

How usage context shapes evaluation and adoption in different technologies

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ABSTRACT

Although lots of technical devices are quite indispensable, the willingness to use the technologies is not necessarily given in all users – some devices are regarded as helpful, others are not perceived as trustful. Technical progress proceeds in every type of technology and new devices have to meet the needs of multiple users. Therefore user diversity is a key factor. This paper examines the effects of gender and age on technical interest in specific technology fields, their effects on purchase criteria for car-, medical-, and ICT and their influence on motivation for usage of these technologies. 92 respondents (21-80 years) participated in an exploratory survey revealing that general interest and interest in specific technology branches is significantly influenced by gender and age. While purchase criteria and motivation for usage differ with the technology context (medical, automobile and ICT), user diversity (gender, age) plays a minor role for adoption and evaluation criteria.

Keywords: technology context, adoption criteria, technology interest, gender, aging, technology acceptance

1 INTRODUCTION

In our society more and more people need technologies – such as medical and automobile technologies – to live an independent and autonomous life in old age.

These technologies must meet older peoples' specific demands – otherwise they neither are useful nor usable. For the development of well-accepted future technologies, we have to find out, which factors are relevant for the evaluation and acceptance of different technologies. Technical applications and electronic services can only be successfully applied if two general conditions are fulfilled: Technology must be fully accepted by the group of older people and, what is still more important, technology must meet the specific demands of the older group. So far, studies on technology acceptance consider mainly acceptance issues in younger people. Also, technology acceptance is mainly examined within computers and information and communication technologies and is connected to two major factors: the ease of use and the perceived usefulness (Davis, 1989). It is though reasonable to assume that the extent of technology acceptance depends on many more factors, especially in the older group (Seock, and Bailey, 2008; Williams and Slama 1995). Technology type, using context, age or technology generation may also be relevant for the extent of acceptance and the willingness of older people to actually use technologies (Arning and Ziefle, 2009; Gaul & Ziefle, 2009)

During the last decade, a research has made significant gains in understanding technology acceptance of ICT (e.g. Arning, Gaul & Ziefle, 2010). Though, the knowledge about determinants and situational aspects is still limited. Due to the increasing diversity of users, technical systems 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, the majority of studies had been directed to technology acceptance and adoption behaviors of young, experienced and technology-prone persons. It is though obvious that persons of different ages might have different acceptance criteria and requirements for technology, especially when considering that, for example, devices in the medical context must meet different demands than technology in the automobile context. Moreover, the gender factor is crucial in the context of technology acceptance and adoption. It had been reported that female users often show lower self-efficacy and higher technology anxiety (e.g., Busch, 1995, Davies, 1994; Downing et al., 2005), what not only affects womens' acceptance for technology (Wilkowska, Gaul & Ziefle, 2010, Ziefle & Schaar, 2011), but also their individual adoption and purchase criteria (Zhou and Xu, 2007).

1.5 Questions addressed

This exploratory study examines conditions of older users' technology acceptance taking different usage contexts into account. Empirically, perceived advantages and barriers within three different technology domains and contexts were assessed: Automobile technology, medical technology and ICT. First we explore users' technical interest in general as well as in different technology branches with a specific focus on gender and age differences. In a second step, different adoption criteria are examined in the different usage contexts. Finally, specific usage motives and acceptance conditions are investigated, again, taking usage context, gender and age into account.

2 METHODOLOGY

92 participants, aged between 21 and 80 years, took part in this study (M=55,71, SD=16,54). 45.7% of the sample was female, 54.3% male. To investigate if technical interest, purchase criteria and usage motivation differ depending on age and technology generation, the sample is split in age groups referring to three different technology generations: The young group is aged between 21 and 39 years (n=20, M=28.5, SD=5.3, 35% female/ 65% male), the middle-aged between 40 and 65 years (n=40, M=57.3, SD=6.8, 52.5% female/ 47.5% male), and the old between 65 and 82 years (n=32, M=70.8, SD=3.6, 44% female/ 56% male).

2.2 Questionnaire

In order to get a deeper insight in users' attitude towards technology in general as well as in specific technologies and their purchase criteria, we chose the questionnaire method to collect comprehensive opinions of prospective users, as well as a large number of respondents. The questionnaire was organized in four sections: The first part consisted of a query of demographic data with respect to age and gender. Section two asked for technical interest in general as well as interest in specific technology areas: household, entertainment, computer, mobile, car, medical, tools, and farming, using a four point Likert scale (no, rather no, rather yes, yes). The third part was directed to adoption criteria for three key technologies: car, medical, and ICT. Eight criteria had to be ranked by importance on a six point Likert scale: price, usability, safety, dependency, design, brand, latest state of technology, and unobtrusiveness. Finally, the usage motivation was explored. Participants had to confirm 16 statements for each of the two technology types, giving potential circumstances under which they would to use these technologies. The statements regard different dimensions and were taken from prior focus groups with older adults (Wilkowska and Ziefle, 2009, 2010; Ziefle and Schaar, 2011).

2.3 Research Variables

Respondents' age and gender were considered as independent variables. Three age groups were formed in order to detect age-specific technology preferences and to compare three different technology generations (computer, household and early technical generation, (Wilkowska and Ziefle, 2010, and Ziefle and Wilkowska, 2011). Gender is also regarded as a main factor in order to understand whether women and men have different usage motivations in different kinds of technologies (Williams and Slama, 1995, Seock and Bailey, 2008). As dependent variables, technical interest, purchase criteria and usage motivation were measured.

3. RESULTS

Data were statistically analyzed by MANOVA procedures and ANOVAs respecting

age and gender effects. Significance level was set at 5%.

3.1 Interest in Technology

First, we report on the reported interest in technology in general as well as the interest in the specific technology branches, comparing gender and age groups. For the general interest in technology, there were significant effects of gender ($F(1,9)=4.3$; $p<0.05$, Figure 1). Female respondents- independently of their age, reported to have lower interest in technology in general.

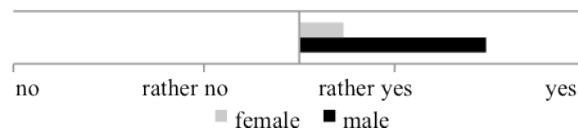


Figure 1 General interest in technology, effects of gender.

Also, significant age effects ($F(1,9)=2.7$; $p<0.05$) were revealed. Younger persons have a considerable higher interest compared to older persons (Figure 2).

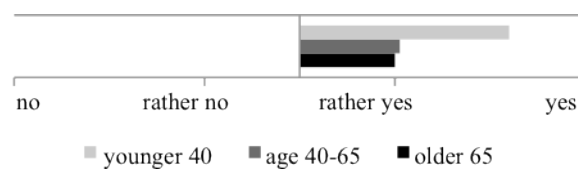


Figure 2 General interest in technology, effects of age.

Beyond the general interest in technology, participants were asked to rate their interest in specific technology branches. Figure 3 shows the descriptive outcomes.

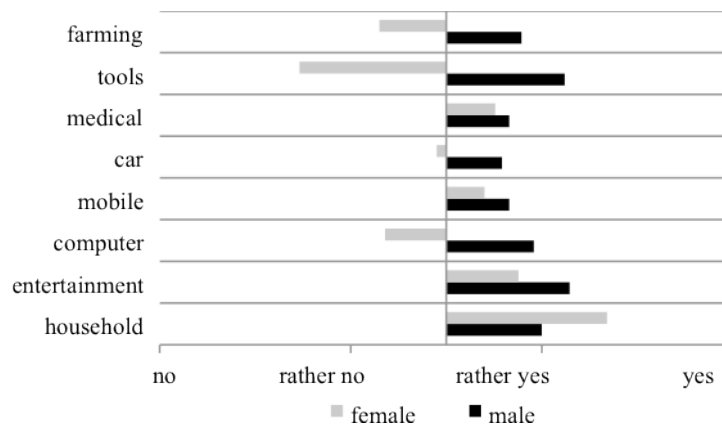


Figure 3 Technical interest in specific technologies, effects of gender.

Again, gender effects were found. Men showed a higher interest in computer technology ($F(1,77)=7.7$; $p<0.05$), tool technology ($F(1,77)=30.4$; $p<0.00$) and farming technology ($F(1,77)=9.6$; $p<0.05$). Only for household technology, female showed a higher interest in comparison to men ($F(1,77)=3.1$; $p<0.05$). When looking at ageing effects, age groups differed with respect to their interest in household technologies ($F(2,83)=4.3$; $p<0.00$), with the oldest group having the highest interest (Figure 4).

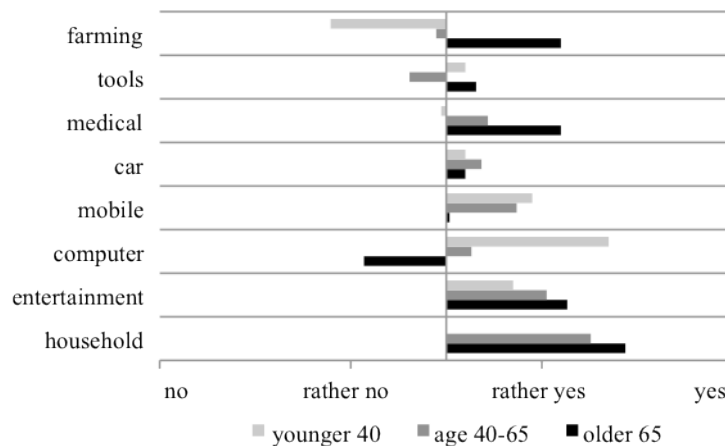


Figure 4 Technical interest in specific technologies, effects of age.

Also, age groups' interest in computer technology was different ($F(2,83)=10.9$; $p<0.00$), with a considerable higher interest in the youngest and the lowest interest in computer technology in the oldest age group. Another significant age effect was found for farming technology ($F(2,83)=4.3$; $p<0.00$), which was high in the oldest and low in the youngest age group.

3.2 Adoption Criteria

In this section we explore if peoples' adoption criteria differ for the three different contexts, comparing ICT, medical and automobile technology. Descriptive outcomes are depicted in Figure 5.

On a first sight, we see that there are criteria that are more important than others: The latest state of technology, price, usability, safety and the reliability of technology, while brand, design and unobtrusiveness seem to be of lower importance. When focusing on the different technical branches, we see different evaluation criteria though. For medical and automobile technology safety is more important than for ICT, and the design and brand is less important in medical technology than in both other technical fields (automobile technology and ICT). Interestingly, usability is equally important for all technology fields, thus can be regarded as a very generic adoption criterion. When looking at user diversity and potential gender and age effects, no significant outcomes were detected.

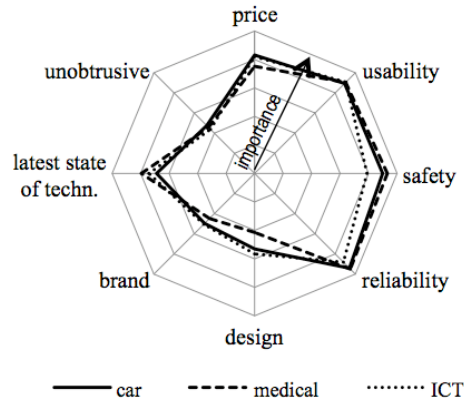


Figure 5 Adoption criteria of specific technologies

3.3 Usage motives

In this section, usage motives in two selected technology fields are examined: automobile (Figure 6) and medical technology (Figure 7). Descriptive outcomes are ranked according to the reported importance.

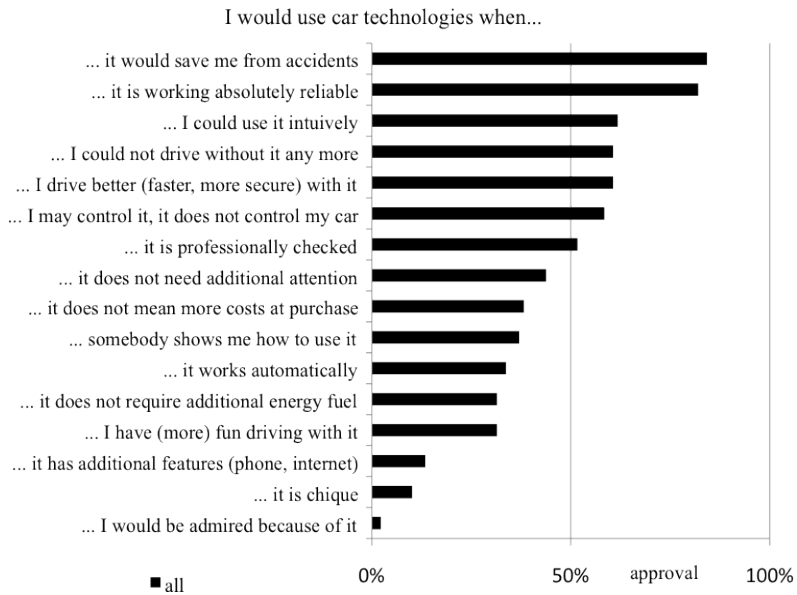


Figure 6 Usage criteria of car technologies.

With respect to technologies in the automobile context, participants attach

greatest importance to “safety”, “reliability” and “usability” of automobile technology. In contrast, comparatively low importance is attached to fun and design features and the social desirability of having such technologies. Interestingly, the rankings did not differ for women and men, showing that usage motives for car technologies are not differentially influenced by gender stereotypes and roles.

Age, in contrast, did impact the reported importance of usage motives in the automobile context. The younger group attached a significantly higher importance to the hedonic characteristics, thus design, fun, additional features as well as to the social desirability of automobile technologies. Interestingly, even though safety reasons revealed to be the most important for all age groups, younger adults reached the highest rankings possible (100 %).

Now the reported usage criteria for medical technology are reported (Figure 7).

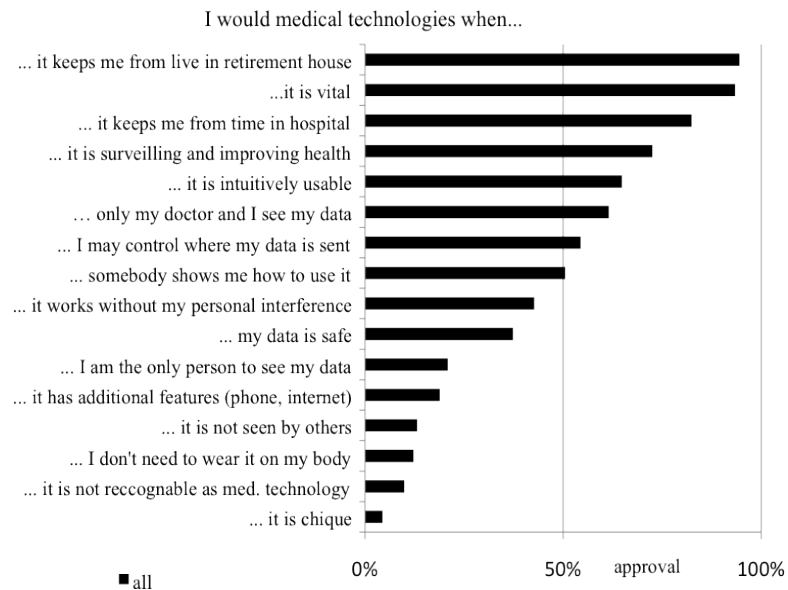


Figure 7 Usage criteria of medical technologies

From Figure 7 it becomes evident that the “independency motive” is most important. Participants indicate to be willing to use the medical technology as it might prevent them from moving to senior homes and from hospital stays. Medical technology is only accepted when it is vital (and no alternative is given). Also, “usability” and “data privacy” are core usage motives, while “unobtrusiveness”, “design” and “additional features” are of minor impact for acceptance.

For the acceptance of medical technology, gender differences were prevalent. Men – in contrast to women – attach significantly larger importance to the conditional usage criterion that they would use medical technology only if it is indispensable. Also, men stress that “data control” and “data privacy”, “unobtrusiveness” and “device design” as crucial for them. Women would also use medical technology for health monitoring, not only in the case of serious illness. For

older persons, the most important criteria are “unobtrusiveness” and “invisibility” of medical technology. For the younger group, “data security”, “privacy” and “data protection” are prominent usage motives, in contrast to the older users, which rated these conditional acceptance criteria as less important.

3.4. Correlation analyses

A first analysis regarded the relations between interests in different technology fields. In order to understand if the general interest in technology is impacted to a stronger extent by the type of technology or, rather, by the individual technology interest profile of persons (technology-prone vs. technology reluctant), we analyzed correlations (Spearman) between technology interest ratings across the different technical branches. In Table 1, outcomes are summarized.

Table 1 Intercorrelations of reported interest in different technology fields.

Bold values are significant (* p<0,05; ** p<0,01).

	household	entertainment	Computer	mobile	car	medical	tools	farming
household	1,0	0,36**	-0,03	0,28**	0,11	,24*	0,02	0,22
entertainment		1,0	0,25*	0,51**	0,28*	0,2	0,32**	0,45**
computer			1,0	0,43**	0,37**	0,08	0,36**	-0,04
mobile				1,0	0,46**	0,08	0,18	0,22*
car					1,0	0,35**	0,36**	0,23*
medical						1,0	0,3**	0,26*
tools							1,0	0,62**
farming								1,0

Apparently, there is no 1:1 correlation across technical branches, according to which persons, who are interested in one type of technical field, would also be interested in another. But of course, technology-prone persons (the younger and/or the males) show higher intercorrelations of technical interest across branches compared to persons with a lower technical affinity (older persons and/or females).

A second focus was laid on the question if the general interest of technology is correlated with the rated importance of purchase criteria (Table 2).

Table 2 Correlation of technical interest and purchase criteria

Bold values are significant (* p<0,05; ** p<0,01, Spearman-Rho).

	Price	usability	safety	dependency	design	brand	state of techn.	unobtrusive
Car	0,00	-0,14	0,72	0,25	-0,12	0,01	-0,27*	0,02
medical	0,12	0,15	0,07	-0,05	-0,14	-0,22*	-0,23*	-0,32**

For automotive technology, the general interest in technology only correlates significantly with the purchase criterion that automobile technology should represent the “latest status of technology”, while all other purchase criteria are not significantly driven by technology interest. When looking at medical technology, technical interest revealed to be significantly with the “brand”, the “unobtrusiveness” of the device and the “latest state of technology”.

A third focus was directed to the question if the rated importance of purchase criteria is different for the technology fields (Table 3).

Table 3 Correlation of purchase criteria across technical fields

Bold values are significant (* p<0,05; ** p<0,01, Spearman-Rho).

	price	usa- bility	Safety	depen- dency	design	brand	state of techn.	unob- trusive
car/ medic.	0,63**	0,6**	0,49**	0,35**	0,54**	0,63**	0,59**	0,18

Persons attaching importance to one criterion (e.g. price) in one context (e.g. automobile) also attach importance to the very same criterion (price) in the other context (medical technology). Thus, the usage context does to a lesser extent specify the profile of required purchase criterions. Rather it is vice versa: The type of purchase criterion is more decisive independently of the technological field.

4 CONCLUSION

This study examined the interrelation of usage context (automobile, medical and IC technology) and user diversity (age, gender) on technical interest (general and in specific branches), purchase criteria and usage motives. It was found that both factors do play a major role. Gender and age significantly impacted the extent of general interest in technology. Also, technical branches were influenced by gender and age. Apparently, even though ICT and mobile technology is ubiquitous in our societies, technical interest profiles did not change over time and are - still - gendered. Regarding the specific adoption criteria, we found that “latest state of technology”, “price”, “usability”, “safety” and “reliability” are more important than “brand”, “design” and “unobtrusiveness” of technology. It is an insightful finding that adoption criteria and their specificity for technical fields are quite generic, not differentiating across gender and age groups. In contrast, the usage motives do differ with respect to technological fields, gender and age.

The findings contribute to a human-centered understanding of technology development and requirement engineering.

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