ACCEPTANCE PROBLEMS OF AMBIENT INTELLIGENCE AND MOBILE TECHNOLOGIES IN HOSPTALS IN INDIA AND GERMANY

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Abstract

Ambient intelligence systems facilitate job performance by medical staff in health care services. Several papers detail scenarios in which these technologies may support clinicians in their daily work processes, but their specific characteristics suggest such technologies also could be useful for surveillance and subsequent control of employees. Until now, only little attention has focused on resolving such issues. On the basis of 16 in-depth interviews with medical staff from three German hospitals, this study identifies a reserved attitude and several acceptance problems among interviewees. The qualitative data indicate 10 hypotheses, tested using a questionnaire study of 215 nurses in training from Germany and India. The investigation of the quantitative data relies on partial least squares modeling to identify and categorise problems with user acceptance of ambient intelligence and mobile systems on various levels. The results of this mixed methods study mainly indicate that German participants assess ambient intelligence much more critically. Consequently, specific strategies for implementing such technologies should be adopted.

Keywords: Acceptance Problems, Ambient Intelligence, Health Care, Mobile Technologies, Partial Least Squares (PLS) Modeling, User Acceptance

1 INTRODUCTION

Ambient intelligence and mobile technologies offer various possibilities for enhancing the efficiency and effectiveness of medical treatment in hospitals. Through the use of sensors for example, such systems provide context-aware support. In the health care domain, ambient systems also might support an operating team by determining whether any instruments have been left in the patient (Macario & Morris & Morris 2006). Such avoidable errors lead to approximately 17,000 deaths per year in Germany, and technologies can help reduce the risk of complications for patients.

Yet ambient intelligence also is bound to provoke public scepticism. For example, the use of radio frequency identification (RFID) tags has invoked concerns about potential invasions of customer privacy, which could result in boycotts of the devices (Spiekermann 2008). Acceptance problems also should be anticipated because an ambient system offers new possibilities for monitoring and controlling the staff in a work environment, which may create anxiety and privacy concerns. These issues also apply to medical staff in health care services. Especially in Germany, people seem quite sensitive to the potential threats of such technologies (Bick & Kummer & Rössig 2008).

Taking the specific characteristics and acceptance problems associated with ambient intelligence into account means questioning the usefulness of common acceptance models (Spiekermann 2008). New technologies imply additional risks for users and thus require adapted acceptance models, especially in the health care domain, where the traditional Technology Acceptance Model (TAM) is inadequate (e.g., Lapointe & Lamothe & Fortin 2006).

Few studies have investigated physicians' acceptance of modern information and communication technologies in general or mobile technologies in particular (Raitoharju 2007). To bridge this gap, we investigate acceptance problems specific to ambient intelligence and mobile technologies by nurses in Germany and India, who are potential users. Germany provides a viable setting because of its negative experiences with adopting ambient technologies (Bick & Kummer & Rössig 2008); India is an emerging country that is closely connected to information technology and is culturally different from Germany. The Global Leadership and Organizational Behavior Effectiveness (GLOBE) study (House & Javidan 2004) supports this assumption. Our study considers any differences in the adoption or application of these new technologies across the two countries. To clarify acceptance problems, we follow a mixed methods approach in an effort to overcome the shortcomings of traditional acceptance models in health care settings. Specifically, we attempt to analyse hospital workers' fears regarding their acceptance of ambient intelligence and identify any differences due to national culture.

We begin by outlining in detail the scientific background and identified research gap. We then present our research design, followed by the results of our investigation. In the conclusion, we outline some opportunities for further research.

2 STATE OF KNOWLEDGE

In this section, we define the term ambient intelligence, explain its application to the health care domain, and offer an outline of acceptance research in hospitals.

2.1 Ambient intelligence in hospitals

The term "ambient intelligence" was introduced by the Information Society Technologies Program Advisory Group (ISTAG) of the European Union to refer to environments equipped with advanced technologies and computing, which create an ergonomic space for occupants (Bohn et al. 2005, ISTAG 2003, Regmagnino et al. 2005). Weber, Rabaey, and Aarts (2005) similarly define ambient intelligence as the "vision that technology will become invisible, embedded in our natural surroundings, present whenever we need it, enabled by simple and effortless interactions, attuned to all our senses, adaptive to users and context-sensitive, and autonomous."

As a complex service, the level of support demanded in the health care industry differs from that in other sectors, and research in this area must take specific working conditions into account. Medical staff occupy various positions, including surgeons, physicians, radiologists, and surgical and ward nurses. They often share available desks, computers, and devices and are extremely mobile. A nurse, for instance, usually walks more than a kilometre per shift (Morán et al. 2006), and they often work collaboratively in teams, rarely on individual tasks. Because their work focuses on the physical domain of the patient, digital content should provide back-up support in decision processes. Nurses also move constantly among locations and are frequently interrupted, so mobility and flexibility are necessary and fundamental elements. Ad hoc problem solving also has critical importance for the entire staff (Bardram & Baldus & Favela 2006).

Ambient intelligence might support medical services in several areas. In combination with mobile technologies, ambient intelligence can improve patient identification processes, such as by employing RFID tags that contain relevant information about the patient and thereby prevent mistreatments due to errors during treatment (Andersen & Bardram 2007).

2.2 Acceptance of mobile and ambient technologies in hospitals

Research in the field of user acceptance attempts to explain how and why users adopt new technologies. Several streams of research can be distinguished. In the domain of health care, most studies use the Technology Acceptance Model (TAM) by Davis (1989), the Theory of Planned Behaviour (TPB) by Ajzen (1991), or combinations of the TAM, TPB, and Innovation Diffusion Theory (IDT) by Agarwal and Prasad (1998). Extensions to these approaches include TAM2 (Venkatesh & Davis 2000), and combinations of various approaches have resulted in the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al. 2003). Although these various approaches offer some degree of generalisability, they generally have been developed for contexts such as desktop computers or standard applications. No studies investigate the acceptance of ambient intelligence technologies in health care, and few studies analyse the acceptance of mobile technologies in this domain (Raitoharju 2007); those that do focus on physicians rather than nurses. Only Wu, Wanga, and Lind (2007) investigate the acceptance of mobile health care systems based on an integrated model of TAM and IDT in Taiwan.

The Technology Acceptance Model establishes *perceived ease of use* and *perceived usefulness* as determinants for predicting acceptance of a technology in a given setting. In TAM2, cognitive and social influence factors also influence perceived usefulness (Venkatesh & Davis 2000). Ong, Lai, and Wang (2004) extend the TAM with *perceived credibility*, or the degree to which a person believes that the use of a particular system will be free of privacy and security threats. These constructs are relevant in many information systems studies, but in health care environments, the influence of perceived ease of use on other constructs is not significant (Chismar & Wiley-Patton 2003, Spil & Schuring 2006). Furthermore, perceived ease of use does not offer a significant predictor of the intention to use a technology in a clinical domain (Chau & Hu 2002, Hu et al. 1999, Jayasuriya 1998). In a study of the dynamics of IT adoption in a major change process in health delivery, the Technology Acceptance Model emerges as inadequate (Lapointe & Lamothe & Fortin 2006).

Thus, it appears that ambient intelligence features specific characteristics that enable new functions and are connected with new acceptance problems (Spiekermann 2008). For example, the possibility of surveillance, which creates suspicions of invasions of users' privacy, leads to acceptance problems, none of which appear in common acceptance models. These acceptance difficulties have not been investigated, so established acceptance models cannot analyse ambient intelligence acceptance in health care contexts. Against this background, we endeavour to investigate which acceptance problems are most relevant for ambient intelligence and mobile technologies in hospital settings. We first investigate which acceptance problems exist in this domain and whether they influence intentions to use the technology.

3 DESIGN AND METHODOLOGY

This study uses a mixed methods design. First, we conducted in-depth interviews to identify various acceptance problems. Second, on the basis of these interviews, we developed a questionnaire that we distributed to nurses in training from Germany and India. The data collection then involved three specific stages: In the first, exploratory stage, we reviewed existing literature to identify various issues that might influence health care domains in which handheld devices could be used. The main purpose of this stage was to identify important factors and create a suitable interview instrument. The second stage involved actual data collection through interviews. Finally, in the third stage, we administered the questionnaire that we developed through the previous stages.

3.1 Explorative research design

We chose a qualitative research design to identify acceptance problems with the use of ambient intelligence technologies in hospitals. Semi-structured interviews, which are flexible and open by nature, provided a suitable means for contrasting areas of application, as described in prior literature. The study took place in the surgery departments of three German teaching hospitals. To provide a high degree of contrast, we chose hospitals that differ in size and organisation, though the number of beds in the investigated clinics is similar at approximately 30 beds each. Participants were physicians and nurses in different leadership positions. This selection criterion reflects the assumption that people in higher positions have better knowledge about relevant tasks and can better evaluate the involved staff. In addition, the interviews in every hospital involved persons in special functional capacities, so that we could understand the individual organisational circumstances. The interviews took place in the work environment, conducted by two researchers with experience in qualitative research. They lasted between 40 and 50 minutes on average and were digitally recorded, with the participants' permission, and later fully transcribed. The transcripts also were coded separately by the two researchers. The full results of this research have been published previously (Bick & Kummer & Rössig 2008).

3.2 Quantitative research design

In this section, we detail the research components and hypotheses, research scope, and methods for analysing the data.

3.2.1 Scenario, constructs, and hypotheses

A developed scenario describes acceptance problems and benefits in three major areas. Because the scenario needed to be easy to understand, we used no special terms and confirmed its comprehensibility with a pretest. The scenario indicates:

A system automatically controls the staff of a hospital in the medication process. The patient and medicine are tagged by sensors. The medical staff uses a mobile device that provides information about the required steps for treatment and automatically documents the work. During the medication process, sensors on the medicine and patient automatically check their mutual suitability. When errors in the treatment are recognised by the system, an alarm occurs, and the error is recorded.

The benefits and potential risks (including the possibility of surveillance) of the system were emphasised. The questionnaire features three major fears, identified in the explorative study. In contrast with perceived credibility (Ong & Lai & Wang 2004), which has a mostly positive connotation, fears represent negative influence factors and have concrete negative associations with technology conditions, the work, and surveillance. The corresponding question items were developed on basis of the interviews. The questionnaire also includes key constructs from TAM, perceived usability and intention to use the system. The personal opinion of the potential user about a fictitious scenario thus represents acceptance, for which the original question items from TAM are applicable. Relevance and voluntariness also emerge as important for acceptance, according to the interviews, and appeared in TAM2 as potential influences on perceived usefulness. To measure these constructs, we use the corresponding questions from TAM2 (Venkatesh & Davis 2000). However, the pretest indicated that perceived usefulness and relevance and intentions to use the system and voluntariness cannot be separated because they display low discriminant validity, so we merged these constructs. The final set of constructs consists of the following:

- *Fears of new technologies*: This construct consists of fears arising from the extended use of technology, such as trust in technology, the fear that technology will replace the personal component of treatment, and rejection of technology in general.
- *Fears about work:* This construct includes worries about changes to work processes. Therefore, it comprises the fear of losing one's job and working longer, as well as the perception of the system as a burden and fears of a reduction in decision making rights.
- *Fear of surveillance:* The extended possibilities of data collection and analyzing are integrated in this construct, which consists of fears of being exposed and monitored during work. Each item entails five question items.
- *Perceived usability:* This construct measures whether participants regard the system as useful and relevant.
- *Intention to use the system:* This construct measures the intention to use technology voluntarily for work purposes.

Perceived ease of use (Venkatesh & Davis 2000) does not appear in the scenario, because it is not possible to measure and because previous studies show it is not relevant in the health care environment. However, the fear of technology construct measures, in general, whether people expect that using the system will lead to problems. Table 1 summarises the tested hypotheses.

H1	Fears in relation to new technologies will have a significant effect on fears of surveillance.
H2	Fears in relation to new technologies will have a significant effect on fears about working conditions.
H3	Fears in relation to new technologies will have a significant effect on usability.
H4	Fears in relation to new technologies will have a significant effect on intentions to use.
H5	Fears of surveillance will have a significant effect on fears about working conditions.
H6	Fears of surveillance will have a significant effect on usability.
H7	Fears of surveillance will have a significant effect on fears about intentions to use.
H8	Fears of working conditions will have a significant effect on usability.
H9	Fears of working conditions will have a significant effect on intentions to use.
H10	Usability will have a significant effect on intentions to use.

Table 1. Research model hypotheses.

3.2.2 Research scope

The objective of the quantitative research design is to evaluate the hypotheses with a paper-based questionnaire. The questions were measured on a seven-point Likert scale (Dawes 2008). A pretest of the questionnaire with professional nurses in Germany resulted in minor changes to the questions. A total of 224 participants (111 from India, 113 from Germany) completed the questionnaire in the main test, and 215 were appropriate for use in the study (9 were incomplete). The participants were undergraduate nurses in India and Germany with at least one year of experience, which ensured they were acquainted with the working environment of a hospital. These participants provide a contrast with the interviewees in leading positions in the preliminary qualitative study. Furthermore, we assumed nurses would be a relatively homogenous group compared with physicians and focus more often on medication processes as a main part of their daily work. The use of students as participants might limit the generalisability of the results, and transferring the qualitative developed items from Germany to India could limit the results as well. To reduce this concern, the items were translated into Hindi as well as English and then retranslated into German. Any differences prompted minor changes, with the translation process repeated. A researcher also discussed the questionnaires with a small group of participants to ensure their understanding. In both countries, the data collection followed the same procedure: The researcher explained the aim of study to a class of nurses in training, emphasising the voluntariness of participating and ensuring the anonymous character of the results. The questionnaires then were distributed and collected. The average ages of the participants were 21.80 years in Germany and 24.49 years in India. The difference results from the different educational systems in these countries. Most people in India have more working experience before they go to nursing school. In Germany, 81.25% of the participants are women (18.75% males), and in India, 73.82% are women (27.18% males).

3.2.3 Data analysis method

To investigate the hypothesis, we used partial least squares (PLS) modelling. An advanced statistical method that belongs to the structural equation modelling (SEM) domain, PLS allows for the empirical analysis of a measurement model and a structural model. The structural model consists of a network that links the latent and manifest variables, and the measurement model connects the constructs with a set of indicators (Wold 1974, 1982). In contrast with traditional statistical methods such as factor analysis, regression analysis, and path analysis, PLS assesses the measurement model embedded in the structural model and thus uses an iterative algorithm that estimates indicator loadings on the construct and then among the constructs (Fornell & Larcker 1981).

We select PLS to test the hypotheses because its required sample sizes are relatively smaller than those for other SEM approaches. Moreover, PLS can test theories in an early stage of research. Various information systems studies use the same method to analyse data (Keil et al. 2000, Venkatesh 2000, Venkatesh et al. 2003). We adopt SmartPLS 2 (Ringle & Wende & Will 2005).

4 RESEARCH RESULTS

The qualitative research in Germany enabled us to identify the constructs and select the items. We next explain the measurement and structural model in detail.

4.1 Measurement model

The investigated model is reflective, so the latent variables are operated by the measurement models and explain the indicators. The strength of the measurement model is determined by its reliability and validity. We calculate the reliability of the single measure, composite reliability of constructs, variance extracted by the constructs, and discriminant validity (Fornell & Larcker 1981, Hair et al. 1998).

To assess the reliability of the single measure, we note the correlation of the indicator and the construct. The factor loading measures reliability as a score that should be greater then 0.7. Factor loadings less than 0.5 are not acceptable and therefore are excluded from the analysis (Chin 1998). If a factor is excluded for one country, we also exclude it for the other country to ensure comparability. In the final model, all the factor loadings of the indicators are greater 0.5, and most are higher than 0.7, so the constructs achieve reliability in both countries.

	Mean		Standard Deviation		Factor Loading	
	Germany	**India**	**Germany**	**India**	**Germany**	**India**
Fears about technology						
It is always better to depend on humans rather than such systems.	3.321	3.009	1.590	1.741	0.743	0.678
I regard it as problematic to trust such a system.	3.532	3.495	1.686	1.857	0.790	0.854
Such a system contradicts ethical values.	3.866	3.058	1.901	1.708	0.735	0.667
I would be reluctant to have more to do with technological devices.	4.277	3.330	1.955	1.641	0.821	0.832

	Mean		Standard Deviation		Factor Loading	
	Germany	**India**	**Germany**	**India**	**Germany**	**India**
Fears about work conditions						
Such a system will probably result in more errors than less.	3.712	3.107	2.124	1.726	0.606	0.826
The usage of the system will have negative consequences for me.	4.718	3.049	1.612	1.530	0.722	0.707
Such a system will lead me to work more overtime.	4.469	3.485	1.659	1.691	0.772	0.781
The system will be an additional burden.	3.864	3.252	1.732	1.934	0.812	0.812
Fear of surveillance						
The idea that I cannot avoid the surveillance of the system frightens me.	4.330	3.019	1.862	1.547	0.844	0.699
I find it objectionable when I do not know what will be recorded.	3.232	2.563	1.831	1.493	0.760	0.810
I would be afraid that I would get exposed through such a system.	4.402	2.689	2.016	1.553	0.801	0.816
I find it objectionable that I cannot change the saved data.	4.153	3.165	1.942	1.547	0.767	0.793
Perceived usefulness						
Using the system would improve my job performance.	4.376	2.165	1.728	1.276	0.872	0.679
In my job, usage of the system is of high relevance.	4.643	2.515	1.565	1.392	0.829	0.745
Using the system would help me do a better job.	4.469	2.418	1.825	1.249	0.891	0.712
Through the use of the system, the producti vity of the hospital could be improved.	3.946	2.204	1.825	1.396	0.691	0.800
Intention to use the system						
Under the assumption that the system would work as described, I intend to use it.	2.847	2.466	1.861	1.327	0.900	0.760
I would use such a system voluntarily.	3.634	2.204	1.870	1.023	0.881	0.647
It would not be necessary that the system be dictated by rules and regulations in order for me to use it.	3.846	2.252	1.846	1.405	0.591	0.760
If the mobile device is small, I would like to wear it.	3.268	2.233	2.127	1.315	0.866	0.767

Table 2. Descriptive findings and factor loadings.

All the Cronbach's Alpha values are greater than 0.7. An acceptable internal consistence requires composite reliability greater than 0.7 as well. The average variance extracted (AVE) should be greater than 0.5. To assess the discriminant validity for each value of the latent construct, we determine whether the AVE is greater than the maximum squared correlation between this construct and other constructs (Chin 1998, Fornell & Larcker 1981). As we show in Table 3, all AVE values are greater than the corresponding maximum squared correlations with other constructs, so the tested models in both countries achieve this requirement, and we can assume the discriminant validity of the results.

	Cronbach's Alpha		Composite Reliability		AVE		Max. Squared Correlation	
	Germany	**India**	**Germany**	**India**	**Germany**	**India**	**Germany**	**India**
Fears about technology	0,776	0,753	0,856	0,845	0,598	0,581	0,450	0,578
Fears about work conditions	0,714	0,791	0,821	0,864	0,536	0,615	0,442	0,578
Fear of surveillance	0,808	0,786	0,872	0,862	0,630	0,610	0,211	0,545
Perceived usefulness	0,840	0,722	0,894	0,824	0,680	0,541	0,500	0,422
Intention to use the system	0,831	0,718	0,889	0,824	0,672	0,541	0,500	0,422

Table 3. Validity findings of the measurement model.

Not all the facets from the model developed in Germany appear in the data from India. As a result, we deleted these indicators from both models, because the model is reflective (Chin 1998). Nevertheless, these findings are important in that they show that the constructs differ across countries. In our model, we focus on describing only the intersection of both models as a comparable core.

4.2 Structural model

Variance-based approaches to structural equation modelling and PLS tend to bias the results. Indicator loadings in the measurement model are estimated as too high, and the path coefficients in the structural model are estimated as too low (Chin 1998). This bias can be avoided with either an adequate sample size—at least 10 times higher than the most complex construct's number of indicators or the largest number of paths leading to a latent construct. In the model, the most complex model consists of five indicators, and the four paths for intention to use the system are the most (Figures 1 and 2), so we require a minimum sample size of 50. Even though both sample sizes achieve this requirement, it is only a rule of thumb; critics argue that this rule does not take statistical power into account. Significance tests that lack statistical power are limited because they cannot discriminate reliably between the null hypothesis and an alternative hypothesis. Thus, the possibility exists that not all significant paths in the model will be identified. Furthermore, the statistical power should be greater than 0.8 (Cohen 1988, Hair et al. 1998). Using G*Power 3.0 for a moderate effect size of 0.15, an α of 0.05 for four predictors (latent variables), and a statistical power of 0.8, we need a sample size of at least 85 (Faul et al. 2007). Because both samples are greater than 100, the statistical power is acceptable (> 0.87), bias problems can be overcome, and the squared multiple correlation R^2 in the upper 13% will be detected as significant.

After computing the path coefficients in the structural model, we used bootstrapping to obtain the corresponding t-values. All hypotheses correspond to paths in the structural model. Each hypothesis test uses a path coefficient (positive or negative) and the statistical significance of the t-values. In the t-tests, we assess the 0.05, 0.1, and 0.01 significance levels (Efron & Tibshirani 1993). In Figures 1 and 2, we outline the path coefficients, t-values, and significance levels.

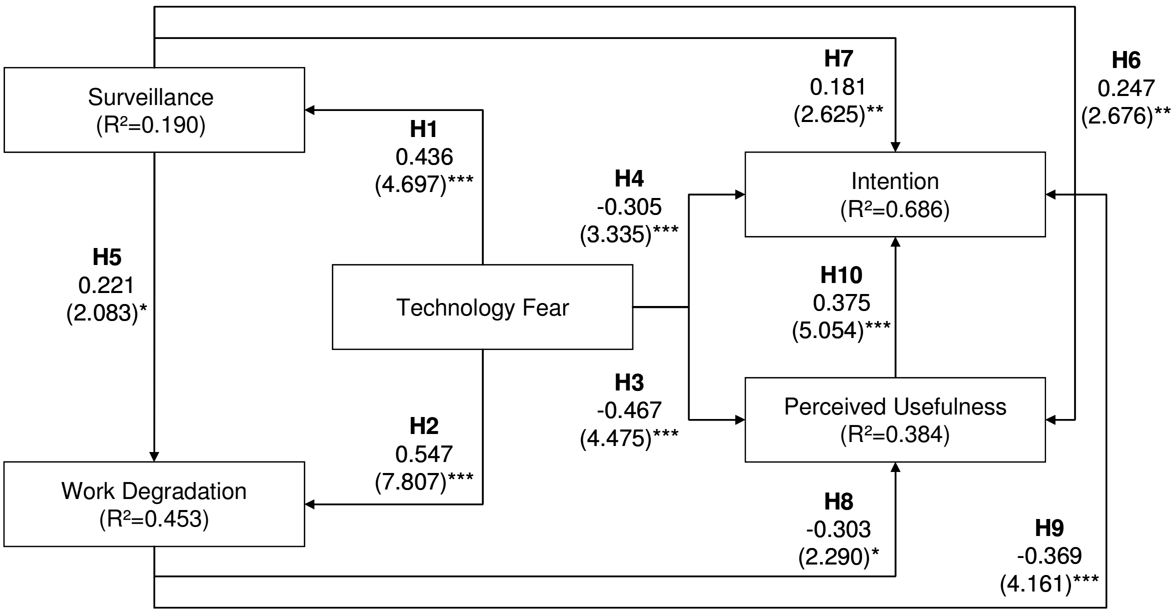

Figure 1. Structural model: German data.
*(***p < 0.001, ** p < 0.01, * p<0.05; hypotheses in bold are supported)*

As in the regression analysis, the R^2 indicates the explanatory power of the latent endogenous variables. For example, Chin (1998) regards 0.67, 0.33, and 0.19 as substantial, adequate, and low values, respectively. We use these same values to evaluate the findings. To assess the relevance of the prognoses (Q^2), we adopt the Stone-Geisser criteria with a blindfolding procedure (Tenenhaus et al. 2005). This approach eliminates values in the empirical data and approximates them with the resultant PLS findings. The procedure ends after all values have been replaced. Using squared errors and approximated values, Q^2 can be assessed; values greater than 0 suggest the constructs have relevance for the prognoses. In both models, the values for Q^2 are greater than 0.

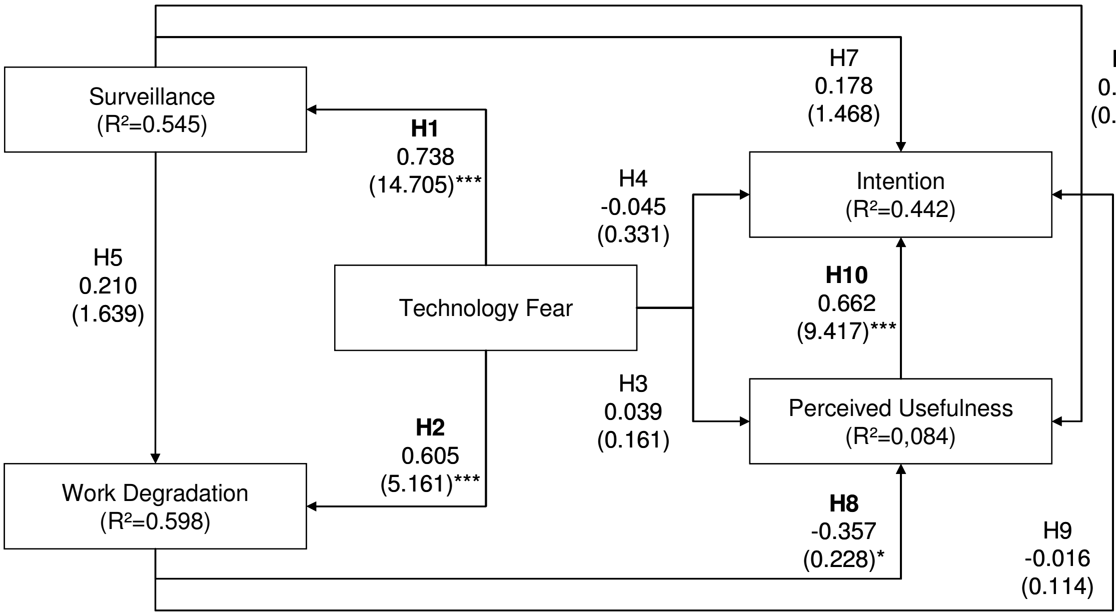

Figure 2. Structural model: Indian data.
*(***p < 0.001, ** p < 0.01, * p < 0.05; hypotheses in bold are supported)*

5 DISCUSSION AND IMPLICATIONS

The concerns about technology, as identified in the qualitative study, have significant influences on perceived usability and intentions to use the technology in Germany. Moreover, all of the hypotheses receive support from the study findings (Figure 1). However, only four—H1, H2, H8, and H10—have significant influences in India (Figure 2). The unease associated with technology in Germany and India also affects users' fears of surveillance and work degradation. In other words, people who do not trust technology and do not want to increase the extent to which they use it in their work also express a fear of being under surveillance and believe that their work conditions will worsen with the introduction of such technologies. This critical point shows that acceptance issues cannot be described sufficiently by the components of classic acceptance models such as TAM2 (Venkatesh & Davis 2000). New technologies such as ambient intelligence, which imply additional risks for users, require adapted acceptance models that take these risks into account. The high correlation between fears illustrates a close connection among the various risks posed by new technology. Therefore, attempts to reduce the fear of new technology may reduce other fears and perhaps increase acceptance levels.

The fear that a user's work will be degraded because of the introduction of a technology has a significant negative influence on the perceived usefulness of ambient intelligence in both Germany and India. This negative influence confirms that people tend to consider technologies less useful when they anticipate negative consequences for themselves. In the Indian data, this fear explains only a minimal lessening of perceived usefulness (R^2= 0.084) and has no direct affect on the intention to use the technology. However, in Germany, fears of technology and anxiety about work degradation have considerably negative influences on both perceived usefulness and intentions to use the technology. However, the surveillance aspect has a positive effect on perceived usefulness and intentions to use a technology; that is, participants appear to understand the positive aspects of surveillance and regard them as useful. However, H1 and H5 imply that technology is very closely related to two other fears with negative implications. In another interesting finding, we note that in India, the only significant influence on the intention to use the technology is perceived usefulness. The correlation between usefulness and intention to use the technology is also much higher in India. In contrast, German respondents indicate that all their fears have an impact on their intention to use the technology. Thus, it seems relevant to take the perceived risks in Germany carefully into account.

6 CONCLUSION AND FURTHER RESEARCH

The main objective of this study is to determine whether special fears about technology influence acceptance of ambient intelligence and whether national culture also might affect attitudes of potential users. The results significantly support the hypotheses. In Germany, we identify three major concerns, each of which affects the perceived usefulness of and intentions to use the technology. However, in India, the findings suggest that only those fears related to the working environment are critical for ambient intelligence acceptance. These results imply that ambient intelligence prompts much more criticism in Germany than in other countries. It is important to allay such scepticism by supporting the implementation process better. Strong relationships among the different fears about the technology indicate it also is important to try to avoid them by adopting a holistic approach. According to the German study, surveillance can have a positive influence on the acceptance of such technologies. In contrast, the Indian findings suggest that only those fears related to work are critical for implementation, which might be enhanced through better communication with the staff.

As mentioned, our study suffers from several limitations. First, the participants are comparatively young and had minimal experience because they were still in training, so our results might not be generalisable to a wider audience. Second, our qualitative development of items in Germany and their transfer to the Indian health care system might lead to bias in the results. The transferability to other application areas (e.g., collaboration, patient monitoring) and other groups of medical staff also cannot be assumed. Third, the results are not necessarily representative of the investigated cultures. Fourth, intention to use a technology serves, in this study, as an indicator of acceptance, but a bias between intentions and actual use is likely.

In a next step, these results could provide the basis for implementing an ambient intelligence system and performing a case study. Research into the changing level of acceptance over time and comparisons across different application areas and users also would improve our understanding of related ambient intelligence acceptance problems. We suggest that the relationships between the cultural dimensions, according to the GLOBE study, and the level of acceptance should be analysed in detail. Finally, other countries could be integrated in further research projects. The acceptance of special technologies is highly relevant because of their enormous benefits. As the comparison between India and Germany demonstrates, certain countries participate in the use of ambient intelligence more readily than others, because they are more open to using new technologies in their working environments. A better understanding of the special fears and risks associated with ambient intelligence thus is required to motivate people with more critical attitudes to participate in the use of such technologies.

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