"Same Same but Different" How Service Contexts of Mobile Technologies Shape Usage Motives and Barriers

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Abstract. As wireless technologies evolve, mobile technologies and services will increasingly affect our lives, accompanied by positive and negative effects. This development requires a high acceptance of users to the presence of mobile services in various usage contexts. In an exploratory focus-group-interview approach (n = 63), this research investigates usage motives as well as barriers, which are perceived by users of wireless mobile technologies. In order to understand the impact of specific usage contexts, in which mobile services are applied, an ICT context was contrasted to a medical service context. Outcomes show that acceptance factors are neither static nor independent from the specific usage or service context in which a technology is applied. Rather, acceptance reveals to be a product of individual usage motivations, situation-specific evaluations, and individual user profiles.

Keywords: Usage motives, usage barriers, acceptance, ICT, medical technologies, system design.

1 Introduction

The distribution of mobile devices represents one of the fastest growing technological fields ever. Mobile information and communication technologies (ICT) have interpenetrated all professional and private fields in last decades. According to recent statistics, 4 billions of GSM connections exist worldwide [1]. Mobile information is delivered by different device types (mobile or smart phones, navigation or medical devices), which provide increasing functionalities. Also, continuously diverse service options are available [2], ranging from control services for technical processes (e.g., programming TV), mobile computing, social networks, entertaining and gaming, Internet access up to administrating personal concerns (e.g., managing accounts). It is predicted that by 2013, over 445 million people will be regularly using their mobile phone to purchase goods and electronic services [3]. Beyond their ubiquity, these technologies have fundamentally changed the nature of social, economic and communicative pathways in modern societies and they will bring essential changes to our lives [e.g., 4, 5, 6, 7]. Communication and information are present everywhere and at

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any time and they overcome physical as well as mental borders [e.g., 8]. Mobile technology is increasingly incorporated in smart homes, (walls, furniture or clothes, [9,10]) and might overstep personal intimacy limits, raising concerns about privacy, data security and loss of control [11, 12]. Sensitive and detailed information regarding various topics is available everywhere and anytime. Decision makers in education, politics, and business may use this information in real time. This may implicate both positive effects (productivity, mobility and growth) but also negative effects (violations of privacy, security concerns [6], infrastructure constraints and user distrust in mobile applications). Current developments require a high acceptance and impose high responsibility to all persons and organizations involved: users, decision makers, technical designers, but also industry, economics and legislation.

Over the last years, a lot of research activities were carried out and a solid body of knowledge is prevalent regarding the design of mobile systems as well as technical, socioeconomic and usability issues [e.g., 13, 14, 15]. Though originating from different disciplinary backgrounds and perspectives, all research approaches pursue the same goal: to develop a successful product, which is adopted and accepted by the user. Technical disciplines focus on technical feasibility and safety, as well as the planning, deployment and implementation of wireless technologies [e.g., 16, 17]. Marketing research focuses on the economic potential of new market segments, services, customer profiles, as well as adoption determinants [e.g., 18, 19, 20, 7]. Cognitive ergonomists and human-computer-interaction experts examine usability issues [e.g., 21, 21, 23] and interface designs that are easy to use and learn. Also, the impact of user diversity [e.g., 24, 21, 25] on the interaction and communication with technology receives broad attention as well as the determinants of technology acceptance [e.g., 26, 24, 27].

Technology acceptance has become a key concept for the successful rollout of technical devices [e.g., 26, 27]. On the long run technical products are only successful if users perceive them as useful, and easy to use [e.g., 11, 27, 28]. Both criteria, ease of use and usefulness, are the key determinants of technology acceptance, a concept originating from the 1980s [27], in which personal computers entered offices areawide. Though research has made significant efforts in explaining and predicting technology acceptance of ICT, the knowledge about factors, determinants and situational aspects affecting acceptance is still limited. Due to the increasing diversity of users, technical systems (visible vs. invisible, local vs. distributed) and usage contexts (fun and entertainment, medical, office, mobility), more aspects are relevant in understanding users' acceptance – beyond the ease of using a system and the perceived usefulness. In addition, studies dealing with technology acceptance mostly considered ICT within the work context [e.g., 29], and it is highly disputable if outcomes are transferable to other technologies and using contexts. Furthermore, most studies are limited to technology acceptance of young, experienced and technology-prone persons, thus a user group, whose acceptance towards technology might not be prototypical for the broad variety of users nowadays confronted with technology [e.g., 30].

Yet, comparably few studies concentrated on the diversity of users and their acceptance patterns [e.g., 31, 11, 32, 15, 33], even though it is obvious that people may have different adoption behaviours due to individual characteristics (etc. age, gender, abilities, beliefs). In addition, only limited knowledge is available regarding the acceptance of mobile services and service-enabling technologies [e.g., 5, 21, 34]. Still

more important, there is a considerable knowledge gap [e.g., 21], in which respect and to which extent the specific *usage context*, in which a specific technology is used, affects acceptance patterns. If we want to learn about the impact of technology adoption as well as its consequences for people's social lives, a deeper understanding of technology acceptance is needed, in combination with a more differential approach.

Our assumption is, that mobile technology acceptance is neither static, nor independent from the specific usage context. Rather, we assume mobile technology acceptance to be a product of individual usage motivation (using motives as well as perceived barriers) and situation-specific evaluations, driven by individual needs and demands. A mobile device once used as a communication device in the ICT context (e.g. communication with others) should evoke different perceived benefits and costs or barriers than the same device (and technology) in a medical context (e.g. monitoring of vital parameters, [e.g., 28]). The acceptance pattern for the same device in two different usage contexts could also be different, if persons evaluate the usefulness of the device for themselves, or for others [e.g., 11]. Thus, a motivation "cartography" is needed, in which acceptance and technology adoption of mobile services are considered in relation to the underlying motivational structure, and usage contexts.

2 Methodology

In the following, the methodological approach of this study is detailed.

2.1 Research Aims

Following an exploratory approach, the studies' goals were: (1) an identification of peoples' utilization motives and perceived utilization barriers for and against using mobile technology in two differing service contexts. One service scenario was an ICT-scenario, i.e. the usage of mobile technologies such as mobile phones, handhelds, smart phones, or netbooks for information exchange and communication purposes. The other service scenario was taken from the medical technology context (MedTec), where mobile communication networks are used for transferring patient data to and from, e.g. medical caring centers or physicians. Examples of these kinds of medical technologies are monitoring devices like a cardio messenger (a device that monitors heart activity in risk patients) or devices for controlling vital parameters like blood pressure levels. (2) The second aim was to contrast usage motives and barriers in both contexts in order to gain deeper insights into the specificity of acceptance patterns regarding ICT and MedTec service contexts. (3) As third aim, we strived for an investigation of the impact of user characteristics such as age, gender or technical experience on acceptance patterns.

2.2 Variables

In order to learn more about usage motives and barriers of mobile technologies in an ICT and MedTec service context, *two independent variables* were investigated by conducting semi-structured interview sessions. The first independent variable was "service context", which consisted of the two levels "ICT" and "MedTec". As second variable the within-factor "target person" with the two levels "oneself" and "others" was under study (Table 1).

Table 1. Independent variables "service context" and "target group"

Service context	Target group	
	oneself	others
ICT		
MedTec		

As *dependent variables*, Likert-scale ratings of an introductory screening part of the interview guideline were analyzed. In order to analyze participants' motive structure, their undirected and spontaneous statements regarding (1) usage motives for oneself and others (in the following referred to as "pro's"), (2) usage barriers (in the following referred to as "con's") as well as (3) "no-go's", (indicating a barrier which hinders persons to use the technology at all) for oneself and others were qualitatively analyzed and numerically recoded into a category system. The category system will be presented in the results' section.

2.3 Materials and Procedure

Focus group interviews were run in order to identify usage motives and barriers. Interview sessions were conducted in form of single or group interviews, depending on the availability of participants. Interviewers (n=5) were professionals from social sciences (psychologists, sociologists) and received an interview training in order to guarantee a standardized interviewing procedure. An interview workbook was developed and given to participants, in which they could write down their statements. The workbooks were collected after they were filled in and were used for data documentation.

In the beginning of the interview session, participants were informed about the general goals of our study and about the procedure of the interview. Also, the interview guideline was presented and participants were asked to answer the screening questions. In a next step, the interviewer presented the ICT- respectively the MedTec service scenario. Participants had to write down personal statements regarding usage motives and barriers on small cards (green cards for usage motives, red cards for usage barriers). In case of group interviews, participants were allowed to discuss their statements after writing them down. Questions to the interviewer were also answered in order to ensure a full understanding of the ICT or MedTec service scenarios. The interview sessions lasted between 30-60 minutes, depending on the responsiveness to discussion.

2.4 The Interview Guideline

The first part of the semi-structured interview guideline (1 – 3) was assessed for screening purposes (demographics, previous technical experience, literacy regarding mobile technologies as well as individual proneness to health concerns due to mobile technologies); the second part (4 – 5) was assessed in order to get insights into participants' motive structure regarding the usage of mobile technologies. The interview guideline (Figure 1) was structured as follows: (1) demographic questions (age, gender, education, profession, family status, children); (2) technical experience with ICT or MedTec (duration of mobile phone or medical device usage, usage frequency and

intensity), interest, level of information and knowledge about mobile technologies in the ICT or MedTec context, respectively; (3) perceived threat by mobile technologies and risk perception [35]; (4) utilization motives ("pro's); (5) utilization barriers ("con's") and absolute "no-go's" for oneself and others.

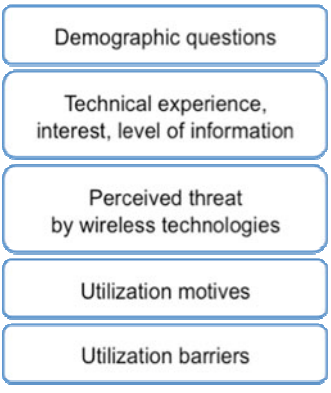

Fig. 1. Interview guideline structure

The interview guideline contained a mixture of open and closed questions. Questions in the screening part (demography, technical experience and interest, level of information, knowledge and risk perception) had to be answered on six-point Likert scales. For the ratings of perceived threat by mobile technologies a visual analog scale was used, where participants had to mark the degree of perceived threat with a cross on a line between the end poles "very low and very high" [35]. Questions in part 4 and 5 (utilization motives and barriers) were open questions, where the brainwriting-method was applied. Participants were asked to think about pro's and con's of ICT or MedTec utilization for oneself and for others and had to write them down. The number of possible statements regarding usage motives and barriers was not limited.

2.5 The Sample

Participants in the current study were recruited by announcements in newspapers and open places in which they were invited to take part in a structured interview about the perception of mobile technologies either in an ICT- or in a medical context.

A total of 63 participants took part in the study with an age range from 21 to 75 years. Participants were randomly assigned to either the medical context, or to the ICT context (independent study design). The sample allocated to the medical scenario consisted of 32 users (M = 42 years, 72% women), the ICT scenario sample consisted of 31 people (M = 39 years, 42 % women).

In order to assess expertise with mobile technologies, participants were asked whether they own a mobile phone respectively a medical device, how long they own it and how frequently they use it. Table 2 gives an overview of participants' expertise with mobile technology (ICT and MedTec).

Table 2. Expertise with ICT and MedTec devices and services

	ICT (100% owner)			MedTec (21.9% owner)		
	Total N	Mean	SD	Total N	Mean	SD
Years	31	9.2	2.6	6	11.2	10.3
Usage frequency*	31	3.2	1.05	6	1.8	1.3

*scale ranging from 0 = "rare" to 4 = "several times a day".

3 Results

In the following section, the results concerning the two different service contexts (ICT vs. MedTec) as well as the impact of user factors on perceived utilization motives and barriers are presented. Data was non-parametrically analyzed. In order to determine differences within and across the two different service contexts, nonparametric testing was complemented by parametric testing procedures (ANOVAs). Bivariate correlations were also calculated. The level of significance was set at 5%; results reaching a level of 10% are referred to as marginally significant.

3.1 Effects of Service Context (ICT vs. MedTec) on Usage Motives and Barriers

Quantitative Analysis of Usage Motives and Barriers. First, perceived utilization motives and barriers for the two service contexts (ICT and MedTec) were contrasted quantitatively. Summarized over the number of all statements (pro's and con's) participants made 32% more statements in the ICT service context than participants in the MedTec service context ($F(1,61) = 12.6$; $p < 0.001$; ICT: in total 377 statements, 12.1 statements per person, SD = 4.5; MedTec: in total 257 statements, 8.0 statements per person, SD = 4.7). In a further step, the different statements (number of con's, no-go's and pro's) were analyzed according to differences within service contexts (ICT vs. MedTec) or target group (oneself vs. others). Overall, participants made significantly more statements about usage motives for (pro's: $F(1,61) = 11.3$, $p < 0.001$) and against (con's: $F(1,61) = 4.9$, $p < 0.05$) mobile device usage within the ICT service context compared to the MedTec service context (Table 3). Moreover, participants made more pro-statements for themselves than for the usage of mobile technology for others in both service contexts ($F(1,61) = 20.7$, $p < 0.001$). An interaction between service context and target groups for pro-statements did not exist. For no-go-statements, no effects of service context or target group were found.

Qualitative Analysis of Usage Motives and Barriers. Detailing participants' motive structure regarding mobile technologies, two independent experts qualitatively analyzed motive and barrier statements. A category system for usage motives and barriers regarding the usage of mobile technologies in the ICT and MedTec service context was developed and applied, i.e. participants' statements were numerically recoded. The category system for both service contexts was identical in most parts. Due to context-specificity, some categories were added either in the ICT- or MedTec-Scenario, or categories received a context-specific phrasing.

Table 3. Mean number of pro, con and no-go statements for service contexts and target groups (n = 63)

	ICT	MedTec	p
Pro's oneself	3.0	2.3	$p < 0.001$
Pro's other	2.3	1.0	$p < 0.001$
Con's	3.5	2.6	$p < 0.05$
No-go oneself	1.7	1.3	n.s.
No-go other	1.7	0.9	n.s.

Overview over Usage Motives and Barriers. The first research question of this study was directed towards an identification of utilization motives ("pro's") and barriers ("con's") for respectively against using mobile technologies in two differing service contexts (ICT vs. MedTec). In the following, the extracted categories for usage motives and barriers, which were reported by participants, are described (in alphabetical order). The categories, which are marked with an asterisk, where only reported as potential motives or barriers for others, not for participants themselves.

Usage motive categories ("pro's")

Availability to be able to reach someone anytime at any place and, in turn, be reachable by others

Communication information exchange with other persons

Documentation precise and "seamless" documentation of (health) parameters

Economic reasons cost reduction in health care budgets (e.g. the decrease of doctor's appointments due to MedTec usage)

Facilitation of daily life organization, reduced frequency of doctor appointments, relief for medical practices

Flexibility to act flexibly

Functions specific functionality, and applications provided by mobile devices (such as SMS, MP3 player)

Improved medical care better and quick diagnosis, higher quality of medical care

Information to get information everywhere quickly, to get information about one's own health status (MedTec)

Mobility to be independent of place

Surveillance monitoring gives certainty about someone's health status and well-being (MedTec), or localization (e.g. knowing where your child is)

Other statements, which could not be allocated to a specific category

Safety feeling more safely by using the technology

Social aspects facilitation of social networking, staying in touch with friends, family, etc.

Status symbol* design, brand or price of a specific device to indicate someone's status

Warning emergency calls or alarm signals in case of critical health parameters (MedTec) (in contrast to the "feeling of safety" the motive "warning" refers to an action or function)

Usage barrier categories ("con's and no-go's")	
(Data) Privacy	concerns about violations of data protection and privacy, protection of personal rights and loss of privacy
Annoyance	noise "pollution" or disturbance due to loud ringtones or phone talks
Availability	feeling uncomfortable due to permanent reachability
Costs	hidden or unnoticed costs while using ICT (roaming costs)
Dependency of technology	the feeling of being dependent from technology (e.g. the usage of ICT devices is indispensable for someone, or the belief the usage is vital (MedTec))
Health damage	fears of physical threat, cancer, heart diseases, brain damages and tumors were subsumed
Manipulation	fear of data manipulation, criminal misuse of personal data and of active manipulation through someone else
Others	statements, which could not be allocated to a specific category
Radiation	fear of radiation emitted by mobile technologies
Social aspects	loss of personal communication and contacts, loss of personal care (MedTec), lower extent of commitment
Surveillance	localization of someone's' position (ICT context), the feeling of being constantly controlled and observed
Technical alternative*	especially mentioned for No Go's – "I never would use this technology if I would have alternatives"
Unaesthetic cell phone towers	refers to the visual appearance or design of cell phone towers
Usability*	problems while interacting with a technical device due to a lack of competence on the user side and the "non-user-friendly" design of a device and its interface on the device side

After introducing the category system, the results regarding the total distribution of usage motives and barriers, which perceived participants for themselves, are presented. As the number of possible statements regarding usage motives and barriers was not limited, i.e. multiple responses were allowed; participants' statements were aggregated in a "multiple response set procedure". The following figures (Figure 2 and Figure 3) and results provide an overview over the total proportion of usage motives and barriers (for themselves), which where stated by participants, combined over the two service contexts.

The most important *usage motive* for mobile technologies, which perceived participants for themselves, was the facilitation of daily life activities, followed by an improved availability of oneself and others (Figure 2). The third-important usage motive was functions or applications provided by mobile technologies such as SMS, MP3 player, camera function, etc. Improved mobility and flexibility were further perceived advantages of mobile technologies, followed by a facilitation of information, i.e. sending and retrieving data. An improved medical care, i.e. diagnosis, therapy and long-term care was a frequently mentioned usage motive, as well as warning functions such as emergency calls or alarm in case of critical health conditions, and safety aspects. Further, but less frequently mentioned usage motives, were communication, documentation, i.e. the seamless recording of data, surveillance, i.e. knowing the location of one's child, social aspects and economic reasons.

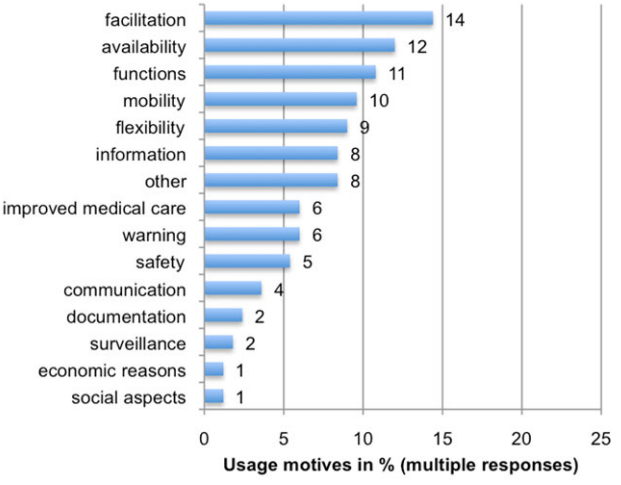

Fig. 2. Usage motives for participants themselves in % (multiple responses)

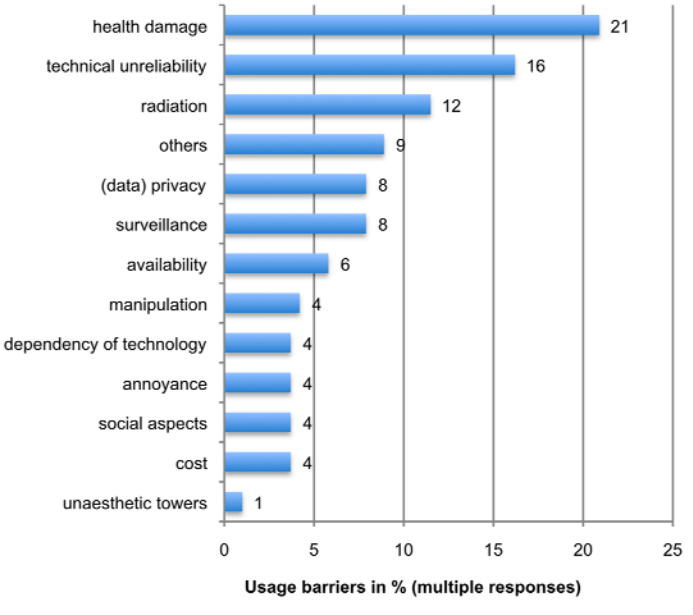

Fig. 3. Usage barriers in % (multiple responses)

The most prominent *usage barrier* of mobile technologies for participants themselves (Figure 3) refers to health damage, i.e. the fear of damages caused to someone's health. Some examples for negative health consequences are cancer, infertility or reduction of cognitive abilities such as concentration. The second most important usage barrier was technical unreliability such as faulty connections with the consequence of data loss. The fear of radiation was also a frequently made statement, which

has a strong association to the aspect of negative health consequences. Further usage barriers of mobile technologies were surveillance, i.e. the positioning of a persons' location or the tapping of telephone conversations; data privacy, i.e. the fear that the access to personal data is uncontrolled and unprotected; availability, manipulation of data and costs. Less frequently named usage barriers were social aspects, i.e. negative effects on social relationships due to the usage of mobile technologies; annoyance by acoustic "noise", (ringtones or telephone conversations of others); dependency of technology and unaesthetic visual appearance of cell phone towers.

Service Context-Specific Differences in Usage Motives and Barriers. The second aim of the study was to learn more about the service' context-specificity of users' acceptance patterns of mobile technologies. Therefore, usage motives ("pro's") and barriers ("con's" and "no-go's") for the ICT and MedTec service context were contrasted. As dependent variable the number of statements per single usage motive or barrier was calculated and used for statistical analyses (ANOVAs).

Table 4. Average no. of statements per person for a specific usage motive in the ICT and MedTec service context

Usage motive	ICT	MedTec	p
flexibility	0.4	0.1	$p < 0.05$
communication	0.2	0.0	$p < 0.01$
availability	0.6	0.0	$p < 0.05$
functions	0.6	0.0	$p < 0.001$
warning	0.3	0.0	$p < 0.05$
documentation	0.0	0.1	$p < 0.05$
facilitation of daily life	0.1	0.7	$p < 0.01$
improved medical care	0.0	0.3	$p < 0.01$

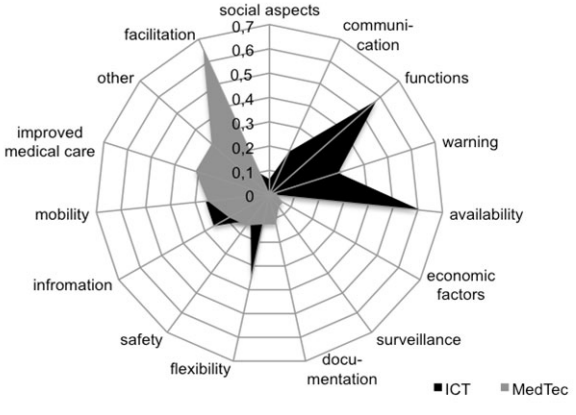

Fig. 4. Pattern of usage motives in the ICT- and MedTec service context

Regarding *usage motives* ("pro's") significant differences between the ICT and the MedTec service context were found, indicating that users perceive *different* patterns of motives and barriers in a specific service context. In the ICT service context (black area in Figure 4) participants significantly more strongly pronounced the following motives: flexibility, communication, availability, functions and warning function (Table 4). In the MedTec service context (grey area in Figure 4), the usage motives documentation, facilitation of daily life, and improved medical care were significantly named more frequently. For other motives no differences between the two service contexts were found.

The contrast of service contexts (ICT vs. MedTec) for *usage barriers* ("con's") also revealed highly significant differences (Figure 5). The usage barriers of surveillance, cost and availability were more frequently stated in the ICT service context (black area in Figure 5). In contrary, the fear of technical unreliability and of data manipulation was more strongly present in the MedTec service context (grey area in Figure 5).

Table 5. Average no. of statements per person for a specific usage barrier in the ICT and MedTec service context

Usage barrier	ICT	MedTec	p
surveillance	0.4	0.1	$p < 0.05$
costs	0.3	0.0	$p < 0.05$
availability	0.4	0.0	$p < 0.05$
technical unreliability	0.2	0.8	$p < 0.01$
manipulation	0.0	0.3	$p < 0.05$

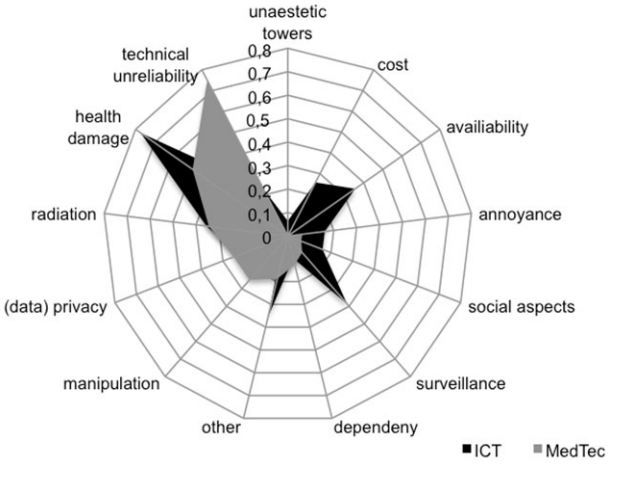

Fig. 5. Pattern of usage barriers for the ICT- and MedTec service context

For the *no-go*-statements ("I would never use the technology, if…"), service-specific differences were also prevalent. Interestingly, they only referred to a limited number of usage barriers. In the ICT service context (black area in Figure 6) participants more often mentioned the fear of damage to someone's health and overcharged costs (Table 6). The no-go "technical unreliability" was more dominant in the MedTec context (grey area in Figure 6).

Table 6. Average no. of statements per person for no-go statements in the ICT and MedTec service context

No-go	ICT	MedTec	p
health damage	0.8	0.3	$p < 0.01$
costs	0.3	0.0	$p < 0.05$
technical unreliability	0.0	0.4	$p < 0.01$

Summarizing the findings so far, we can conclude that the same technological base of devices and services, i.e. mobile technologies, rises different advantages and concerns in potential users.

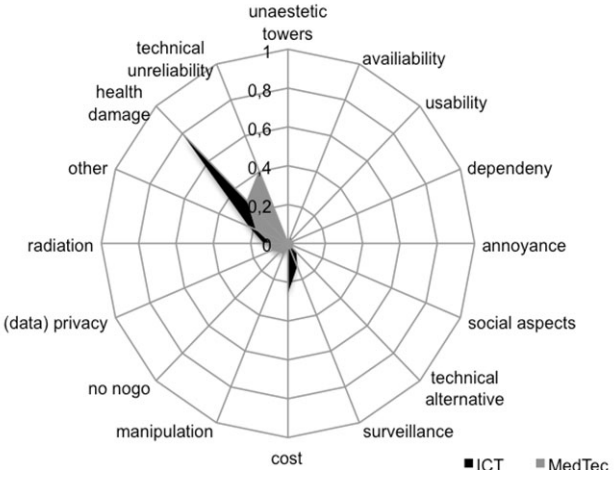

Fig. 6. Pattern of no-go statements in the ICT and MedTec service context

3.2 Effects of User Factors on Usage Motives and Barriers

In a further step the impact of certain user factors on specific using motives and barriers was analyzed. Besides prevalent factors like age and gender, knowledge of and interest in technology, using frequency, average years of using the device and the perceived threat (caused by a specific technology) as well as risk perception were also considered as user factors.

In order to analyze age effects, participants were divided in three age groups (Table 7). Participants were also assigned to three different risk perception groups: those who tended to be *unconcerned* about possible risks, those who were *undecided* whether or not risks exist and those who tended to be *concerned* about possible risks of mobile technologies. Two participants in the ICT condition and four in the MedTec condition could not be assigned to any group because of missing responses.

By differentiating participants according to the perceived threat extent, three groups were formed according to their score on the 10-point scale: high threat (>4.6), medium threat (2.6 - 4.5) and low threat (<2.5).

Overview of the Total Sums of Con's and Pro's. First, it was analyzed whether user groups differ in their number of statements. While there were no significant differences for age, gender and risk perception, the extent of perceived threat affected the number of usage barriers in the MedTec service context. People with a high degree of perceived threat reported significantly more usage barriers ($F(2,29) = 4.33$; $p < 0.05$; 3.7 statements per person; SD = 0.82) than people with a medium (1.9 statements per person; SD = 1.6) and a low degree of perceived threat (2.3 statements per person; SD = 1.7). The second user factor that revealed a significant difference was the using frequency in the ICT service context. Participants, which use their devices more than once a day reported more usage motives for others ($F(1,29) = 4.62$; $p < 0.05$; 2.9 statements per person; SD = 1.85) than people who use their device less frequently (1.7 statements per person, SD = 1.1).

Impact of Age and Risk Perception. In a second step the impact of user factors on the total distribution of usage motives and barriers in both contexts was analyzed. As shown in table 7, only for the ICT service context significant age effects were found.

Within the usage motives, the enhanced feeling of *safety* and the simple fact to *communicate* with people was more often reported by the youngest group (< 30 years). In contrast to that, it was the oldest group (50+) that stated much more the usage barrier *annoyance* as reason against using an ICT device.

Table 7. Mean number of motive and barrier statements for service contexts and age groups

	age			
ICT	**0-30 (N = 11)**	**31-50 (N=10)**	**51+ (N=10)**	**p**
safety	0.6	0.2	0	$p < 0.05$
communication	0.73	0.1	0.2	$p < 0.05$
annoyance	0	0.1	0.7	$p < 0.05$

Moreover, effects of risk perception on motive patterns were found (Table 8). Within the ICT service context, the usage motive *flexibility* was mostly named by *concerned* persons. Within the usage barriers, *cost* was more often named by *unconcerned* people, and not at all by *concerned* persons. For the *undecided* group it is the usage barrier of *permanent availability*, that distinguishes this group from the other two, because they named this kind of argument more frequently. Within the MedTec context, *radiation* as usage barrier is significantly more often reported by *concerned*

users than by *undecided* and *less concerned* user groups. The usage barrier *technical unreliability* is mostly reported by *undecided* people but also by the *concerned* group.

Table 8. Mean number of statements for service contexts and 'risk groups'

	'risk groups'			
ICT	**No concern (N = 17)**	**Undecided (N = 9)**	**concerned (N = 3)**	**p**
flexibility	0.2	0.4	1.6	$p < 0.05$
costs	1.0	0.3	0	$p < 0.05$
availability (barrier)	0.4	1.2	0.7	$p < 0.05$
MedTec	**N = 18**	**N = 7**	**N = 3**	
radiation	0.3	0.3	1.7	$p < 0.01$
technical unreliability	0.6	2.9	1.0	$p < 0.05$

Impact of "Technical Expert" Factors and Perceived Threat. Finally, the scores on the perceived threat scale, as well as all technical experience factors (knowledge, interest, using frequency, mean years of device use) were correlated with the number of statements in each category, separated by service context and separated by target group (usage for themselves or others). For a better understanding of the correlation results: Higher values indicate a higher level or frequency of the variable (e.g. high values in interest ratings express a high level of interest).

Figure 7 shows a correlation model for the ICT service context. At first sight, it becomes evident that more usage barrier statements show significant correlations to user factors than positive usage motive statements. Among all user characteristics considered, the degree of *perceived threat* as well as the *using frequency* showed the strongest associations to motives and especially usage barriers -meaning they are correlated to a greater amount of arguments.

Correlation patterns show, that the higher the degree of a perceived threat by technology, the higher the fear of possible health risks. On the other hand, people who do not report to perceive any threat have greater fears of high (and also unknown) costs and fear of (data) privacy loss. People with a low degree of perceived threat also state, that they would only refrain from using their mobile device if costs will be too high (no-go).

Experience-related using factors (domain knowledge, interest and using frequency) were found to be predominately related to positive usage motives, indicating that the active handling of technology leads to a more positive perception of technology. Though, participants, who use their device very often (more than once a day), also complained about *technical unreliability* (usage barrier), apparently recurring to frequent experience with this problem. The barrier *social aspects* – loss of personal contact due to technology usage – is negatively correlated to the level of domain knowledge, technical interest and years of using the device. Thus, frequent device users and technically experienced persons deny fearing that mobile technology usage leads to a decrease in social contact.

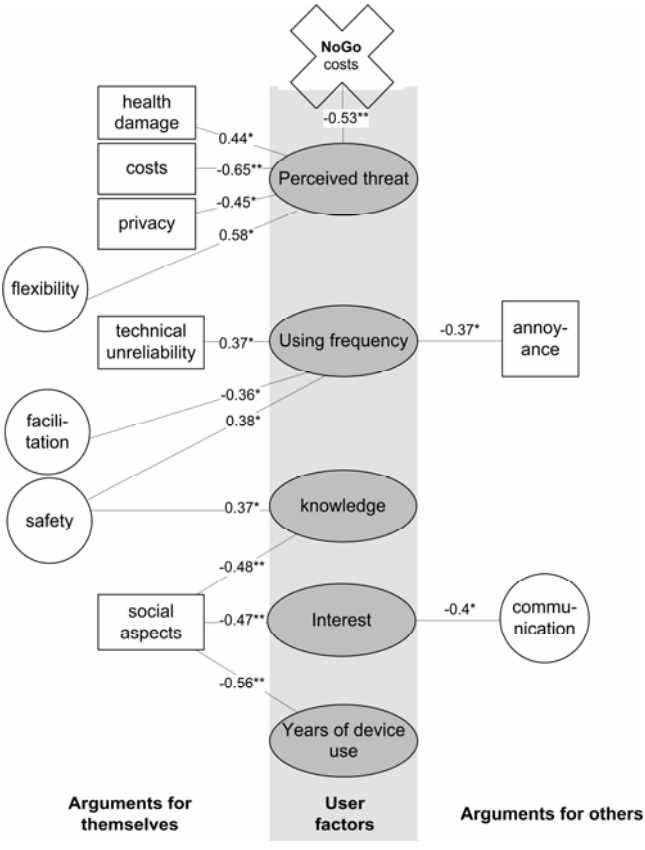

Fig. 7. ICT service context: Correlation of arguments and user factors differentiated by arguments for themselves and for others ("barriers" in squared boxes, "motives" in circles; *p<0.05; **p<0.01)

Concerning arguments, which militate in favor for usage of the respective technology for others, there were two prominent factors among assessed user characteristics, which show significant correlations. The usage motive *communication* was negatively correlated to the level of interest and the usage barrier *annoyance* was negatively related to using frequency. We conclude, that especially older people, who use their device less frequently, react very sensitive to "noise pollution" (annoyance) by mobile devices (e.g., ringtones).

In Figure 8 (previous page), the correlation pattern for the MedTec service context is depicted. As can be seen, about the same number of statements were given as positive usage motives for oneself and for others. Within the MedTec context, additional and different motives and barriers were associated to user factors in comparison to the ICT service context. In the MedTec context, the level of domain knowledge was the most relevant user factor, which showed associations with usage motives and barriers. Moreover, the usage barriers *radiation*, *fear of data manipulation* and *fear of being controlled* (surveillance) were positively correlated with perceived threat in the

MedTec service context. In contrast to the ICT service context, there were much more correlations of arguments in the MedTec service context, which militate in favor of usage the technology for others. Finally, it is noteworthy, that in both service contexts expertise-related factors were more strongly correlated to positive usage motives, meanwhile usage barriers were more strongly related to the degree of perceived threat.

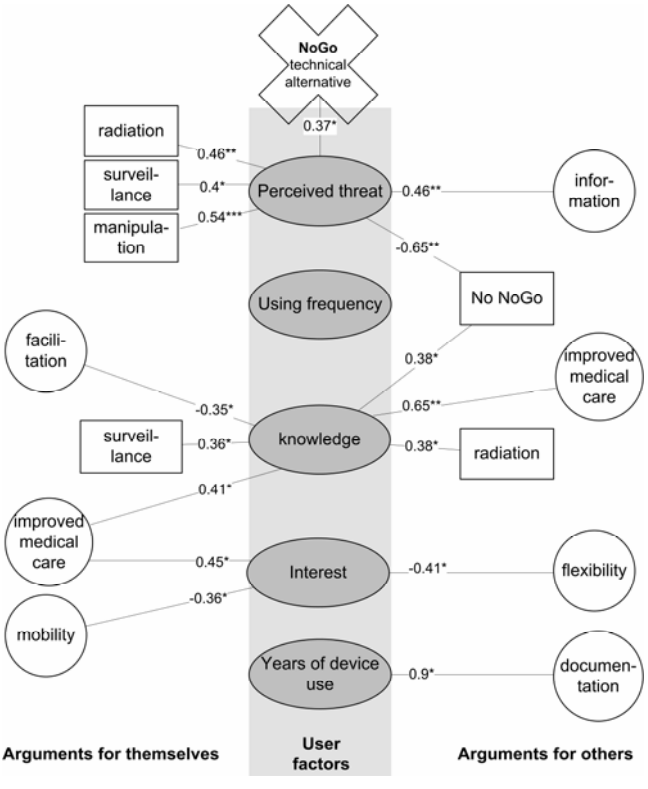

Fig. 8. MedTec service context: Correlations between usage arguments and user factors, differentiated by arguments for themselves and for others ("Con's" are given in squared boxes, "pro's" in circles). *p<0.05; **p<0.01

4 Discussion

In the following sections the findings and implications of our study are discussed.

4.1 Identification of Usage Motives and Barriers

The analysis of user statements regarding pro's and con's of ICT and MedTec device usage revealed an comprehensive image of usage motives and barriers – which is especially valuable for the development and marketing of technical service systems.

These motives and barriers are involved or cognitively activated when users think about using or adapting to a specific technical service. We identified different types of factors, which affect the adoption of specific technologies or services: a) usage motives, which can be seen as "benefits" or "promoters" of technology usage, b) usage barriers, which reduce the probability of a product's success on the market, and c) no-go's, which should be seriously considered in system design, because they can "kill" the acceptance of a product in the market.

Interestingly, some categories regarding motives or barriers had a high similarity or even congruence with regard to their content. An example for a category, which was present "on both sides" (pro's and con's), was *availability*, which was either perceived positively (in terms of improved reachability of oneself and others) *or* negatively (in terms of annoying permanent availability). Another "Janus-faced" category was *social networks or relationships*. On the one hand users appreciated the facilitation of staying in touch with family members or friends due to ICT services, but on the other hand they also complained about a growing superficiality and low commitment in social relationships. For the aspect *surveillance* we also uncovered diverging "Janus-faced" statements: One the one hand, users made positive statements about the improved certainty about someone's health status (MedTec), well-being or localization (e.g. knowing where your child is); on the other hand users disliked the feeling of being of constantly controlled or localized. The aspect *health awareness* was also mentioned ambiguously: on the one hand participants appreciated - especially in the medical service context – the positive effects on someone's health awareness, but, on the other hand, they stated that they did not want to be permanently reminded of their health status. After identifying these "Janus-faced" usage motives and barriers, one central question emerges: What are the underlying factors or mechanisms of these "double-sided" motives? We assume that one important moderator is "perceived control", i.e. behavioral situation control and not "affective" control of a technology. However, future studies will have to investigate the effects of potential moderators such as control on these specific "Janus-faced" usage motives and barriers.

The overall high number of motive and barrier statements suggests, that users seem to integrate several motives when forming usage decisions and to balance benefits and risks against each other. This corroborates previous findings and approaches [10], where the acceptance and intention to use technologies is explained in terms of a cost-benefit analysis. It is assumed that users weigh individually expected benefits and costs (e.g. investment of money and energy, personal efforts and frustration while learning to use the system) before adopting a new technology. Future studies will have to provide a deeper insight in the genesis of acceptance decisions. To this end, a research approach is necessary, which allows the analysis of the interaction between different usage motives and barriers, i.e. the determinations of their relative importance by using conjoint analyses. The findings of the present study will provide a sound basis for conjoint analyses and the identification of critical and potent decision criteria.

4.2 Is There a Service-Specificity in Motive Patterns?

The contrast of usage motives and barriers in the ICT- and MedTec service context convincingly confirmed our assumption of the presence of service-specificity in

motive patterns. Motive patterns in the two service contexts revealed to be quantitatively and qualitatively different.

Referring to quantitative differences, participants made over one third fewer statements for the MedTec service context. We assume, that due to the smaller diffusion rate of MedTec in comparison to ICT, participants had not yet enough concrete experience with the MedTec service context to produce a comparable number of usage motives and barriers. Therefore, in following studies a bigger group of actual MedTec users should be recruited. Another interesting finding was that potential users made more statements about usage motives and barriers for themselves than they claimed for others. Especially in the MedTec service context, we expected more statements directed to the usage of medical technology for others. This expectation was based on the effect of "comparative optimism" [36], according to which (health) risks for others are perceived to be higher than for one self. Hence, we assumed that "others" would be perceived as the main target group of MedTec services rather than oneself. On the other hand we cannot exclude, that the (cognitive) change of perspective was difficult to realize, which is necessary to find usage motives and barriers for others. With regard to user factors, this might also explain the contradictory finding of a larger number of correlations between user factors and arguments for others in MedTec service context than in the ICT service context. We assume that participants' lower personal experience with medical technology might have activated more unspecific public opinions, rather than arguments based on own experience, which in turn results in a more uniform picture of correlations in MedTec service contexts.

Regarding qualitative differences it was revealed, that potential users in fact perceive *different* patterns of motives and barriers in a specific service context. For example in the ICT service context the motives of flexibility, communication, availability, functions, and warning function were more dominant, whereas aspects of documentation, facilitation of daily life, and improved medical care were more important in the MedTec context. One finding is especially noteworthy in this context. Although both service types are based on the same (mobile) technology, the fear of health damage as a consequence of electromagnetic radiation is considerably more prominent in the ICT service context than in the MedTec service context. The critical question is, why potential users of MedTec services do not think about potential negative effects on their health. We assume that users make a "trade-off" between costs (usage barriers) and benefits (usage motives) in their decision process and that specific usage motives in the MedTec service context have a higher relevance (i.e. improved medical care, facilitation of daily life) in this decision process. Hence, further research is necessary in order to find out, why the very same usage barrier is evaluated differently in two differing contexts.

4.3 The Role of User Factors

This study pointed out, that in the context of mobile (wireless) technologies the 'expert' factors and perceived risk respectively perceived threat are appropriate factors to differentiate between user groups. The most important user factors with regard to acceptance patterns in both technical service contexts were "perceived threat" and "risk" as well as 'technical expertise' factors (e.g. domain knowledge, using frequency or interest). For example, people who use their mobile device not that frequently, who are

not that interested in the topic or report to have less technical knowledge, stated more usage barriers, especially regarding social aspects. Interestingly, positive usage motives were correlated with 'expert' factors; perceived threat was more strongly correlated with usage barriers. It is not sufficient to consider just one sort of user factor for classifying but to take both factors into account in order to get an understanding of both sides of acceptance - this is especially important with regard to the identified "Janus-faced" usage motives. Gender had no effect on motive patterns, in contrast to age, which revealed some significant effects. However, we assume, that age effects were moderated by expertise effects. Therefore, in future studies age should always be considered in combination with other user factors such as expertise.

4.4 Limitations of the Present Study and Future Research

As the present study had a strong exploratory character, a number of research questions were uncovered. Future studies will therefore have to address more aspects in acceptance-relevant motives as well as further mobile service contexts, e.g. social software services, such as Facebook, or telemedical assistants in the MedTec context. Also, future work should integrate broader user groups (i.e. older users and frail persons) and more actual users of MedTec devices (i.e. patients, which already use mobile medical devices) in order to supplement the investigation of "anticipated usage scenarios" by "actual usage experience". Apart from the assessment of motives and barriers of users in structured interview situations, one research focus should be laid on the analysis of user's behavior in real usage situations. Future research activities should finally investigate the interaction of acceptance-relevant usage motives and barriers in more complex decision situations, where several motives and barriers have to be integrated at the same time by the user. Accordingly we will apply conjoint analyses in a next research step.

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