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Combining apps targeting professionals and senior citizens to improve housing accessibility and influence housing provision policies

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Abstract. Two separate apps that address the increasingly important issue of accessible housing for senior citizens have been developed in different project settings. One of the apps was developed to facilitate the process for professional raters to assess housing accessibility in the context of individual housing adaptations. The other app was developed for senior citizens to raise their awareness of possible accessibility problems in their current dwelling and in other apartments within the available housing stock. Both apps were developed with a high degree of active user involvement in processes utilizing multiple state of the art methods. The results are two well accepted prototype apps perceived as user-friendly and appropriate for the intended user groups. By combining these two apps, our ambition is for the professional raters to benefit by gaining knowledge of their clients' perceived needs and desires, and for senior citizens to benefit by getting access to a database of professionally rated dwellings. The ultimate goal is the generation of sound knowledge reflecting the needs and desires of senior citizens and professional requirements regarding accessible housing as a means to inform and influence housing provision policies.

Keywords. ICT tools, data collection, user involvement.

1. The application idea

The purpose of this contribution is to demonstrate the benefit and potential societal impact of combining two separate mobile applications (apps) that address the increasingly important issue of accessible housing for senior citizens. One of the apps was developed in order to facilitate the process for professional raters (i.e., occupational therapists) to assess and efficiently document housing accessibility in the context of individual housing adaptations. The other app was developed as part of the

innovAge project (1) for senior citizens to raise their awareness of possible accessibility problems in their current dwelling and in other apartments within the available housing stock.

It is crucial that Information and Communication Tools (ICT) for use in practice in this field are based on a valid and robust scientific methodology for accessibility assessments. One well-established and research-based methodology available for professional assessments of housing accessibility is the Housing Enabler (HE) (2). This instrument has been shown to be useful for professionals in producing reliable and valid assessments as a basis for interventions targeting housing accessibility problems, at both individual and group levels (3). The apps presented here have the HE as a common conceptual and methodological starting point.

At present the two apps are still separate prototypes. Our application idea is that by combining these two apps (both Android based), valuable knowledge concerning the accessibility of the existing housing stock and of senior citizens' perspective on housing accessibility issues will be generated over time. The goal is to create mutual benefit for the two intended target groups. That is, our ambition is for the professional raters to benefit by gaining knowledge of their clients' perceived needs and desires with regard to housing accessibility, and for the senior citizens to benefit by getting access to a database of professionally rated dwellings. Moreover, the knowledge provided by combining the two apps arguably has the potential to constitute a stronger influence on policy-makers to change housing provision policies in order to better serve the needs of accessible housings for senior citizens.

However, even though the purpose of this contribution is to demonstrate potential gains by combining apps developed for different target groups, the research and development work conducted so far concerns the two separate apps. Therefore, we will describe the background, methodology and results of the development procedures of each of the two apps. Hence, the presentation also serves to exemplify the utility of using ICT tools in clinical practice and among senior citizens that are based on the same methodology and platform.

2. State of the art in this area

The rapidly ageing population is currently one of the main societal challenges. By 2019, the population of people 65 years and older across the world will surpass the population of children aged 5 years and younger (4). More people are also expected to live longer periods of their lives with disabilities (5), which will increase the demand for accessible housing. Although the legislation in many European countries places high demands for the design of built environments, insufficient accessibility is still a major problem (6, 7). To meet the need for accessible housing at individual and population levels, systematically collected and accumulated data by means of modern ICT tools, such as apps, have the potential to contribute to the identification of accessibility problems in the housing stock and to the development of solutions to the problems thus identified. Systematic and detailed knowledge collected by professionals, demonstrating the prevalence of barriers causing the most accessibility problems in the existing housing stock, combined with perceived needs of senior citizens, would constitute a strong foundation for the information of different actors engaged in housing provision and housing provision policies.

When it comes to the concrete development of such apps, in the Scandinavian countries user involvement in the field of ICT development rests on a strong tradition of participatory design (8). Involving users in the design of apps has a number of benefits, such as reducing the risk of product failure or the need for product corrections at late stages of the design process, ensuring the participants influence so that the design solution is compatible with goals and beliefs of intended user, improving the end-user acceptance and satisfaction with the product, and strengthening the relation between a product and its usability (9, 10).

3. The methodology used

User involvement can be applied along a continuum, ranging from informative over consultative to participative involvement (11). At the informative end of the continuum, the role of the users is to provide information, whereas at the participative end users are invited to influence and even take part in decisions of the development of the system at hand. The development processes of the two apps were characterized by a close involvement of the targeted user groups. Several participatory and user-centered design methods were employed throughout the iterative development processes, to involve users at different stages and levels in order to develop apps that reflect their needs and meet their requirements on usability and appropriateness (12).

The development of the app for professionals was conducted in Denmark. The target users were occupational therapists providing housing interventions such as housing adaptation services. Based on a workshop approach, the development of this app comprised several steps and involved HE instructors and clinical occupational therapists with and without HE competencies. Utilizing inspiration cards (13), a first step identified problems and benefits of existing paper-based rating forms and formulated requirement and wishes for a new app. A second step consisted of a controlled lab usability test (14, 15). To further identify technical and practical problems usability tests were thereafter performed in real dwellings. This third step involved heuristic expert evaluations and checklist review (14), combined with questionnaire, interview, observation and think aloud methods (15). The fourth and final usability test was carried out in real clinical practice and recently completed. Data were collected by means of questionnaire diaries (16) and focus group interviews (17). Data were analyzed by means of equivalent methods.

For the app targeting senior citizens, the research circle methodology was employed (18, 19). User representatives participating in research circles conducted in Sweden, Latvia, Germany and Italy described and analyzed problems and questions about housing provision, the built environment, accessibility, the possible benefits of an app and what features would make such a tool usable and appropriate. Based on user requirements formulated in the research circles, a first prototype of the app was developed. The app has thereafter been improved and fine-tuned, taking into account the results of a series of usability tests with older people in Sweden and Latvia. For this purpose, a combination of individual usability tests carried out situated in the homes of the participants and follow up user forums. In the individual usability tests think aloud methods (15), observations, questionnaires and Software Usability Scale (SUS) (20) was used. In total 30 people aged 65+ were engaged. Data comprised field notes, audio and video recordings. The data were analyzed using NVivo software and thematic analysis.

4. The R and D work and results

As concerns the development of the app targeting professionals, the existing paper-based HE assessment forms were transformed into an app. New features aiming for quality assurance and documentation of the occupational therapy practice with respect to housing interventions were added. Usability tests showed high user satisfaction with the app. Advantages highlighted were that using the app resulted in less time consumption and a reduction of data entry errors. The extended functionalities such as the opportunity of photo documentation, e.g. of a particular door or threshold that generated accessibility problems were also appreciated. Frequent need for technical support demonstrated the importance of preparing the ICT infrastructure at the municipality level for efficient use of the app.

The development process of the app targeting senior citizens resulted in a user-friendly and well accepted prototype which scored high on the SUS scale. However, the results also indicated the need for the involvement of other stakeholders, such as decision-makers regarding housing adaptations, actors in housing provision, municipal property managers and housing companies. In order for the app to be really useful the necessity for access to valid and continuously updated databases of the housing stock was also pointed out.

Although the apps were developed independently of each other, the choice of operating system (Android) and the high degree of active user involvement throughout the development process were the same. Design features emphasized differed for the two target groups however: for the professional raters a design that supported extended functionalities was essential, whereas for the senior citizens simplicity and an easy to understand interface were considered more important (see Figure 1).

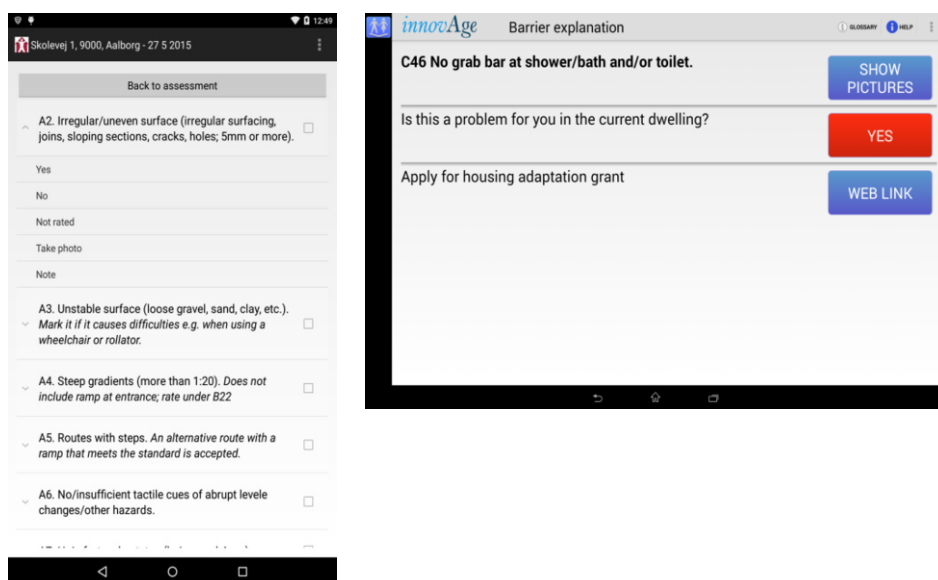


Figure 1. Examples of the user interface of the two apps. To the left is a screen shot from the app targeting professionals and to the right a screen shot from the app targeting senior citizens.

5. Implications and contributions to the field

A common platform, here exemplified by means of the HE methodology and two apps, has the potential to facilitate communication between senior citizens, professionals and actors in the housing provision sector. In addition, the collection of systematic knowledge from e.g. occupational therapists on housing adaptation needs combined with an increased knowledge on perceived accessibility barriers among senior citizens, could contribute to improving national standards and guidelines for accessible housing (21).

As senior citizens of today and tomorrow can be expected to demand more active involvement in decision-making regarding housing options, contemporary ICT tools can be used to empower them in this regard. With the aid of such apps senior citizens could evaluate and compare the accessibility in available housing options themselves and thereby become more critical consumers and thus exert pressure on housing practices and policies towards improved housing provision and better options with regard to accessible housing. In practice, however, this requires implementation of routines among professionals e.g. occupational therapists aiming to systematically survey the housing stock by means of employing digitalized assessment forms like the app described here.

6. Conclusions and planned activities

Exemplified by these two apps targeting different users but emerging from a common conceptual and methodological starting-point, we have attempted to demonstrate the potential benefits of a shared effort towards the designing of accessible housing in favor for senior citizens, professionals, policy and society at large. We argue that ICT tools with the capacity to empower senior citizens and support professional practice have the potential to influence housing provision and ultimately housing policies.

Although we expect the combination of the apps to be beneficial, by the generation of sound knowledge reflecting the needs and desires of senior citizens and professional requirements regarding accessible housing, the synergy effects remain to be shown. Project planning in progress includes integration of the two apps into a web based service, testing of the capacity to build up databases of the housing stock by means of systematic data collection in pilot municipalities in Denmark and Sweden, including examination of how the interaction between senior citizens, professionals and policy-makers is affected by the availability of such a web based service.

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