = 105) and decreasing worry about attractiveness (M = 2.57, SD = 1.15; N = 103). These results show that the worries and barriers about the technology are independent of the context. However, the ranking of the motives and benefits depends on the using context.

4.3   Impact of Gender and Age on Acceptance

Taking account the different user characteristics, we investigated the influence of age and gender regarding the evaluation of using motives and barriers in each context.

The analyses of variance showed that there is no significant influence of gender on the agreement with the using motives in each context. The same result was found for the using barriers. However, a correlation analyses showed a significant correlation between age and the using barriers in the preventative scenario (r= -. 191, p<0.05). Thus, the younger participants of the sample reach higher values in the evaluation of the using barriers in the preventative scenario.

5   Discussion and Conclusion

This study focused on the influence of the usage context on the motivation to use an invasive stent. Therefore, a medical, a preventative and a beauty scenario were presented in a survey. The participants were asked to evaluate potential arguments for and against the use of an invasive medical stent for each scenario.

The starting point of the study was the assumption that technology acceptance is neither static nor independent of the specific usage context as it had been conceptualized in traditional acceptance models [15]. In contrast, technology acceptance must be regarded as a fragile construct, which is highly sensitive to perceived benefits and barriers of a diverse user group as well as usage-context driven and situation-specific evaluations. This is not only observable in highly controversial technologies, but also and especially in the medical sector. Here, humans' vital fears regarding bodily harms and the exceeding of personal limits is of pivotal importance as well as the consideration of individuals' needs to protect intimacy and privacy. In addition, regarding the trade-off between health and beauty, also ethical considerations might play a role.

In general we could show that the using context has an impact on the motivation to use an invasive technology. This applies for the using motivation and barriers overall, as well as for the single items.

As found, participants evaluate usage motives and barriers depending on the context.

It could be shown that the acceptance, measured by the agreement to the usage motives and the negation of the usage barriers, is overall highest in the medical scenario and lowest in the beauty scenario. Hence, the results show that the respondents were most willing to accept bodily harms and violation of body limits when this was necessary for the treatment of a chronic disease. Considering the evaluation of the single items, the most important arguments for the use of the invasive chip are security issues. Security was also the most important barrier, including the fear of bodily harms by a medical technology.

Considering the impact of gender, no significant influence was found. However, we found that age and the using barriers in the preventative scenario correlate significantly. From this it follows that younger persons are more likely to agree with the arguments against the use of a medical invasive stent for preventative purposes

than older adults. This is probably due to the fact that younger people may not be as familiar with preventative issues as older people.

6   Limitations and Future Research

As the present study had a strong exploratory character, a number of research questions were uncovered. Still this kind of research, touching social and technical issues in the medical sector, is just at the beginning with many possible influential factors that have not been regarded so far. Even if the presented results are insightful, a cautionary note has to be considered regarding methodological specificity, and the basic vulnerability to artifacts. The results described and discussed here are based on a questionnaire method. Being asked evokes attitudes, which might reflect cognitions, and attitudes of participants, however, the gap between what humans think and what humans actually do is a well-known and vastly documented psychological phenomenon [16]. Future work should therefore integrate more experienced users of both contexts (i.e. older users and frail persons as well as people with experience in beauty surgery) in order to supplement the investigation of "anticipated usage scenarios" by "actual usage experience".

Another limitation regards the comparatively high education level. We cannot exclude that the findings can be transferred to persons with a lower education, and different values, norms and attitudes as well as another economic status which might impact the openness to medical technologies in both contexts, health and beauty.

In addition, the findings must be regarded as strongly culture-specific. The role of the body, the value of medical treatment or the possibility of beauty surgeries must be related to cultural and societal norms which are not only impacted by the mechanization level of a society, but also on the economic status and the well-being of citizens. Furthermore, even if gender was not revealed as a decisive factor in the sample studied here, it should be taken into account that gender roles and the conceptualization of interdependence and relatedness do considerably differ across countries and cultures, respectively. Finally, the extent of religiousness and the normative power of responding to religious norms in cultures could also represent a valuable research topic.

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