

Acceptance of Ambient Assisted Living Applications: A Cross-Cultural Analysis

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1 Introduction

1.1 Background

In recent years, the pressure on the health and care sector increased due to organisational problems and rising health care costs (cf. Cimperman et al. 2016, p. 22). Demographic developments and increasing life expectancy are increasing the need for alternative solutions for care and assistive technologies. According to a WHO forecast, the current global share of older people will rise from 8.5% to about 20% by 2050. As far as the development in Germany is concerned, the predicted share will rise from currently 22.75% to about 32% in 2050 (cf. OECD 2008).

One of the greatest accident risks for people over 65 years of age is falling. About 30% of all accidents for this age group can be attributed to this. This risk increases with increasing age. For people over 80 years the risk is 50%. (cf. Yacchirema et al. 2018, p. 604).

Ambient Assisted Living (AAL) technologies can make everyday life easier for elderly and sick people, control their health and call for help if necessary. These systems can be used both in stationary settings in homes or on the move (cf. Isken et al. 2011, p. 224). A sub-sector of these are mobile applications that use smartphones and sensors to monitor vital parameters, for example, or detect falls and notify emergency contacts.

The smartphone is playing an increasingly important role in the daily routines and activities of the population. It is used for communication and entertainment and is a constant companion (cf. Nunes et al. 2019, p. 1). Therefore, it is obvious to use mobile devices to support elderly and sick people.

1.2 Research Question

The forecasts and trends will be used as an opportunity to review developments in AAL technologies. The increasing rise in life expectancy leads to an increase in the risk of health impairments. Various studies take this fact as a basis for their research. There are some studies that already deal with acceptance research and the determinants of electronic health (eHealth), disease management applications. Other research is concerned with telemonitoring or web-based technologies (cf. Dou et al. 2017, p. 2). In

most cases, however, the geographical reference area of existing research is outside Germany.

Here, different factors are found in relation to the decision on use and various influences are identified. Under certain circumstances, the resulting influences may vary from country to country or other influences may be more pronounced.

The present research work will therefore now focus on the question of how acceptance of AAL applications in Germany looks like and which influences have an impact on this.

1.3 Research Method

The field of AAL technology includes mobile applications as well as systems that are integrated in the stationary environment of people. In order to differentiate between individual disciplines and topics, the following section will first deal with the topic of fall and consequences before discussing AAL technologies in more detail. For this purpose, scientific research was used and concepts were presented.

Subsequently, an application available in Germany will be presented in the later online survey. For the presentation, an AAL application was selected that automatically detects falls of the person based on sensor data from the smartphone. The illustration should give the participants an insight into possible functions. In this way, the participants should also be able to evaluate the benefits of the function.

The research model will then be discussed. The UTAUT2 model was used for this purpose. This was supplemented by approaches from other acceptance research. Parts of the Health Beliefs Model (HBM) were used to gain a deeper insight. In this way, the current state of health can be integrated into the study and influences on a possible adaptation can be identified. The theoretical research model created with it is linked to the hypotheses that have been put forward. The subsequent evaluation of the data sets from the survey should reveal possible effects on behaviour and acceptance. The hypotheses will be tested for significant effects in a two-sided t-test and discussed in the following section. For this purpose, comparable studies will be analysed, and their findings will be compared with those in the context of this thesis. Finally, the results are shown and the work is reflected.

6 Conclusions

The proportion of older people in our society is increasing, together with their risk of falling. In old age and in illness, a fall can have serious consequences. Support from AAL technologies can be beneficial not only in the event of an accident, but also in terms of care and disease management.

The study used a modified form of the UTAUT2 model with extensions to the health-belief model and other approaches. The aim of the study was to investigate the acceptance of mobile AAL apps in Germany and to identify significant effects on behavioural and adaptation intentions. To this end, the general topic area was first explained and the modified research model was presented. A total of 92 data sets could be used for the evaluation.

The evaluation also showed that effects that were shown in other research studies could not be proven in this study. Thus, three hypotheses could be confirmed here and thus a significant effect of the variables "Facilitating Conditions", "Habit" and "Perceived Disease" on behavioural intention could be highlighted. When looking at the available results, an acceptance of mobile AAL apps in Germany cannot be disputed and the research question can thus be answered positively. In particular, the results show the benefit of their use as a weighty factor.

However, it can also be recognised that the presented app "SOS-BodyGuard" is a rather unknown solution for fall detection.

The majority of the interviewed participants stated that they had the necessary resource, i.e. a smartphone, and that they were able to use the app. Similarly, on the basis of the results and the information provided by the developer, a weak dissemination of the app can be found. The majority of respondents indicated that they did not know the app and that its use was not one of their usual apps or that it was a necessary use.

Possible changes through the use of the app were rejected by the respondents. This means that the app must not affect the normal, accustomed life of the user or change the way health information is handled.

The result of the survey is a first step towards closing the research gap. The different levels of the variables in this evaluation, as well as the deviation from existing research results from previous studies, can be used to further close the research gap.

The knowledge gained from this work can be useful for future work to further develop AAL technologies and to explore their acceptance more widely.

6.1 Limitation

Due to the one application presented, the investigation is limited in relation to the total number of AAL applications available. The interviewed participants showed a heterogeneity in their social and economic situation. The exact motivation to use a fall detection application remains unclear. A variety of chronic diseases or signs of aging can be suspected but cannot be precisely proven by the investigation carried out.

A further limitation was due to the failure of the comparative study. The survey conducted is intended to investigate the acceptance of ambient assisted living applications in Germany. A German application was used as an example to illustrate the function of the application to the respondents. No comparable study was found in the research on previous studies dealing with fall detection applications. For this reason, studies on the acceptance of health applications are used for the discussion. A comparative study in the USA with an English-language questionnaire and a US-American application as a means of illustration was circulated in the same way, but the response behaviour and participation were insufficient. This was due to unsuccessful publication requests in US senior citizens' groups in the social media. In other networks, too, the distribution was quite restrained, so that a total of 20 participants filled out the questionnaire, of which about 25% were complete at all. The comparative survey was online during the same period as the survey in Germany.

The present age structure partially limits the significance of the results. The aim of this survey was a general acceptance of these apps. However, as explained, the influence of younger participants could distort the survey.

AAL systems face other challenges that were not addressed in this survey. There are technical challenges, such as outdated Android versions, questions about connectivity and security of communication channels or signal reception within buildings. Ethical

and legal determinants may be relevant in terms of usage. Relationships must be defined, and responsibilities clarified.

In particular, however, psychological challenges, such as fears, concerns and other reasons of dislike, stand in the way of the use of AAL technologies (cf. Spasova, Iliev 2014, pp. 103).

6.2 Critical Consideration and Outlook

Isolated feedback on the questionnaire showed that the questionnaire was considered too scientific. It would also lack questions on the use of smartphones and the basic use of smartphones. Furthermore, the survey was often cancelled by the participants, who could not answer the questions because they did not know the app. The reference to the presentation of the benefits was lost in this case. This was found in the welcome text and in the introduction to the application.

For future research, please note that questions will be asked regarding smartphone use and ownership. The wording with regard to a complicated question should be checked. The statements were translated into German and at some points redundant formulations were found.

The influence of age and gender as well as the experience with smartphones should be investigated more intensively. Therefore, an adaptation of the questionnaire and the evaluation would be appropriate. A more concrete focus on the target group would possibly be useful, as the available results were based on a not inconsiderable participation of younger people under 30 years of age. For future surveys in the area of acceptance research of AAL technologies, an older study group should be focused, and the effects investigated more closely. Rapid developments in technology and app development offer a good opportunity for further research.

Furthermore, the following research can be applied to data protection and privacy. The results show a certain degree of confidence among the respondents, but security and privacy measures have not been investigated in more detail. In particular, the topic of authorisations, data collection and vulnerability to attacks by hackers.

Device connectivity may become another focus of the surveys. Here, only the acceptance of a fall detection function was examined, but hearing aids, for example, also offer a fitness tracking and fall detection function in conjunction with the control app.

The following surveys could be conducted in person, i.e. at senior citizens' meetings or similar events. It was planned to interview seniors and other people from the target groups on site, but unfortunately, due to the current pandemic, this was not possible or only possible under difficult conditions.

These strategies can make future surveys more effective and advance research in this area.