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ORIGINALES

Development and evaluation of a prototype-application for caregivers of elderly

Elaboração e avaliação de um protótipo-aplicativo para cuidador de idosos

Desarrollo y evaluación de un prototipo de aplicación para cuidadores de ancianos

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ABSTRACT:

Objective: To develop and evaluate a prototype for mobile device with guidelines for caregivers of the elderly.

Methodology: Methodological research applied, technological production, descriptive and exploratory, with a quantitative approach performed in Private Higher Education Institution. Study collaborators were composed by a committee of experts, they are professionals of information technology (IT) and Nurse teachers. The study was developed in three stages: (I) Analysis of the scientific literature, (II) development of mobile application, (III) Evaluation of the prototype application. The project was submitted to the Ethics and Research Committee, where it was approved under the number of 2,723,146.

Results: Quality characteristics were evaluated from a software: functionality, usability, reliability, efficiency, maintainability and portability. All the content addressed in the prototype application was evaluated by the committee of experts, where he obtained an average of 4.6, being considered suitable for validation

Conclusion: We found that the construction of a prototype application to assist the caregivers of elderly promotes the possibility of solving a difficulty found in a simple and dynamic.

Keyword: Mobile Applications; Elders; Caregivers; Health Care; Technology.

RESUMO:

Objetivo: Elaborar e avaliar um protótipo para dispositivo móvel com orientações para cuidadores de idosos.

Metodologia: Pesquisa metodológica aplicada, de produção tecnológica, descritiva e exploratória, com abordagem quantitativa realizada em Instituição de Ensino Superior Privada. Os colaboradores do estudo foram compostos por um comitê de especialistas, sendo eles profissionais da Tecnologia da Informação (TI) e Enfermeiros Docentes. O estudo foi desenvolvido em três etapas: (I) Análise sobre a literatura científica, (II) Desenvolvimento do aplicativo móvel, (III) Avaliação do aplicativo-protótipo. O projeto foi submetido ao Comitê de Ética e Pesquisa onde foi aprovado sob número de parecer 2.723.146.
Resultados: Foram avaliadas características de qualidade de um software: funcionalidade, usabilidade, confiabilidade, eficiência, manutenibilidade e portabilidade. Todo o conteúdo abordado no protótipo aplicativo foi avaliado pelo comitê de especialistas, onde obteve média de 4,6, sendo considerado adequado para validação.
Conclusão: A construção de um aplicativo-protótipo para auxiliar os cuidadores de idosos promove a possibilidade de resolutividade de uma dificuldade encontrada de forma simples e dinâmica.

Palavras-chave: Aplicativos Móveis; Idoso; Cuidadores; Assistência à Saúde; Tecnologia.

RESUMEN:
Objetivo: Desarrollar y evaluar un prototipo de dispositivo móvil con directrices para cuidadores de ancianos.
Metodología: Investigación metodológica aplicada, de producción tecnológica, descriptiva y exploratoria con abordaje cuantitativo realizado en la institución privada de Educación Superior. Los colaboradores del estudio estuvieron compuestos por un comité de expertos, profesionales de la tecnología de la información (TI) y enfermeras docentes. El estudio fue desarrollado en tres etapas: (I) el análisis de la literatura científica, (II) el desarrollo de la aplicación móvil, (III) la evaluación de la aplicación prototipo. El proyecto fue presentado al Comité de Ética e Investigación, donde se aprobó bajo el número de dictamen 2.723.146.
Resultados: Se evaluaron las Características de Calidad a partir de un software: funcionalidad, facilidad de uso, fiabilidad, eficiencia, mantenibilidad y portabilidad. Todo el contenido abordado en la aplicación prototipo fue evaluado por el comité de expertos, donde obtuvo un promedio de 4,6, siendo considerado apto para la validación.
Conclusión: La construcción de un prototipo de aplicación para ayudar a los cuidadores de ancianos promueve la posibilidad de resolver una dificultad encontrada de forma simple y dinámica.

Palabras-clave: Aplicaciones Móviles; Anciano; Cuidadores; Prestación de Atención de Salud; Tecnología.

INTRODUCTION

Currently mobile communication devices, it is noticeable that people are increasingly connected due to easy access to all tasks that are done on a desktop computer or a smartphone. Due to the increasing number of users of this mobile technology, it is also necessary to deploy applications on virtual stores in order to meet the demands and facilitate the carrying out of routine activities in a practical way [1].

The percentage of people with ten or more years of age using the mobile phone handset in Brazil is 78.3%, as in the Northeast is 69.6%. Piauí cell phone use percentage is 68.4% [2].

Applications are software that store various information and enable interactivity and allows always be connected to the modern world ensuring a connection at all times because they are very portable and can promote, facilitate and innovate teaching and learning by making them more attractive [3, 4].

In this context technological advancement should be given special attention to the elderly population in Brazil is growing every day because this person needs care that enable healthy aging. Aging is a natural process that causes changes in the human

body, both physically and psychologically which causes no problem if it is within the normal conditions [5]. So, the elderly and their caregivers are benefiting from mobile technology due to relevant approached scientific content and easy access anywhere.

Aging brings physical, social, cognitive and behavioral changes that affect the individual's performance, interfering with the autonomy and independence, thus hindering the self-care and making them dependent on caregivers who are now responsible both for the activities already performed as assist in developed the elderly[6,7].

Caregivers have little knowledge on the health problems presented by the elderly, may compromise the therapeutic and generate overload and / or illness of caregivers. Pointing thus the need for methods and tools that can assist in time to provide the care[8].

The study is justified because of the numerous problems that affect the elderly and they often require fast to its resolution and was thinking about it that the idea of developing a prototype mobile device with grounded content in the scientific literature on the guidelines of health care of the elderly, so as to facilitate and improve the care of the elderly caregivers in long-stay institutions (ILPI) dynamic, interactive and attractive manner, given the rise of health technology.

Nursing is the front line of care and many elderly caregivers are not health professionals, therefore they benefit from containing easily accessible application content addressing health care of the elderly developed by nurses who have experience in the area.

From this perspective, this study aimed to develop and evaluate a prototype for mobile with guidelines on care for the elderly.

METHODOLOGY

a methodological research applied production technology that is characterized by the development of a new product, activity or service was performed (9). Study of quantitative approach, which ensures the accuracy of results, enabling a safe margin as to the inferences made [10].

This study also ranks as descriptive and exploratory. The descriptive research requires a lot of information about what you want to search, and is intended to describe the phenomena of a certain reality. Already the exploratory research aims to provide familiarity with the problem, aiming at building hypotheses or leave it explicit [11].

The survey was conducted in a Higher Education Institution (HEI) of a private nature in the city of Teresina-PI. This institution was chosen because of the need required application assessment with professional Information Technology (IT) and Nurses Teachers who have power both health of the elderly as with technologies.

The study population was composed of three undergraduate course teaching in nursing and three professional IT. For teachers, the following inclusion criteria were used: be a graduate in Nursing, be hired as a professor of Nursing at the IES selected have experience in the workplace for at least one year. For professionals in the IT

following inclusion criteria were selected: have superior training course in computer area, inform experience in mobile application development, be hired as the IT sector employee in IES selected for at least one year.

They were excluded specialists of IT and teachers of IES Nursing course selected, which are license to health, leave or vacation and those who do not have agreement with the data collection procedures after the clarification of all stages of the research.

This amount of participants was based on a dissertation research presented to the Ribeirão Preto School of Nursing, University of São Paulo, in which we developed a mobile application to prevent and classify pressure ulcers [12].

To address the goals of the present study was conducted in three stages: (I) Analysis of the scientific literature; (II) the mobile application development and (III) Mobile App Rating.

(I) Analysis of the scientific literature

An analysis was carried out on scientific publications discorram about the health of the elderly and health technology through the previous narrative review of the literature for a contextual approach on the subject. The literature review is vital in the research process to define the problem, to obtain an accurate picture of the current state of knowledge of a particular subject, the gaps and the contribution of this investigative process for the development of knowledge through location analysis, synthesis and interpretation by means of journals, books, and other conference minutes [13].

(II) Mobile Application Development

The application for mobile object of this research device was developed by a graduate professional in the information system and was divided into seven topics relating to the care to be provided to the elderly. Topics covered in the application refer to (1) vaccines, (2) food, (3) prevention of falls, (4) pressure damage prevention (LPP), (5) Hygiene (6) use of drugs, (7) first aid.

Through these contents can offer to carers of the elderly, necessary information based on scientific evidence of rapid, practical and dynamic.

For the development of the present study software was used the C # programming language using Xamarin framework. To develop the software you need to use programming language that is the standard method to express the instructions of a program, and it is through this language you can specify what data the device will use, how they will be processed, stored and transmitted [14].

The C # language is simple, allowing the development of different systems on various operating systems, is also object oriented, interpreted, portable, robust, secure, and offers high performance [15].

Framework is a set of codes, classes, functions, techniques and methodologies that allows software development in an easy way [16].

(III) Mobile Application Development

The evaluation of the mobile application includes the last stage of this study which was conducted by professors and professionals of Information Technology (IT), through two questionnaires type Likert scale that allows to know the degree of agreement of respondents assertive front proposal1

In assessing the application, we used the quality characteristics of software: functionality, usability, reliability, efficiency, maintainability and portability. These features allow to evaluate the software in all internal and external aspects, and thus, you can analyze the user's point of view and consequently the quality of the object of study [18].

Questionnaires experienced a content validity test through the submission of an APPRAISAL expert committee. This committee consists of six judges, three teachers of undergraduate nursing IES selected which evaluated the following aspects: functionality, usability, reliability and efficiency of the app. As for the IT experts evaluated the functionality, usability, reliability, efficiency and maintainability and portability of the app.

The questionnaire was applied individually in the months of March and April 2018, in a private room in the selected institution, with the door closed and only the presence of the researchers, for comfort, tranquility and concentration. The date of collection of the data was previously scheduled, respecting the availability of the participants. The duration of the appreciation of the mobile app took about an hour to an hour and a half.

The method for participants to examine the application included the delivery and presentation of printed research project built by researchers with the information needed to conduct and appreciation. All participants received a mobile device with the application already installed and configured for easy handling.

Data were analyzed by SPSS statistics 20 with providing descriptive analysis results tables.

After authorization of the IES, the project was submitted for consideration of the Ethics and Research Committee (CEP) which was adopted in the opinion of the number 2723146.

RESULTS

(I) Analysis of the scientific literature

A narrative review of the literature was conducted to address theoretical references on health technology and develop the prototype application content. The review was conducted throughout the study period of development of contemplating one of the goals.

The literature review allowed from reading, interpret the results and understand the importance of technology in health, with a view, the rise of the use of mobile applications.

Through the results of the literature review, we identified the problems that most affect the elderly to develop these prototype applications in order to assist caregivers of dynamic, interactive and easy to access anywhere.

(II) Mobile Application Development

Contemplating the second stage of this study, we developed a prototype mobile application android by a graduate professional in Computer Science.

"A prototype is an initial version of a software system used to demonstrate concepts, experiment design options and find out more about the problem and possible solutions" [19].

The prototypes can be divided into low, medium and high fidelity, the latter means that the prototype is very similar to the final product as it performs all the proposed functions, however, are improved in the final product. Therefore, the prototype developed in this study is considered high fidelity because performs all the duties involved. Final evaluations have order to identify any failure to be able to improve the final product [18].

The prototype application was titled as: care for the elderly. No need to use the internet and not the database to access the content, is quite didactic because the amount of demonstrative images Care to be held and easy language. The prototype has the intention to assist caregivers of seniors with care for this population, given that most caregivers are people with little or no training in health.

On the application home screen you can check the content covered, clicking on a topic there are texts and images with updated content and from scientific studies providing information on vaccines, food and hygiene of the elderly. It also provides training to prevent injury by pressure (LPP), fall and measures to encourage the correct use of medication such as how to store polypharmacy, instruments that can be used to collaborate not to forget the times that the medications should be taken. By clicking on "first aid" you can access the content of what to do in situations like, Cardiopulmonary Resuscitation (CPR), choking, seizures, fainting, hypoglycemia, intoxication and Vascular Accident (CVA). Figure 1 and 2 shows the final version of the application.

Figure 1- Overview of the home screen

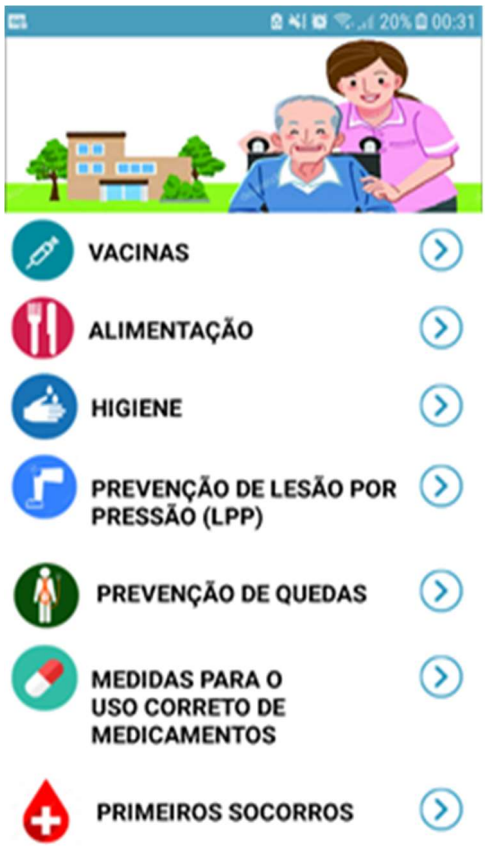

Figure 2- First Aid Home Screen

(III) Evaluation of the prototype application

Upon completion of the application prototype development, it has been rated as the questions of software engineering by experts of IT and Nursing Course Teachers.

The evaluation is needed to identify system problems, which users crave and sana doubts that arise on development. Only so developers are directed to solve problems to improve the system [20].

From the owner? Made by the panel of experts computer teachers and obtained the data shown in Table 1.

Table 1- Average and standard deviation of responses of teachers and specialists. Teresina, PI, Brazil 2018

affirmative	Average responses	Standard deviation
1.1) The software is necessary in the execution of their duties?	5	0
1.2) The software performs what was proposed in the correct way?	5	0
2.1) The software reacts appropriately when failures occur?	4.8	0.4
2.2) The software tells the user the input of invalid data?	4.5	0.8

3.1) It is easy to understand the concept and implementation of the software?	4.5	1.2
3.2) It is easy to learn to use the software?	4.8	0.4
3.3) The software offers help clearly?	4.1	1.1
4.1) The software running time is appropriate?	4.6	0.5
4.2) The resources available in the software are adequate?	4.3	1.2
5.1) It is easy to find fault when it occurs?	4.3	0.5
5.2) It is easy to modify and adapt the software when needed?	5	0
5.3) It is easy to test when there are changes in the software?	5	0
6.1) It is easy to adapt the software to other environments?	4	1
6.2) It is easy to install the software on other devices?	4.3	1.1
Total Average:	4.6	0.8

Source: Direct research

DISCUSSION

The prototype covers information about issues that most affect the elderly and care to be performed by elderly caregivers in a simple and dynamic way. The themes were: vaccine, food, hygiene, injury prevention by pressure (LPP), fall prevention measures for the correct use of medicines and first aid which shows care in Cardiopulmonary Resuscitation (CPR), choking, seizures, fainting, hypoglycemia, toxicity and vascular accident (CVA).

To better understand the results obtained, we performed an analysis of each parameter. In feature functionality were two questions, one about the accuracy in the execution of their duties and perform what was proposed correctly to the evaluators and was considered appropriate, since all the answers obtained to score five.

In Reliability feature was done questioning about the appropriate response of the software when failures occur and if the user is informed about the input of invalid data and scores a between 4.5 and 4.8 and was considered appropriate, given that the higher scores are between 4 and 5.

To assess the usability parameter where the question "software offers help clearly" got one of the lowest average: 4.1 and one of the largest standard deviation of 1.2. This value can be explained by the fact that some evaluators do not feel able to answer that question. They were also asked the following question "is easy to understand the concept and application of software"? and "it is easy to learn to use it."

To evaluate the efficiency parameter questions were asked about the time of execution and appeals are suitable which averaged between 4.3 and 4.6 is considered appropriate by all the experts. In Table 1 one can observe a major variation in responses by obtaining a standard deviation of 1.2. This amount can be explained by the fact that some evaluators had no expertise in application prototype programming, which can interfere with their assessments.

As for Maintainability parameter, the inquiries by the evaluators were on the ease of finding fault if it occurs, modify and adjust when necessary and test when there are changes which averaged between 4.3 and 5 (maximum score). The fact that the prototype need not use internet and database restricts the same fault, though.

Portability assesses the ease of adapting the software to other platforms and installation on other devices, the last parameter evaluated scores a between 4 and 4.3. The lowest average reached, the evaluators justified by the fact that the prototype has been developed only for the Android platform, being prevented installation on other operating systems such as iOS (iPhone) and Windows Phone. For added portability, you should develop the final version of the software technology that allows the solution.

Overall, the prototype was considered appropriate for achieving an overall average of 4.6 thus being within the average proposal that was between 4 (agree) to 5 (strongly agree).

The Android platform is used more widely in the world, but it was pointed out the need to expand the software to other platforms, thus, that there are limitations to the use of the population.

For future work, it proposes to adapt the prototype for other platforms as there are technologies that enable this solution at low cost. It is proposed also another study whose goal is the development of the final version of the application and perform validation with users in care practice.

CONCLUSION

It was concluded that in this study the preparation and consideration of a prototype that helps us care for the elderly have been achieved, noting that the use of health technology promotes the possibility of solving a difficulty encountered in a simple and dynamic way.

The content presented will serve as reference to proper care because it was created and tested by professional nurses who recognize the need of elderly caregivers, and professionals of Information Technology which allowed the creation of an easy to handle.

The difficulties in this study were found at the time of evaluation of the prototype, because not all evaluators had technical knowledge of the instrument's construction so making it difficult to evaluate.

This study contributed to a reflection on the importance of using health technology based on evidence for the dynamics and ease of care to the elderly, keeping in mind that not all caregivers are knowledgeable in health.

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