Cogitare Enfermagem

TECHNOLOGICA INNOVATION

DEVELOPMENT OF A SOFTWARE PROTOTYPE BASED ON THE HEALTH BOOKLET OF THE ELDERLY PERSON

HIGHLIGHTS

1. Development of technology for the Multidimensional Assessment of Elderly People.
2. Software based on the health booklet of the elderly person.
3. Analysis of the software's usability using Nielsen's heuristics.
4. Facilitating health care.

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ABSTRACT

Objective: to describe the development of a software prototype based on the Health Booklet for the Elderly, using Heuristic Evaluation to analyze its usability. **Method:** applied technological development research, using Nielsen's Heuristic Evaluation as a way of carrying out usability analysis, which began in November 2021 in Juiz de Fora and São João Del Rei. **Results:** the initial prototype has 5 screens, which contain some relevant data for the health care of the elderly, such as age, comorbidities, and history of allergies. The elderly will be able to edit their personal data, but only professionals will be able to include the patient's health data, with the aim of making it more reliable. **Conclusion:** The use of this application will help to update and advance the use of technologies aimed at health care and will bring benefits to health systems and users.

DESCRIPTORS: Health of the Elderly; Information Technology; Health Technology Assessment; Technological Development; Comprehensive Health Care.

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INTRODUCTION

In line with the phenomenon of population aging, a reality in many countries around the world, including Brazil[1], the increase in life expectancy has revealed changes in health conditions with a predominance of chronic non-communicable diseases[2]. As a result, there is a prospect of long-term care that demands greater consumption of services, an increase in hospitalization rates and hospital stays. Thus, there is a need for increased debate around the sustainability of the health services offered[3].

As a strategy to help care for this population group, the Brazilian Ministry of Health offers the *Caderneta de Saúde da Pessoa Idosa*, (in Portuguese) The Health Booklet of the Elderly Person, which enables longitudinal monitoring by recording the individual's information from a clinical, psychosocial, and functional point of view. Currently, only the physical version of the booklet is available, and users must present it at their appointments[4].

Despite having been made available by the Ministry of Health since 2008, the Health Booklet of the Elderly Person is little used by the elderly and by health professionals. This is because professionals consider filling in the information to be complex and there is no training on how to use and incorporate this instrument into work routines. Professionals' lack of training in dealing with the booklet has an impact on user adherence, as they also lack information and guidance on how to use it[5].

In Primary Health Care (PHC), the management of information produced in Elderly Health Care is carried out using paper-based evaluation instruments, with data records collected by different professionals, with little integration, which is insufficient for managing the care of this population[6]. This is a relevant point, given that one of the aspects cited by health professionals for low adherence to the use of the booklet is the insufficient time to fill it in during the consultation, associated with the low use of the booklet by all team members[7].

From this perspective, technologies have emerged as a solution for managing the information produced in the Health Care for the Elderly, making the practice safer and more qualified. They are a tool to facilitate communication between professionals, users, and health services[8], as well as being a strategy to save time in carrying out activities and financial resources, which is essential when it comes to the Brazilian Unified Health System (SUS)[9-10].

In view of this, the aim of this study is to describe the development of a software prototype based on the Health Booklet of the Elderly Person, using Heuristic Evaluation[11] to analyze its usability, with the aim of optimizing and encouraging adherence to the use of this instrument in health service routines.

METHOD

This is an applied technological development research project that describes the prototype of a software program based on the Health Booklet of the Elderly Person, using Heuristic Evaluation[11] as a way of analyzing its usability.

The development of the first prototype began in November 2021, and since then it has been adjusted and modified to meet the needs of adaptation for better use and enjoyment of the software. The research was carried out in the cities of Juiz de Fora and São João Del Rei, including researchers and members of the research groups involved in developing the software.

The technology has been developed in partnership between researchers from the

Intelligent Systems Laboratory at the Federal University of São João Del Rei (UFSJ) and the Study and Research Group on Policies, Technologies, and Ageing at the Federal University of Juiz de Fora, both in Minas Gerais. The development is based on the Health Booklet of the Elderly Person made physically available by the Brazilian Ministry of Health, in line with the aims of the National Elderly Person's Health Policy[12] and contributing to the Implementation of the Line of Care for Comprehensive Elderly Health Care in the SUS[4].

An agile development methodology was used to manage the technology construction project, which takes place in four recurring stages: i) identifying the problem; ii) surveying the state of the art; iii) proposing new solutions; iv) validating the proposed solutions.

In the first stage, a survey of the research problem was carried out based on the practice of the professionals involved and associated with a survey of the state of the art related to the subject, making up the second stage. From this, the first prototype model was developed, making up the third stage of the technology construction process. The fourth stage was the process of validating the prototype through heuristic evaluation, allowing it to be reformulated with the adjustments suggested by the evaluators.

The management format used was incremental and iterative models, which break down the solution to be delivered into smaller objects and implement a predictive cycle in each object separately so that the solution developed expands with each iteration of the process[13].

To generate a navigable prototype, MockFlow software was used, which has simple, easy-to-use tools and makes it possible to create sketches of new websites and applications.

As this is a prototype, a validation process with health professionals and the elderly will be necessary before implementation in health services. However, the initial evaluation based on the heuristics was carried out by 8 researchers and 12 members of the research group, aged between 25 and 65, with the aim of making the software simple and suitable for later validation with users.

Of the 20 evaluators, 4 were male genders and 16 female genders. Their educational backgrounds were nursing (n=17), Computer Science (n=2) and Nutrition (n=1). The qualifications of the researchers involved are doctorate (n=5), postgraduate course - doctorate (n=4), master's degree (n=1), postgraduate course - master's degree (n=6), postgraduate course - residency (n=1) and graduation student (n=3).

The evaluation took place through the availability of access to the prototype for the team involved, who analyzed each screen based on a checklist containing the heuristics and their meaning. In addition, we provided a space for the evaluator to report observations to improve and achieve usability.

The term usability is commonly used in studies evaluating human-computer interaction. A usable system should be easy to use, effective, efficient and improve productivity, with little or no possibility of errors during use and pleasant, bringing satisfaction to those who use it[11].

One of the ways of analyzing the usability of systems is through Heuristic Evaluation[11], which seeks to assess the needs of users and the difficulties they face when using technologies, with the objective of finding flaws in this interaction between users, programs, and applications, through guidelines that will help identify irregularities in websites and/or applications[14]. In addition, this evaluation makes it possible to identify problems during program development, allowing them to be revised and adapted during the creation and testing process, providing a better quality of usability for end consumers, making human-computer interaction easier and more efficient.

To evaluate the usability of the prototype, we used Nielsen's method[11], which consists of ten heuristics that are the principles of interaction between users, programs, and applications, as shown in Chart 1.

Chart 1 - Nielsen's ten heuristics. Juiz de Fora, MG, Brazil, 2022

System visibility and status	The system must continually inform the user about what it is doing and how it is interpreting the user's input.
System compatibility with the real world	Terminology in user interfaces should be based on the language of the user and not on system-oriented terms.
User control and freedom	To increase the user's feeling of having controlled the dialog, the system should offer the user an easy way out of situations when it is necessary to undo or redo an action.
Consistency and standards	The same information should be presented in the same place on all screens and dialog boxes and should be formatted in the same way to facilitate recognition.
Error prevention	Systems can be designed to avoid putting the user in error situations.
Recognition rather than memorization	The system should display dialogue elements to users and allow them to choose between the items generated or edit them, minimizing the use of users' memory.
Flexibility and efficiency of use	The same information should be presented in the same place on all screens and dialog boxes and should be formatted in the same way to facilitate recognition.
Aesthetics and minimalist design	Systems can be designed to avoid putting the user in error situations.
Helps users recognize, diagnose, and recover from errors	The system should display dialogue elements to users and allow them to choose between the items generated or edit them, minimizing the use of users' memory.
Help and documentation	The same information should be presented in the same place on all screens and dialog boxes and should be formatted in the same way to facilitate recognition.

Source: Nielsen (1994).

RESULTS

The problem identification stage took place through the practical activities carried out by researchers working in PHC in the municipality of Juiz de Fora, who identified low adherence to the use of the booklet. Associated with this, the second stage was a survey of the state of the art related to the topic, which pointed out that professionals have low adherence to the use of the *Caderneta de Saúde da Pessoa Idosa* in Basic Health Units due to the difficulty of filling in the information, associated with insufficient time during consultations to fill it in, the lack of training in the use of the instrument, influencing adherence to the use of the instrument[7].

The third and fourth stages took place concurrently, through the development of the prototype as a response to the problem identified, along with the validation processes that were applied during the construction of the prototype, its revision and reformulation.

The prototype has two versions of the application, one aimed at elderly users and the other at health professionals. The version for health professionals has more possibilities for including and altering health data, with the aim of guaranteeing more reliable information and standardizing the language. The elderly will have access to the information but will be able to make alterations to their social profile.

Regarding the system's visibility and status heuristic, the initial prototype has five screens, which contain some data relevant to the health care of the elderly. The first page refers to the process of logging in to the application. Users, whether health professionals or elderly people, who do not have an active login to the software are taken to page 2 when they click on new registration. From there, you will be able to register yourself by filling in basic information such as name, Individual Taxpayer Registration Number (Certificado de Pessoa Física -CPF, in Portuguese) or National Health Card (Cartão Nacional de Saúde-CNS, in Portuguese), creating a password and whether you are a health professional.

Figure 1 shows the comparison between two registration screens developed, the first being the initial version and the second after the modifications made based on the heuristic evaluation.

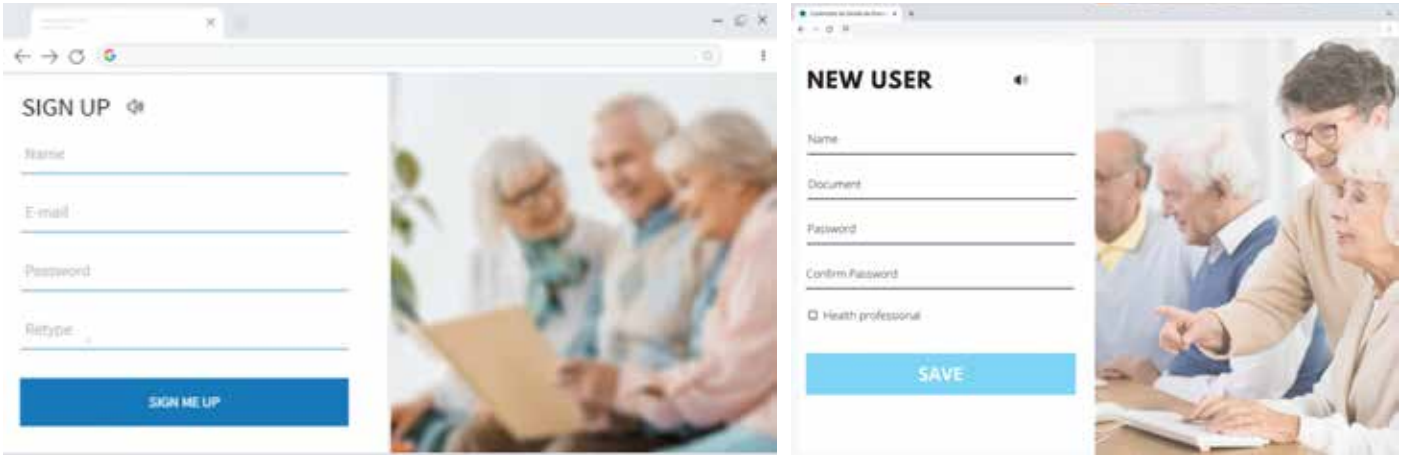

Figure 1 - Comparison between the initial screens of the application for logging in and/or registering, before and after evaluating the heuristics and adjustments. Juiz de Fora,MG, Brazil, 2022

Source: Authors (2022).

After registering on the platform and accessing the account, users are directed to a home screen, where they can interact with the features the program has to offer. In the case of elderly users, they will have access to creating their own booklet by filling in personal and social information, while the elderly person's health information must be filled in and updated by a health professional. The data registered on the platform is saved and can be viewed by both professionals and the elderly and can be used to monitor their health situation.

The home page of the software for the elderly is made up of personal data, as well as the user's main health information, such as the Basic Health Unit of reference, allergies, blood group and Rh factor and whether they have any type of disability or chronic illness. The elderly will have free access to edit their personal data, such as address and telephone number. This screen will also appear to health professionals when they search for the elderly person in question, and they will be able to update and enter the elderly person's health information.

The health professionals' home screen shows a list of the booklets of all the elderly people they are monitoring. On this page, the health professional can add new booklets, view and edit pre-existing booklets. It also has a booklet search bar so that the professional can find the user quickly in the system. This functionality also corresponds to the system's visibility and status heuristic. Figure 2 shows a comparison between the first version developed for the health professionals' home screen and the second version

after applying the heuristics.

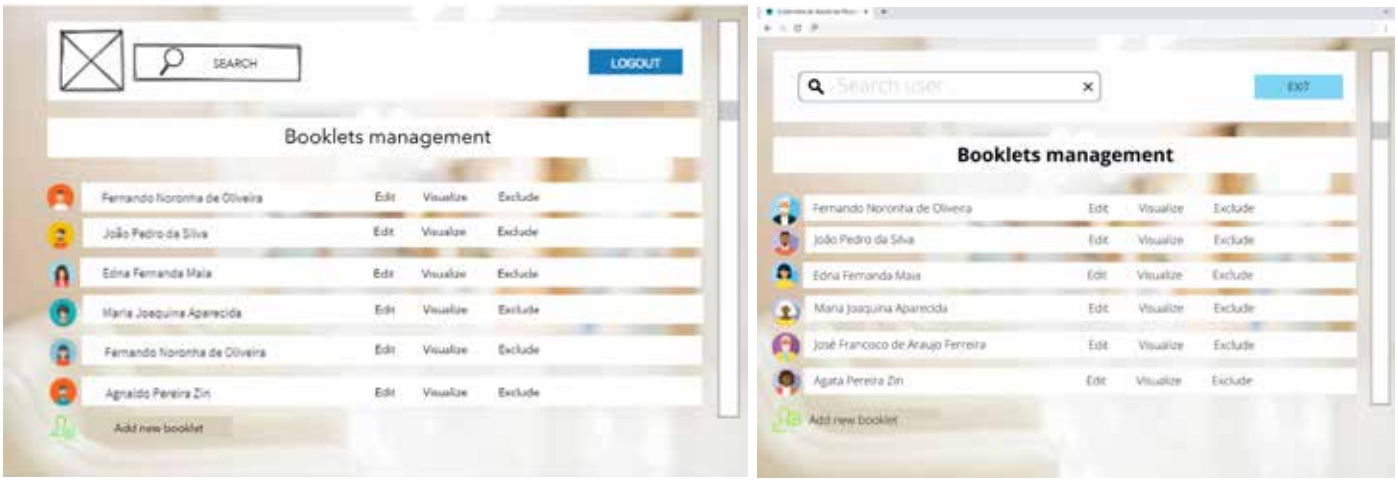

Figure 2 - Comparison between the health professional's initial screens, with the list of users' booklets that they attended before and after applying the heuristics and adjustments. Juiz de Fora, MG, Brazil, 2022

Source: Authors (2022).

Considering the software's objectives of being easy to use and being able to speed up the recording of information during appointments, we developed the tools to edit the instrument in a simplified way, so that users and health professionals can quickly identify the information they need and change it. In addition to ease of access and editing, the software also has audio functionalities, whereby you can listen to the information on the screen and enter your data via the microphone's audio input, which corresponds to the heuristic of flexibility and efficiency of use. Figure 3 shows the initial page of the notebook when it is enabled for editing and its functionalities.

Figure 3 - Notebook editing page and its functionalities. Juiz de Fora, MG, Brazil, 2022

Source: Authors (2022).

The prototype considers information that is important for the elderly person's health, such as blood pressure and blood glucose checks, as well as a list of medications used, previous surgeries and a history of hospitalizations. In addition, there will be a space dedicated to vaccination records, which will include an alert about the need for new vaccinations and boosters. This information can be accessed by users, but only professionals will be authorized to make changes.

Chart 2 describes the results of the technology evaluation based on Nielsen's heuristics[11].

Chart 2 - Evaluation of Nielsen's ten heuristics in the prototype developed. Juiz de Fora, MG, Brazil, 2022

Heuristic	Applicability in the prototype
1. System visibility and status	Buttons for logging in, creating a new account and commands on the registration screen are easy for the user to access and visually perceive;
2. System compatibility with the real world	Simple, objective and jargon-free language was used; familiar icons to represent an action were also used, such as the audio icon, the printer and the search magnifying glass;
3. User control and freedom	To help users recognize mistakes, an on-screen alert was used, for example, in the field for filling in the registration and password when there was an error;
4. Consistency and standards	A palette of shades of blue was used, creating a clean, elegant style; the image chosen for the login and registration screen shows the target audience, referring to humanization;
5. Error prevention	Confirmation boxes were used to delete any form;
6. Recognition rather than memorization	The health professional has basic, well-defined instructions on the interface, such as the button to register, making it clear where they need to click to carry out the action without the need for memorization; the layout of the booklet is similar to that of the physical booklet to facilitate the transition of information from one to the other;
7. Flexibility and efficiency of use	If the user has difficulty interacting with the system's fields, there are audio options where they can hear the text on the screen. There is also a microphone icon - if the user has an audio input device at their disposal, they can use it to enter their e-mail address and password to "log in" to the system;
8. Aesthetics and minimalist design	The digital passbook only displays information that is relevant to the user, there is nothing to distract them and make them lose focus on their objective, which is to register the information requested. The interface was built with a clear, minimalist layout;
9. Helps users recognize, diagnose, and recover from errors	Form warnings have been inserted in fields that are not filled in correctly;
10. Help and documentation	The system presents basic instructions that avoid user doubts.

Source: Authors (2022).

DISCUSSION

The use of health technologies around the world has been shown to be a tool to assist in health care, seeking to improve its efficiency[8]. From this perspective, we confirm the importance and benefits that the Computerized Health Booklet of the Elderly Person will bring to this population and to health services and their professionals.

We were able to identify the presence of the principles of Nielsen's Heuristic Evaluation[11] in the development of the software. The visibility of the system is clear and objective, the user can see where their data will be entered and identify the buttons that need to be clicked, given that they are defined and identified. This principle is relevant as older people are less likely to engage with health-related information products and services and need effective interventions to harness the potential of health technology[14].

Regarding the health professionals' screen, which provides a list of monitored users, there was an important change after the heuristic evaluation was carried out. We changed the language because although most professionals are more familiar with the language, we tried to standardize it and make navigation simpler and more intuitive. We also tried to make the design more minimalist, following the patterns of the other screens.

In addition, the application has a simple language in which the user can clearly identify the information, corroborating the fact that health technology for the elderly must be properly designed[14]. Changing the language after applying the heuristic evaluation was fundamental to adapt the most suitable terms to meet the demands of the target audience. Although some of the words presented in the first prototype were in English and are present in the daily lives of people who use the internet, this is not always the reality of the elderly population, which is why the decision was made to change the language to one that is more accessible and compatible with the daily lives of these users.

Considering that this is an application that will also be used by health professionals, some information, especially that which is specific to the field, is presented in technical language. It is possible to adapt the language on the page accessed by users, which is also recommended by authors who reinforce the idea that information for elderly people should be provided in an understandable way, as this population group generally has a low level of health literacy[15]. These points reinforce the principle of compatibility with the real world[11].

Regarding user control and freedom, the application shows the user and/or health professional the data that has been entered incorrectly, which qualifies the information stored and enhances the reliability of the data. The options to exit and/or return are always available for a simple and accessible way out of possible mistakes, but always associated with a data confirmation screen so that what has already been registered or entered is not lost.

Consistency and standards can be identified in the minimalist aspect of the design, which features neutral colors, as well as the figure of an elderly person, generating user identification with the application. We also identified this heuristic in the standardization of the commands, which are in the same place on all the screens so that the user can access them effectively and by recognition.

Sensory changes resulting from the aging process, such as reduced vision and hearing, influence the use of technology and should be considered for the digital inclusion of the elderly population[16]. We also consider elderly people with disabilities, who are more likely to experience a significant digital gap[17]. The option of using the audio tool and microphone are adaptations for those who have difficulty interacting with the system and need special assistance, considering the principle of flexibility and efficiency of use[11].

It is worth pointing out that despite the wide access to technologies, the elderly are

the ones who have the greatest difficulty in dealing with electronic equipment and the use of technologies in health, and for this reason, digital training processes are necessary to promote the development of fundamental skills for incorporating new learning and inserting technologies into the daily lives of the elderly, so that they can exercise full citizenship in a digital society[16].

The software will be a way for users to obtain information about their state of health and will be monitored and updated by a trained health professional to record diagnoses, test results and therapeutic proposals. Through this technology, it will be possible for elderly people, family members and health professionals to participate in the care plan that best suits the specific needs of each user, promoting comprehensive, individualized, and humanized care[18]. It also allows the elderly to be better informed and more active in their health-disease process.

Technology makes it possible for professionals to share information, favoring interprofessional care, since professionals from different areas will be able to record and collect information on the health-disease conditions of the elderly and based on this, they will be able to insert new care proposals. This is a way of optimizing the service, since the information will already be recorded, and it will only be necessary to include new information, as well as avoiding duplication of care, since they will have access to the care plan that is being developed with these users[19].

Como limitações do estudo, podemos apontar que se trata de um protótipo de uma Caderneta Informatizada de Saúde da Pessoa Idosa, sendo necessários ajustes e complementos que se adequem à realidade dos SUS através da validação em campo. A proposta é que o protótipo seja aperfeiçoado após utilização dos profissionais e usuários, que farão sugestões de mudanças e adequações.

As the study's limitations, we can point out that this is a prototype of a Computerized Health Booklet of the Elderly Person, and adjustments and additions are needed to adapt it to the reality of the SUS through field validation. The proposal is for the prototype to be perfected after it has been used by professionals and users, who will make suggestions for changes and adjustments.

FINAL CONSIDERATIONS

The prototype of a computerized health booklet for the elderly person is an advance in health care. Despite its initial limitations, it can be considered a facilitator of health care, by optimizing information through sharing between health professionals and users, avoiding duplication of care and helping to identify priorities and care needs.

This study identified the software's main strengths and points that need to be improved to meet the needs of users and the SUS. We hope that this technology will be used in health services and in the daily lives of the elderly after it has been improved, and more screens have been added that consider the assessment of the elderly person.

We believe that the use of this application will help to update and advance the use of technologies aimed at health care, and that it will bring benefits to health systems and users. This technology could also be adapted for other population groups, such as children and adolescents, pregnant women, and people with chronic diseases, making the health system more technological, reliable information accessible and users protagonists in their health-disease process.

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Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work - **Delgado CE, Siqueira FM, Freitas GKS de, Carvalho DBF, Fortes FL da S, Cavalcante RB.** Drafting the work or revising it critically for important intellectual content - **Delgado CE, Siqueira FM, Freitas GKS de, Carvalho DBF, Fortes FL da S, Cavalcante RB.** Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved - **Delgado CE, Siqueira FM, Freitas GKS de, Carvalho DBF, Cavalcante RB**. All authors approved the final version of the text.

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