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Minha Bula: Mobile Application to Transcribes Medicine Leaflets for Patients with Visual Impairment

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Abstract

Visually impaired people have significant difficulty in following drug treatments, due to the existence of barriers, among them and mainly, the printed leaflets. Therefore, the transcription of this information via mobile solutions is essential for efficiency and follow-up of drug therapies. This research had the main objective of demonstrating the modeling and implementation of an application prototype that aims to expand the access of visually impaired patients to the information contained in drug leaflets, and ensure the effectiveness of the treatment of these people. As a research methodology, the bibliographic review focused on the PubMed portal, in addition to complementary sources, government websites, epidemiological databases and national guidelines, as well as research selected by evaluative criteria in the health and technology areas. Through the application developed, visually impaired people will be able to access the information contained in the drug leaflets duly approved by ANVISA, which will certainly guarantee the necessary analysis for proper and safe use. The project has great potential to optimize care and promote the access of patients with some degree of visual impairment to adherence to safe and accurate treatments and in compliance with SUS's recommendations.

Keywords: Visually Impaired; Mobile Solutions; Social Inclusion; Medicine Leaflets

1. Introduction

According to demographic census of Brazilian Institute of Geography and Statistics (IBGE), from 2010, 18.6% of Brazilian's population has some type of visual impairment. From this total, 6.5 million with severe visual impairment, 506 thousand with total vision loss (0.3% of the population) and 6 million with great difficulty seeing (3.2%) (Christy & Pillai, 2021). Obstacles are imposed to this part of the population to access health-related information, through mobile devices, must be eliminated in order to guarantee social equality (Nimmolrat et al., 2021).

Meanwhile, Technological medicine evolution in recent years enabled healthcare process improvement and reached therapeutic goals for quality of life changes (Souza et al., 2021; Alves et al., 2019; Pereira et al., 2021; Silva et al., 2021, Vaz et al., 2021). However, some factors may limit mobile apps to reach their effectiveness, such as: inconsistent regulation and evidence, insufficient security regarding patient's data, which certainly compromises their care, and finally, the failure in developing a platform that is focused on a patient's needs.

The main existing barriers for visually impaired patients, can significantly affect proper use of drugs and impair treatment follow-up, thus negatively impacting therapy outcomes (Nimmolrat et al., 2021; Brennan et al, 2021; Miyazaki et al., 2023). For these people, medication use is hampered, considering the difficulty of accessing information contained in package insert.

Assistive technology (AT), according to Technical Assistance, is an interdisciplinary action that involves products, resources, methodologies, strategies, practices and services to generate functionality in activities, as well a effective participation for people with disabilities or reduced mobility, with the objective of offering independence, security, quality of life and social inclusion. AT allows visually impaired people (VIP) to have access to the same level of information as others, thus enabling social and functional independence to expand their knowledge in the areas of employment, education, health, communication and leisure (Christy, 2021). Therefore, the use of mobile apps that provide access to safe information regarding medicine will undoubtedly be very useful (Okan et al., 2019; Nimmolrat et al., 2021).

Another problem faced by VIPs when it comes to accessing drug leaflets concerns the knowledge of Information Technology (IT) of these future users, as well as their ability to access smart devices. The irregular level of knowledge and practice with current technologies and applications of these people greatly reduces the ability to use systems, as well as such as understanding and access to information. Even with the evolution and tools that allow access to computerized knowledge, there is a large gap regarding the existence of health apps that directly serve the visually impaired in order to facilitate medical treatment for these people (Shrestha et al., 2020; Nimmolrat et al., 2021).

So, a question guided this research: how would it be possible to optimize the reading process and knowledge of a disabled user in relation to the description of their medicines?

This research aims to demonstrate the process of implementing a health app that transcribes the information contained in drug leaflets in a dynamic, accessible, specific way and that guarantees all the information necessary for medications to be used safely, by people with visual impairment, allowing treatment continuity. Among specific objectives contained in the project mentioned above are: the definition of the interaction scenario with the chosen technological tool; presentation of app structure; choice of data to be manipulated and, finally, the description of future implementation steps of the referred project, with data connection via cloud platform.

In comparison to competitors, there was an analysis carried out in Table 1, consolidated in Figure 1. The comparison in table 1 questioned: applications for reading package inserts, quantities of listed drugs, offline or online access, complexity of understanding the information described and functionalities presented. It was observed that, as well as the app "ProDoctor Medicamentos", "Minha Bula", object of the present study, also presents information on active principles, pharmacological groups, therapeutic indications, drug presentations, laboratories, package inserts, generics, in addition to having a very informative and intuitive design and interface. However, there wasn't provision of data on the availability of medicines at the SUS popular pharmacy, not even drug prices. On the other hand, the differential of "Minha Bula" a free accessibility aimed at both the visually impaired and the hearing impaired. Table 1 shows applications available for the Brazilian scenario, with analyzes of features that the competing software presents, features that were considered absent (or that could be modified) for the purpose of the research, positive comparisons (MinhaBula offers more than the competitor) and negative (MinhaBula does not offer, when compared to the competitor).

Table 1: Apps Detailed Comparison

Name	Features	Characteristics that could be improved	MinhaBula Positive Comparisons	MinhaBula Negative Comparisons
BulasMed (Google PlayStore®, 2021)	Offline access to medication package inserts (with the possibility to favourite and share), through quick search by name, substance, laboratory and therapeutic effect. Allows access to prices and another interface to search for doctors.	There are few Drugs. Information design and distribution are not optimized (same as a printed leaflet). Connection with other interfaces for querying prices, without good results.	Accessibility for people with visual and hearing impairments. More medicines. More informative and intuitive design and distribution. Queries within the interface	-
ProDoctor Medications (ProDoctor, 2021)	Extensive information about the drugs: active principles, pharmacological group, therapeutic indications, presentations, laboratories, package insert, generics and similar. Very informative and intuitive design and interface. Allows communication to app managers to request a new drug	-	Accessibility for people with visual and hearing impairments.	No association with availability at the pharmacy, by SUS, prices.
MedSUS (Gov.br, 2019).	Possibility to favourite Access to updates. Provided by the Ministry of Health that brings together information about the drugs listed in the SUS Rename.	Complex access	Accessibility for people with visual and hearing impairments.	
MedCode (Medcode, 2021)	Prescriptions, Ducts, Drug prices, Laboratory, ICD-10, Scores, Offline, Paid out, Dose calculator, simplified in pediatrics.	Very embracing app	Accessibility for people with visual and hearing impairments.	

Source: (Authors, 2023)

With regard to the "Bulas Med" app, is identified that it and "Minha Bula" offer the possibility to favorite and share, through a quick search by name, substance, laboratory and therapeutic effect, however, the first one does not allow offline access, despite having more

drugs, design, more informative and intuitive distribution, as well as consultations within the interface.

Figure 1: Apps General Comparison

APPS	FREE	ACCESSIBILITY	AVAILABILITY IN SUS	OFFLINE ACCESS	MANAGERS + USERS
Bulas Med	✓			✓	
ProDoctor Medicamentos	✓				✓
MedSUS	✓		✓		

Source: (Authors, 2023)

However, "MedSUS", in addition to offering information about the drugs listed in the SUS Rename, also offers the possibility of favoring. There was a difficulty in access by users. The application "Minha Bula" has as its main objective, for ease of access by all users, including the visually and hearing impaired, a fact that differentiates it from other applications and allows it to be the preference for the portion of the population referred to as the target audience of the project developed in this article.

2. Material and Methods

2.1 Research Methods

The core of the research is the challenge of implementing an application that contributes to patients with hearing or visual impairments, with the ability to connect physicians and guardians to support this audience in reading and knowing the medicines they consume (or intend to consume). For conducting this research, three pillars were based: an evaluation of the literature on accessibility (mainly through software), medical prescription and package inserts and mobile applications for this purpose; the second pillar was the use of an application modelling, with an Adapted Canvas to understand user demand and a BPMN to determine its operating process; finally, the prototype of the application was modelled. Firstly, bibliographic research was carried out on this article, through a literary review, using the descriptors: "Mobile applications" "Visual impairment; "Accessibility". The research process included a literature analysis with the following premises: what are the premises of the limitations of a patient's research when he wants a description of the medicines he consumes? Are there technological tools available on the market that are accessible? what is the standard description of a medicine like?

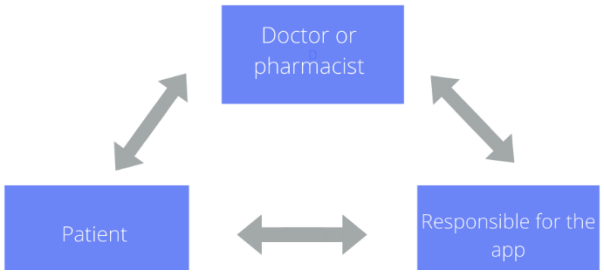
Is this method of description easily understood by the user? What does ANVISA (National Health Surveillance Agency) make available on the subject? Given these arguments, a literature review was carried out.

It is important to emphasize that the focus of population is guaranteed access to this portion, to the information contained in medication study inserts that can be used by them, as well as determining and analyzing all surgical variables exposed in the research. Medicines were distributed, planning and publication of the mobile application of information contained in package inserts, duly approved by the National Health Surveillance Agency (ANVISA). In addition to a survey selected by the evaluation criteria of the health area, articles with the content of technological analysis, from the last 2 years, with the support of evaluation that were used as a form of contribution in sectors of the area, from the process/protocol to the management of raw material logistics data and hospital management.

2.2 Structure for building the application

The development of the project went through three main stages: the definition of its scope, evaluation of its functioning and challenges (using the adapted Canvas and Business Process Model tools), and the implementation of the prototype's interfaces. This project focuses on following scope: reading and transcribing medication package inserts for people with some degree of visual impairment. However, the use of the mobile application is mainly focused on the doctor or pharmacist, who will be responsible for maintaining the database of the mobile solution, as well as on the patient with some degree of visual impairment. Thus, regardless of the institution, it is defined that its use will be made by the health professional together with those responsible for the application (Figure 2).

Figure 2: Persona Interaction



Source: (Authors, 2023)

The application will be used with the objective of registering all the data referring to the package inserts of medicines approved by ANVISA and its proposal is that the doctor, pharmacists and team that carry out the monitoring of package inserts have access to information and data of the medication routine, avoiding possible complications and contributing to a satisfactory continuity of treatment. As it is a very comprehensive mobile solution, its development is being carried out for application, both in private health companies and in SUS, emphasizing that there is a concern that an application is developed with low implementation cost, with easy access.

/ use and with high performance in the monitoring of patients with some degree of visual impairment, enabling its use both for these users and for physicians who monitor adherence to the respective pharmacological treatment.

Furthermore, knowing the existence of competing applications in the market, and that "Minha Bula" is the most inclusive, since it encompasses visual and hearing impaired users, the big difference between it and the applications already available on the market were raised. The importance of continuity in the management and organization of health services is also highlighted, which must guarantee quality in the delivery of information throughout the patient care process, by indicating the appropriate drugs, from the prescribing phase, as well as how to provide a correct explanation about access and use the by patients.

In this way and for all the above, it is proven that the application studied in this article will certainly guarantee the desired effectiveness regarding the delivery of safe information contained in the package inserts of drugs approved by ANVISA, as well as access to updates that the patient can perform on the platform, and also to their adherence to the pharmacological treatment necessary to maintain their health. The information collected and stored in the application will assist health professionals in making accurate and effective decisions regarding the health of patient-user. It is also important to note that if the patient is treated in an urgency/emergency service, the doctors involved in the referred service will have at hand the patient's entire pharmacological history, which will provide these professionals with access, consolidating and guaranteeing quality information, for decision-making and appropriate conduct.

For the development of the project, as used by Silva et al (2022), two tools were used to research the relevance of the application and how it works. For the first function, Canvas technique was used, which, as done by Silva et al, 2022, evaluated the positive and negative points, in view of the scenario that would contribute. The Canvas used was the one proposed by Souza et al., 2020, adapted for app demands. For organization of functionalities, an analysis, represented by a diagram based on Business Process Model and Notation (BPMN), as performed by Silva et al., (2022), using the heflo® tool. Finally, for the application's development, the Canva platform was used, a functional prototyping software that allows collaborative development in real time with other users remotely. The plethora of materials available for free, such as video lessons, tutorials and articles, which describe in a practical way the operation and handling of Canva, significantly influenced our choice for this tool. A prototyping process was carried out using the Android Studio® tool.

3. Results

3.1 Mobile Structure Modelling

Among results of the modelling proposed application, an adapted Canvas was developed, created by Souza et al., 2020, to assess the capabilities and competencies of the proposed

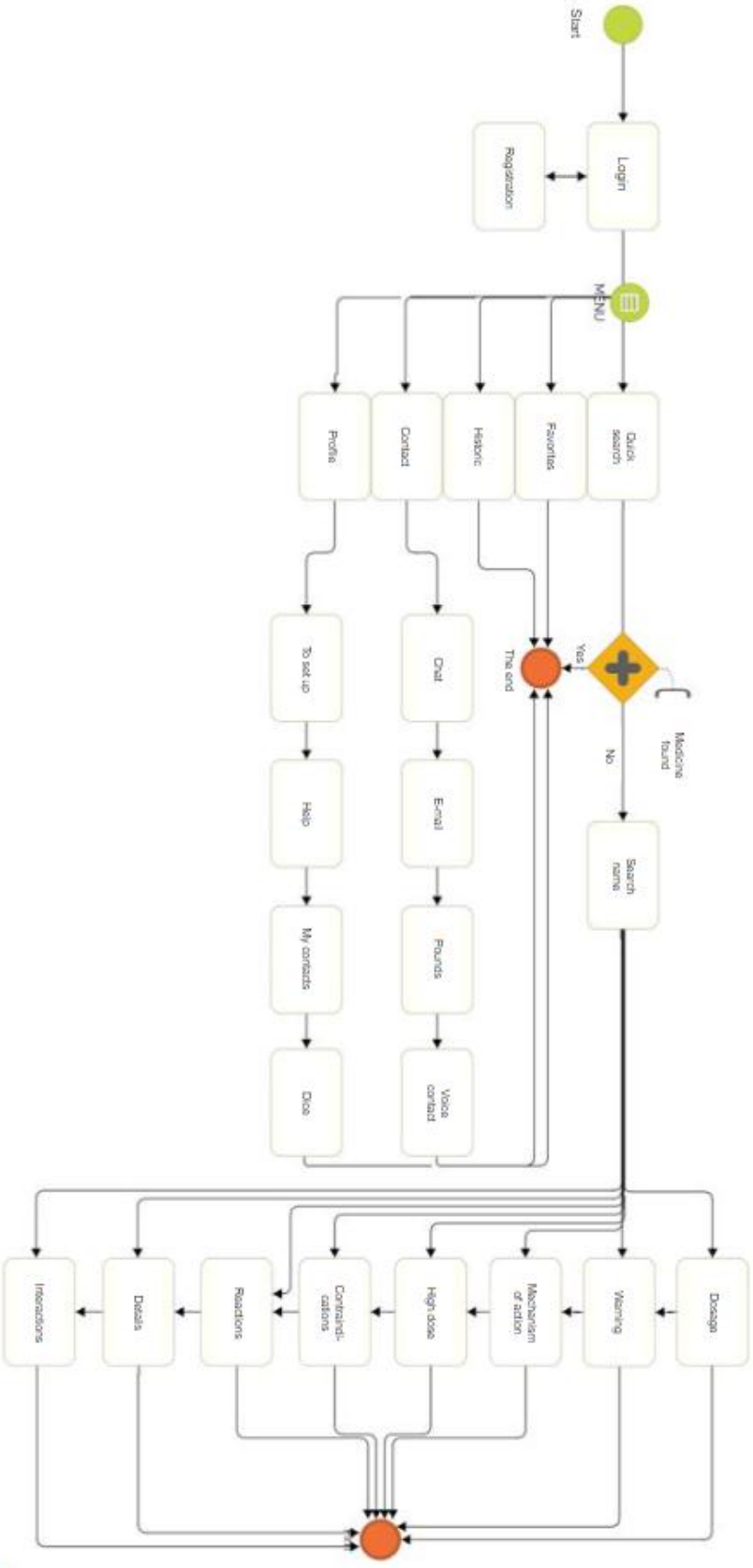
solution (as results: the main focus of the app (in blue), main contributions (in green), main risks and challenges (in yellow) and its references (in pink)). They were evaluated from initial questions, such as the purpose of the app to its implementation challenges and risks. Such an artifact is described in figure 3. As described in the result in Figure 3, firstly (in blue) the purpose of the application was questioned, where the ability of a patient to use the application, connected with their doctor and with the possibility of accessibility for the visually impaired (with features such as Speech for interaction via audio) and hearing impaired (with screens with an adaptable and comfortable view).

In sequence, in green, the contributions that were raised were evaluated, issues of differential contributions of the solution (which has references in accessibility and dissemination of knowledge of medicine inserts - which unfortunately is far from the great part of the Brazilian population) and those involved in the process (in the case of doctors, students, etc.) and the use cases for using the app (which are connected to the BPMN in Figure 4). In sequence, in yellow, challenges and risks were evaluated for the tool: Laws, accuracy, relevance, adherence, and other issues, both in relation to the application and in the management of the data that it will consolidate were evaluated. Finally, in pink, scientific references of related tools and development tools, related work on accessibility. Once its actions and operating issues were defined, its operating flow was determined, as described in Figure 4 (with its screenshots described in Figures 5 and 6): the application begins with login, through an email and password chosen by the user. If the user does not yet have a login, it is possible to register by clicking on “REGISTER” function. After this step, the user will be directed to a menu, with several functions. In “HISTORY” function, the user will be able to access the drugs previously researched, in a faster and more efficient way. In “FAVORITES” function, the user will be able to access the medicines saved as favorites.

Figure 3: Demand assessment

Source: (Authors, 2023)

Figure 4: Mobile solution working flow (BMPN Based)



Source: (Authors, 2023)

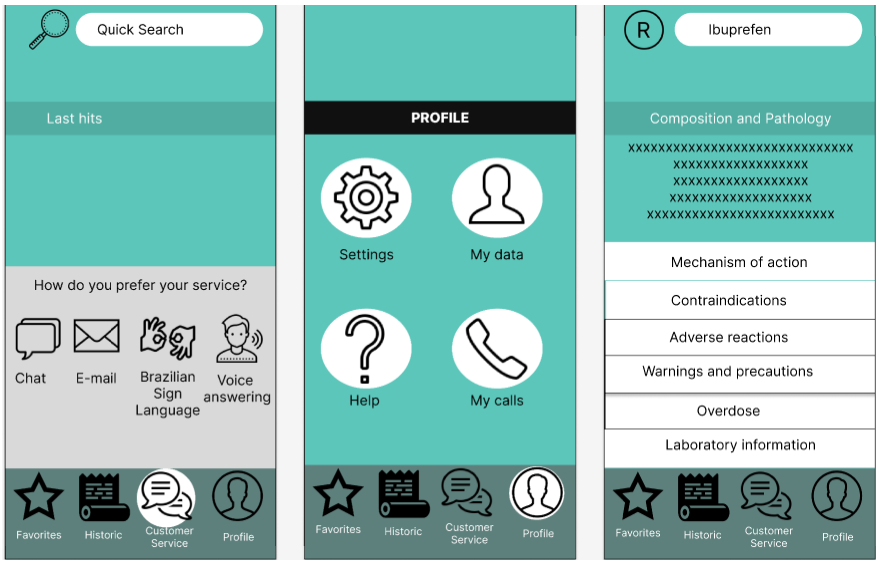
Figure 5: Screenshots – Part 1

Source: (Authors, 2023)

In “SERVICES” tab, user will have access to the application support, being able to choose the way in which they want to receive this service. Finally, still in the menu, there will be a function called "QUICK SEARCH" in which the user can search package inserts by providing the drugs name. In this function, user can choose which part of the leaflet he wants to access. He will be able to choose whether he wants to have access to dosage and composition, warnings and precautions, mechanism of action, overdose, contraindications, adverse reactions, laboratory information and drug interactions. All of this, optimally arranged, in topics, with an easy-to-understand design to facilitate user research. This support can be provided by email, chat, pounds or voice service. In “MY PROFILE” function, the user will have access to the application settings, their data, their previous visits and a help option to be able to see the most frequently asked questions.

In short, the BPMN of the mobile application process, summarizes a login process, and the possibility of choosing to receive information about a medicine leaflet, either by pounds or by audio (depending on the disability). There is the possibility to favorite a medicine, communicate via chat with the doctor and pharmacists to exchange information and doubts, in addition to having the security of those responsible and doctors connected during the analysis in case of doubts.

Figure 6: Screenshots – Part 2



Source: (Authors, 2023)

3.2 Discussion

The proposed tool has a social context of helping people with visual impairments. However, even with a noble context, the rigor of a standardized process for building the tool was not denied. With the use of "Canvas Adapted" from Souza et al (2020), it was possible to objectively define the main focus of the app (in blue), its main contributions (in green), its main risks and challenges (in yellow) and its rationale (in pink). With brief and objective definitions, a contextualization was made, with a procedural tool, about the context of this proposal contributions. In an objective description, through this adapted canvas, it was possible to delineate that the focus of the application is to support the patient with accurate information about their medication, where information about the user and the other connected characters could be managed and a safe monitoring of the medications used would be carried out. It is properly referenced in the literature, both for inspirations in works with the use of technology for this purpose, and for references on analysis of descriptions of medicines.

In addition to the identity of the tool, it was possible to define a standardized way to verify its operation, which was subsidized by medical references of the needs of the target public, which was portrayed by the developed BPMN, based on references that were carried out in the searches in medical databases.

In addition, the tool respects demand of Brazilian's LGPD (General Data Protection Law), and the managed data is protected and anonymized in its analysis and storage. Finally, the tool, at no cost to its user, allows for optimization of a very important process in the patient's life with a disability. With its use, monitoring a process (which, if done incorrectly, can cause complications or even death) can bring more security to the patient, his family and the doctor in question.

4. Conclusion

"Minha Bula" app project was successfully developed and has great potential for optimizing the health care of people with some degree of visual impairment, by stimulating active search for information, in addition to allowing greater chances of treatment adherence in a fast, safe and efficient way. Another factor is the economic viability (low cost) of this tool. Through this research, it is possible to verify that the application has the capacity to manage data from users and doctors, optimize the reading of information about medicines and monitor the doctor about their use by the patient. The market's apps presented offer information about the package inserts and reference, generic and similar drugs that are currently available. The project presented here, on the other hand, offers and extends to patients with some visual impairment the technological tools used in these apps.

Thus, researchers expect that this app can positively influence the outcomes of patients in need of pharmacological treatment, effectively reducing the lack of access to all relevant information contained in the package insert. The app can be used in any care setting, including for the population assisted by the SUS and has the potential to improve the patient's quality of life.

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