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Updating Bem-me-ker: An User-Centered Approach to Redesigning an Onboarding Application for Cancer Patients

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Abstract

This paper presents the research and development of a redesign of Bem-me-ker – an application of the Portuguese Oncology Institute (IPO) of Porto. For this project, we resorted to an user-centered methodology featuring a survey of the current market and the context of the digital health industry, interviews and usability tests with patients, caregivers and IPO stakeholders. Such user-centered methodology proved to be efficient in responding to their needs, with satisfactory results. Its contributions are focused on the incorporation of the concept of patient navigation into the design of an onboarding application, transforming it into a virtual manager of the disease for cancer patients, and with the ultimate goal to improve their wellbeing and quality-of-life. We see that this approach is also capable of being adjusted to the needs of other institutions and patients, thus contributing to the improvement of the national health service, providing digitally optimized information to citizens.

Keywords: *eHealth, mHealth, interaction design, cancer, onboarding, chatbot*

1. Introduction

During the post-graduation in interaction design, web and games of the faculty of fine arts of Porto, the opportunity arose to collaborate with Fraunhofer AICOS in the redesign of the application Bem-me-ker of the Portuguese Oncology Institute (IPO) of Porto.

Bem-me-ker is an application used by cancer patients to consult personal information such as exams, medical reports and appointments at the IPO of Porto. In the current version patients can use the application on their mobile phones, but also on their personal computers, using their own IPO number and password to access them. Although there is an older majority, its users are of all ages and all have different backgrounds, needs and difficulties.

The biggest issue presented by IPO stakeholders was the lack of interaction with patients. The application was a repository of appointments and static information. As cancer requires urgency in

diagnosis and treatment, it is imperative that IPO is able to answer their patients' questions and optimize their process of admission and treatment, avoiding scenarios in which the disease moves faster than the institution's administrative processes. (The information we had from the current application was based on opinions of IPO stakeholders and some users, since we didn't have full access to it, there will be no detailed description of this version).

Considering this issue, it was important to increase the autonomy of patients with the digitalization of IPO's services. In order to make this possible, it was necessary to opt for a user centered methodology ensuring the product capability on meeting the different needs of IPO's patients and people who for some reason needed to use the application. This methodology was the right one for us, as it places the end user at the center of the design process in order to achieve good usability outcomes (Harte et al., 2017).

Considering the COVID-19 pandemic we faced some difficulties. We weren't able to perform as many interviews or tests as we expected, but in the end, 9 online interviews were conducted with different types of users, 17 usability tests were performed in the different phases of the project and all proved to be sufficient in our case. Our main focus was to ensure that the user had no difficulty navigating the application regardless of their age, as cancer can unfortunately be diagnosed to anyone, keeping both the patient, caregiver and doctor abreast of their medical condition.

One aspect that was researched and that proved important in showing the relevance of our project was the investigation of the current health industry.

According to Zhao, Ni, & Zhou, (2018), the current demand for a healthy living has increased pressure on the traditional health industry. The total fiscal expenditure on health care is increasing in developed countries, and in some developing countries, it is hard to obtain adequate medical services at low cost due to scarcity of medical resources. Zhao, Ni, & Zhou also state that there is an increase in morbidity, in ageing aggravation related problems, and in various types of chronic diseases around the world. They also refer that, as a result, the global health industry has focused on reducing the cost of healthcare, on improving the efficiency of diagnostics, treatment and monitoring, and on optimizing the allocation of health resources. In this context, mHealth services have been getting much attention during recent years, as they save time, lower the cost of diagnostics, and improve the quality and efficiency of medical resources (Zhao et al., 2018).

The ostentation of developed countries to widespread technological adoption and the desire of emerging economies to expand their medical services to the most remote rural regions makes the digital health sector one of the areas that will evolve the most in the upcoming years. According to Ugalmugle & Swain, (2020), the digital health industry will grow at 28.5% CAGR (compound annual growth rate) through 2026, and the increasing adoption of digital health technologies due to COVID-19, will further boost the digital health industry. Besides this, the system of healthcare is also suffering a paradigm shift as the worldwide senior population is increasing, making patients require more health services at home. This is where smartphones can play a role in the digital health industry, as they allow patients to have control of their own health without leaving their homes (Pennic, 2018).

The objective of this study is, therefore, to identify the needs and expectations of different user profiles to redesign the IPO application, Bem-me-ker, making it a more complete and user-friendly disease management tool, using a user-centered approach, meeting the current demand for the digitization of health services.

In this article, we will present the different phases of Bem-me-ker's redesign development, including all the necessary research that helped us to solidify and justify many of the final decisions. Section 2 describes the project methodology, including the user research methods; section 3 presents users findings, requirements, prototype results and evaluation; section 4 discusses the prototype validation; section 5 presents discussion regarding the investigation and section 6 presents conclusions regarding the entire project.

2. Methodology

This project was based on a cycle of four elemental activities, described by Hartson & Pyla, (2012) as Analyze, Design, Prototype, and Evaluate. According to the authors analysis translates to understanding user work and needs, design translates to creating conceptual design and determining interaction behaviour and look and feel, prototype translates to realizing design alternatives, and evaluation translates to check if our design is on track to meet user needs and requirements.

In the analysis phase, nine exploratory interviews were conducted to gather relevant information about users' routines, needs and expectations. To get an overview of opinions, the participants were selected based on different profiles, from cancer patients, ex-patients, caregivers, psychologists to IPO's stakeholders. In this phase were also created 3 different personas to represent the target users. (See section 3.1 for interview results).

The findings from user's analysis were used as background for the application user-centered design. After the conceptual and architecture design, it was created the application prototype to test with users.

In the evaluation phase two rounds of usability tests were conducted, in the first round 4 participants tested a low-fidelity prototype, and in the second round 17 participants tested a high-fidelity prototype. To ensure that our sample was broad enough to cover likely users' variations, the participants selected were cancer patients at IPO, cancer patients at other institutions, and non-patients, with ages between 22 and 64 years old.

The test script started with a short presentation of the project, test guidelines and the Think Aloud Protocol, used to better understand the user. According to Hartson & Pyla, (2012) the think-aloud technique is a qualitative data collection technique in which user participants, as the name implies, express verbally their thoughts about their interaction experience, including their motives, rationale, and perceptions of UX problems. The authors also claim that by this method, participants let us in on their thinking, giving us access to a precious understanding of their perspective of the task and the interaction design, their expectations, strategies, biases, likes, and dislikes.

After the introduction, the participant received a set of tasks to perform, one at a time. The previous task had to be completed to get a new one. Each task was classified in 3 levels by the supervisors as: completed the task without difficulty (the user performed the task effectively); completed the task with difficulty (the user has taken too many steps to accomplish the task, taking more time than expected); and failed to complete the task. At the end, participants were asked to comment on their experience with the application.

In the end of each round based on the qualitative analysis of the tests and the participants inputs, the prototype was iterated. (See section 3.2 for prototype results)

3. Results

3.1 Interviews

The interviews qualitative analysis presented different concerns and expectations about the application. While the IPO´s stakeholders wanted the application to streamline patients' navigation and to ensure that the disease did not progress faster than the institution's administrative processes, patients wanted the application to be secure, useful for their daily lives, and easy to use. On the other hand, caregivers wanted the application to provide them a disease manual, with useful information to deal with cancer patients.

From these interviews, the following was highlighted in Table 1.

Table 1. Main contributions of interviews for user research

Keywords	Interviewees' comments
Description of the process	➔ Patients face several stages and types of treatments; ➔ There is an urgency in diagnosis and treatment; ➔ After being discharged, the patient often has to deal with problems arising from disease; ➔ The staging of the disease was made at a private hospital and then I was transferred to the public for follow-up; ➔ I did several tests on the same day to confirm that I would not have cancer on my entire body because it was an invasive carcinoma; ➔ Doctors do not give all the information. We learn as the days go by.
Emotional state of the user	➔ Patients show difficulty in orientation and great anxiety. ➔ People focus mainly on completing the treatment and surviving. ➔ 80% of patients are afraid of getting cancer again. It is a fear perpetuated by time. ➔ There are many problems when children with cancer return to school. ➔ The situation was eating me inside. Each exam was a new stress with fear that the cancer had spread. ➔ There is a lot of anxiety, because things have to be done at the moment without delay.
Caregiver behavior	➔ They feel a lack of support and helplessness as some of them do not know what to do to take care of the patient in the best way. ➔ They have difficulty in reconciling their professional, family and patient lives.

Patient behavior	➔ Some patients have difficulty understanding the tests ordered. Between diagnosis and registration at the IPO, patients waste time because they do not bring appropriate documents. ➔ Online support is used mainly by patients, but also by family members, and with less frequency by nursing homes and other institutions. ➔ There are low levels of physical activity in IPO patients ➔ Many users look for information sources on the internet that are not reliable.
Project motivation	➔ To not allow the disease to progress faster than administrative processes. ➔ It is necessary to speed up exams that influence decision making. ➔ Eliminate unnecessary intermediaries and administrative processes. ➔ Eliminate duplicate questions, which are made through different media.
Current application limitations	➔ Repository of consultations. ➔ The platform that exists is accessible, but it is not immediate. ➔ Senior people show more difficulty in using the application. ➔ It is not possible to answer all questions in time. ➔ Human resources are scarce and lack the necessary training. ➔ It is mainly just one scheduling platform.
Chatbot	➔ Support users in the onboarding process (Patient-navigation). ➔ The chatbot must always remember the user that it is a robot and that it has limitations. ➔ Patient-navigation. ➔ Virtual disease manager. Not just an administrator, but an expert on the disease. This will be the key to the organization of services. ➔ Automate responses as much as possible. ➔ Help the user, if it is not possible, forward to physical managers. ➔ Provide emotional support. ➔ It must be simple to use. ➔ Redirect to reliable information in Portuguese and written in a simple and direct way (...) Explain procedures and medical words / expressions. ➔ Must have a serious personality to give credibility but also have some affection. ➔ It should not make diagnoses, it should only advise, suggest and/ or show possibilities. ➔ It must show empathy so that they enjoy using it. ➔ It shouldn't be just a questionnaire, it should be dynamic. ➔ It shouldn't be boring. ➔ Never give more information than the patient wants. ➔ It must convey trust (...) avoid talking directly about cancer. ➔ It must adapt its interaction based on the different stages of cancer. ➔ Must not be condescending. ➔ Must use simple and direct phrases (...) must be positive and assertive. ➔ Do not provide “dangerous” information. ➔ It cannot give medical answers.
Information requirements	➔ Review with users the documents required for consultations. ➔ Display maps of buildings. ➔ Identify the doctor at the consultation. ➔ Present the cancer patient’s passport.[1] ➔ Present a “caregiver's manual”.
Functional requirements	➔ Facilitate the screening of users, help to understand who are the priority patients. ➔ The application must communicate with the user but also with the doctor. ➔ Allow teleconsultation and sharing videos with exercises for patients. ➔ Request transportation credentials, declarations of presence and internment. ➔ Give access to doctors and nurses, so they can respond directly.

	➔ Make it possible to enable or disable the chatbot at any time. ➔ Should help patients with their day-to-day problems. ➔ Make it possible to consult consultations that will take place after several months and still be able to reschedule them. ➔ It must enable autonomy in the various stages of the disease. ➔ Have access to the medical history. ➔ It must portray the patient's journey. ➔ Help with logistical issues (financial aid, psychological help, professional help, etc.). ➔ Assist in navigation between different hospitals and establishments. ➔ Patient's rights. ➔ To be able to redirect to a children's version and / or tab with children's stories, games etc. ➔ Reminders help a lot because we have a lot of specialties in a week.
Application image	➔ It must be light, credible, assertive and easy to use. ➔ It should not be too professional or informal. Familiar image like Facebook, Pinterest, Whatsapp... ➔ Friendly. ➔ Must be realistic, not fanciful. Uniform. ➔ Avoid the boring image of the hospital (medicines, medical tools, etc.). Think outside the box.

The interviews revealed several issues with the current application, like the lack of patient interaction by the fact the application is just a repository of appointments and static information, the online support service frequently disabled or takes a long time to answer patients' questions.

Other relevant issues were the lack of functionality and decision support: "It is mainly just one scheduling platform", the lack of joy: "It must show empathy so that they enjoy using it", the lack of accessibility: "Senior people show difficulties in using the application" and the lack of available content: "Should help patients with their day-to-day problems".

To learn more about participants' digital literacy, and at the same time investigate the current Portuguese market, during the interviews participants were asked to mention health applications they used or knew. The most mentioned were My Cuf, Lusíadas and My Luz. These inputs led to a comparative analysis between Bem-me-Ker and other hospital institution's applications looking for differences and similarities (Table 2).

Table 2. Functionalities comparison between My CUF, Lusíadas, My Luz, and Bem-me-ker

Functionalities	My CUF	Lusíadas	My Luz	Bem-me-ker
Appointments and exams	X	X	X	
Personal area	X	X	X	X
Historic	X	X	X	X
News	X		X	
Account management	X		X	
Schedule			X	
Documents access	X	X	X	X

Access to prescription information		X		
Online payment	X		X	
Video call			X	
Notifications	X		X	X
Online support		X	X	X
Specialties search	X		X	
Pharmacy Search	X		X	

This analysis revealed a substantial lack of actions in Bem-me-ker application, that allowed to identify useful features for a new version.

The interviews also inspired the creation of 3 personas to represent the users, their behaviour and goals. According to Unger & Chandler, (2009) personas are documents that describe typical target users. A persona encapsulates and explains the most critical behavioural data in a way that designers and stakeholders can understand, remember, and relate to Goodwin (2009).

The oldest persona was Maria, 80 years old, diagnosed with breast cancer. The second persona was Margarida, a single mother of 9 years old Martim, a cancer patient. And the third persona was an incident cancer patient with 59 years old, Fernando.

The interviews analysis were concluded with the requirements definition, listed in 5 categories (Table 3) according to Preece, Rogers, & Sharp, (2015).

Table 3. Definition of requirements and features

Functional Requirements	· Create an account; · Log in; · Allow login of different types of users; · Retrieve password; · Memorize username and password; · Present information about the form fields; · Take a guided tour of the application; · Allow to cancel the guided tour at any time; · Manage incoming notifications; · Change password; · Manage access; · Edit profile; · View the terms and conditions of the application; · Display the application's privacy policy; · Display the most important contacts; · Display information about the application and the Institution; · Display calendar; · Allow to go through the months of the year (from the current month onwards) ; · Display list of days with markings according to the calendar month; · Provide detailed information about each appointment; · Receive and send messages in the chat; · Receive and send media files in the chat;

	· Allow video calls for teleconsultations; · Allow calls to the helpline; · View conversation history; · Search the conversation; · Search media files; · Add files to favourites; · Allow group conversations; · Add and delete group members; · Allow hiding group conversations; · Allow leaving the group conversations; · Consult digital documents; · Filter digital documents by date and type; · Download the document; · Request documents; · Submit a form to request a new document.
Information Requirements	· Inform about all appointments, from consultations, exams to surgeries; · Display detailed information for each appointment: date, location, specialty…; · Inform about the documents that the user must take; · Inform about special care before each exam, analysis or surgery; · Inform about the location of the appointment through a map; · Present documents of the user's process (medical reports, exams) ; · Inform about the privacy policy; · Inform about the terms and conditions; · Inform about contacts; · Inform about the Institution and the application; · Present personal information; · Present clinical history; · Inform about active accesses; · Inform about active notifications; · Provide detailed information/ explanation about treatments; · Present treatment options; · Provide detailed information/ explanation about the prescription drugs; · Recommend exercises; · Recommend adequate diets for each case; · Inform about symptoms; · Inform about special care for patients; · Inform about appropriate procedures.
Context Requirements	· Have access to the Internet; · Be compatible with the Android operating system; · Have a connection to the IPO database; · Be readable during the day on the street.
User Requirements	· Know Portuguese; · Have basic knowledge of how smartphones work; · Have basic knowledge of mobile applications.
Usability Requirements	· Be useful; · Be intuitive; · Be clear; · Be familiar; · Be readable by senior people.

3.2 Usability tests and prototype acceptability

The first round of tests was executed with a paper prototype (Figure 1), a simple wireframe identifying the basic elements on the screen with no graphic details. The low-fidelity prototype was tested with a group of 4 non-patients with ages between 19 and 53 years old. Using the guidelines of the Think Aloud Protocol, each participant received a set of 10 tasks to complete, based on simple actions that cancer patients can perform in the application.

Figure 1. Low-fidelity prototype

The tests results (Figure 2) revealed some problems in the navigation and content sections. The tasks where the participants presented more difficulties were to manage notifications settings, access user profile, check the documents required for the next appointment and login for the first time without creating an account.

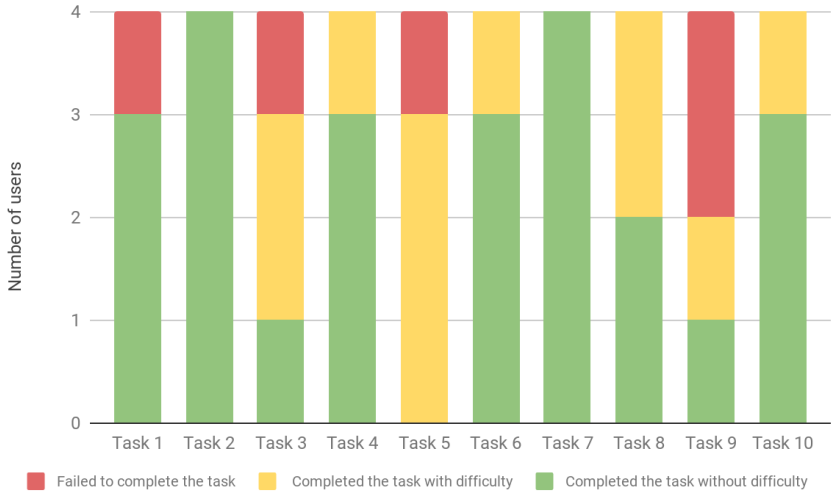

Figure 2. Low-fidelity prototype tests results overview

Although the prototype received good acceptance feedback, the participants said that some icons were too close and too small making them go unnoticed, and that the Profile “inside” the More button didn’t make sense to them.

Regarding the tests results, the following changes were made in the prototype iteration:

- the profile icon was placed in a more prominent place, to be easier to find;
- a presentation of the application was included, to make sure users understand how the app works;
- all buttons had labels to reduce doubts about their function;
- it was possible to filter documents, to make them easier to find;
- all text forms had information about the required content.

The second round of prototype tests were executed with a high-fidelity prototype (Figure 3). This version presented more screens and graphic details than the previous. All the tests were conducted online via Skype or Zoom, where participants were asked to access the prototype on the Invision[2] online platform and share their screens.

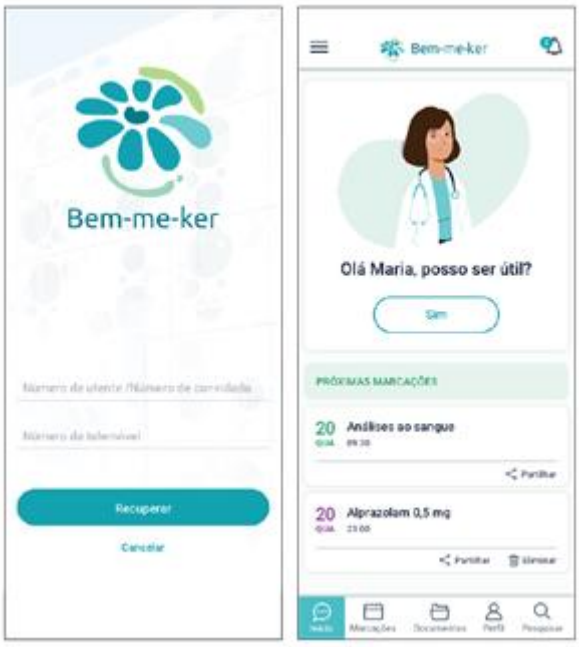

Figure 3. Login page on the left, and the main page on the right

In this round to test its usability and collect the acceptability feedback a total of 17 participants were selected: 4 cancer patients, 1 cancer patient at IPO, 2 caregivers and 10 non cancer-patients, with ages between 22 and 64 years.

The first 12 tests results, presented on Figure 4, revealed that most of the tasks were successfully completed. However, users also showed difficulties, most of them associated with misinterpretation of the tasks or the button labels, taking a bit longer to achieve the goal.

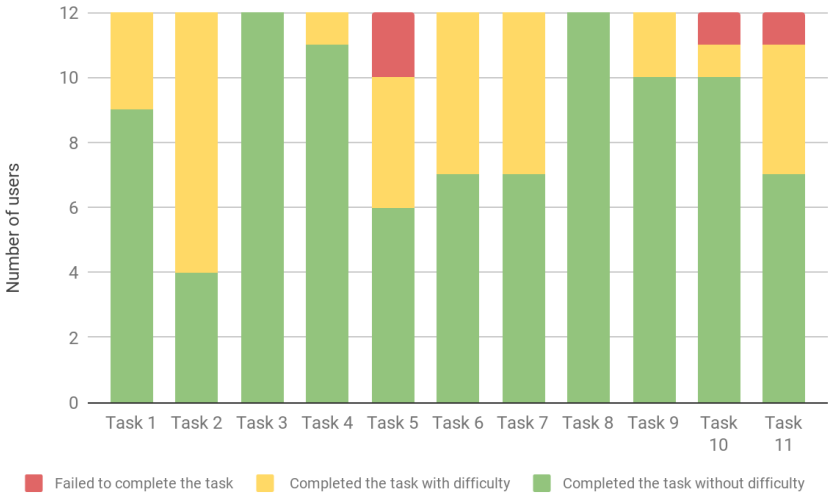

Figure 4. High fidelity test results

On the other hand, there were some tasks that the participants didn't finished such as:

- Request a document, as users didn't associate the icon with the action
- Share the account with another user, as the participants were looking in the profile instead of in the settings, or didn't associate the action with the label "manage access".

For the last 5 tests the prototype was iterated with small changes, which were validated during the missing tests. The changes made were: the addition of a dialog example in the Chatbot screen, and the replacement of some icon buttons with text buttons, to increase the understanding about their functions.

In the last tests there was an increase in the number of tasks completed without any difficulty as the Figure 5 confirms. However, there were still tasks uncompleted due to misinterpretation of some labels according to users.

When asked to comment on their experience with the application, the feedback from participants was very positive:

- All the participants were very satisfied with the overall appearance, saying it communicates calm and serenity, through colours and graphics;
- Patients and caregivers were very satisfied with the *search functionality,* as they shared that many might not feel comfortable talking to robot. It would also be a way to avoid users from looking on the internet for unreliable information.
- The participants that already knew the original application, considered that our redesign has greatly improved both the image and the utility of the application.
- When asked if *they would use the application more often*, they said yes, since the user could be more active, whether searching for information or talking to chatbot.
- They also were very pleased with the app mental model, since it was similar with other well-known apps like Google Calendar and Facebook, turning it easier to use.

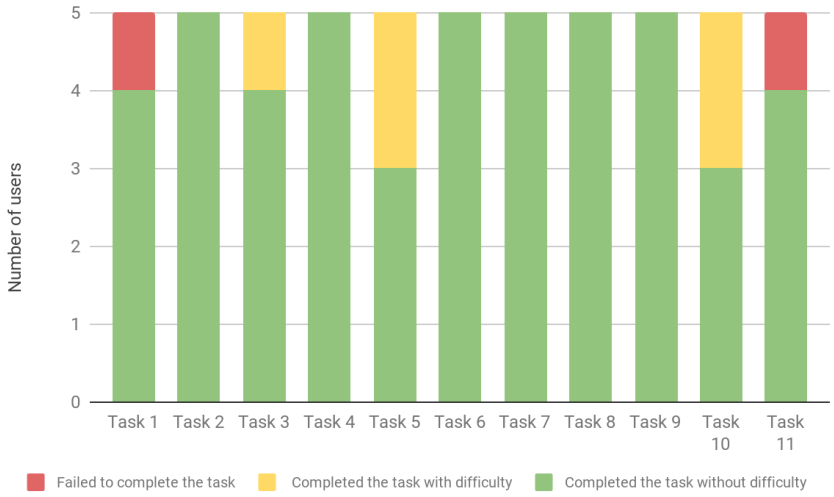

Figure 5. Final High-fidelity test results

After all the usability tests and several iterations this was the final result:

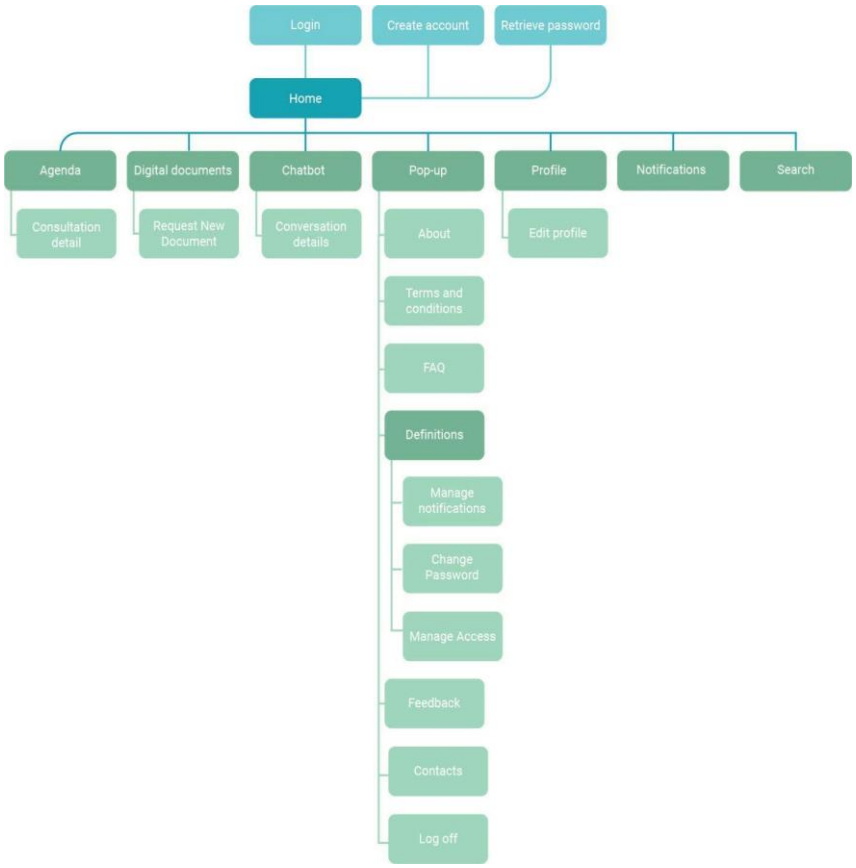

Figure 6. Navigation Map

Login and Main pages – In the Login page, patients and caregivers are able to log in, create and recover accounts. In the Main page, users have access to the application's main features, the chatbot and their next appointments.

Chatbot – Inspired by the concept of Patient Navigation, the main objective of the chatbot is to support and guide users and, whenever it is unable to answer their questions, it redirects them to a human assistant, in order to minimize frustration with the experience. As seen in Figure 7 the chatbot has 3 types of interactions: on the left is an example of a predefined interaction in which users have to choose their answer from a predefined list of choices; at the center an example of an interaction, where the chatbot shares a link to an article within the application that may be of interest to the user; on the right an example of an interaction, where the chatbot shares a downloadable file that might be useful for the user.

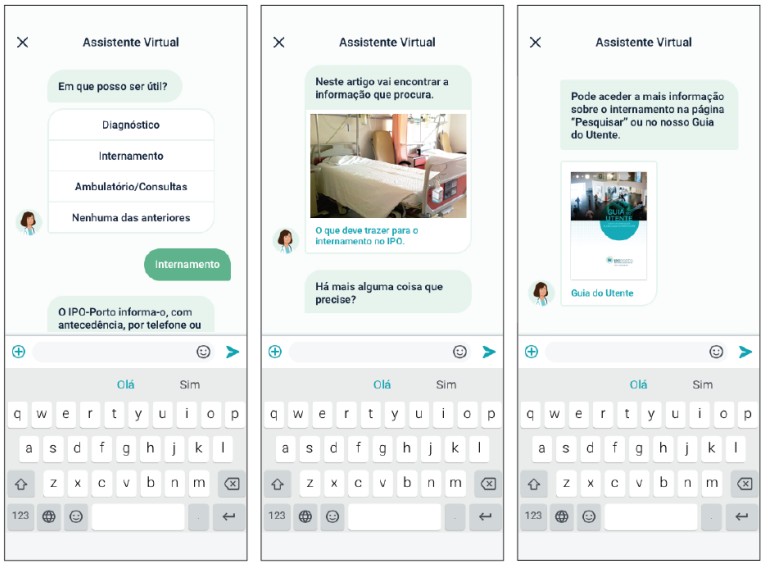

Figure 7. Chatbot predefined interaction on the left, link to an article on the center, downloadable file on the right

Appointments and Details pages – In the Appointments page, users can consult the institution's events and to create their own events. This latter and new functionality intends to encourage users to create a Disease Digital Diary, from complementary external treatments to the use of medication, concentrating such information on a single platform. In the Details page, users can find the detailed information about a given event, such as date, time, location and important recommendations for a given procedure (Figure 8).

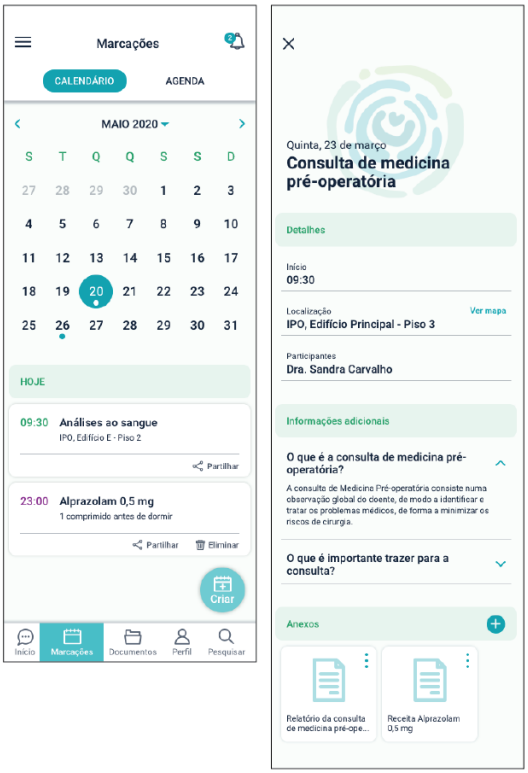

Figure 8. Appointments page on the left, and details page on the right

Documents page and Document Request – Patients for, various reasons, need to request documents such as declarations of presence to deliver at work or school, receipts of payment or even test results to print and take to other doctors who accompany them from other establishments The Documents page is chronologically organized, with information fed by the institution. In this page, users can Request a New Document, which opens a form they have to fill out, from it the patient may choose which type of document they need (receipt, declaration of presence, test result, reports, and others)

Profile page – The Profile page is divided into two major categories: Personal Data and Health. In the Personal Data tab, users are able to access information such as date of birth, name, ID number, contacts, address, health insurance and emergency contacts. In the Health tab, users can consult their clinical evolution. From diagnosis to treatments, the Profile page allows the development of the Patient's Passport[3]. This solution is particularly important for recent patients, who throughout their lives will be faced with the need to refer their medical history to other institutions and specialists.

Search page – The search page is an alternative to the chatbot. This new functionality provides another way for patients to acquire information. This search engine is to be based on reliable information from the institution, in which patients are able to find articles related to their types and stages of cancer (Figure 9).

Figure 9. Search

Configurations page and Share Account – Here, users can provide access of their account to caregivers or relatives. This is important as many patients may not have the motor or cognitive abilities to use the application themselves. Users can also manage notifications and change their password.

Notifications page – A notification is displayed when an event from the calendar is near. By accessing this page, the user is able to see a list of recent notifications, being able to access their detailed information about them in the Details Pages.

Other pages – The remaining pages are: the Pop-up Menu; the *About* page, which presents a slideshow of how to use the application; the Terms and Conditions page; the Contacts page; the FAQ page, in which the patient can access the most common questions; the Feedback page, which redirects users to a chatroom in which they can speak to the bot and rate the application.

4. Discussion

IPO stakeholders wanted patients to be more autonomous and to avoid the disease to move faster than the institution's own administrative processes. For them the solution was the implementation of a chatbot in Bem-me-ker application to help cancer patients managing the disease and guiding them through the healthcare system. Although IPO stakeholders had no interest in changing the visual design at first, in the end, it greatly impacted the user experience and trust, as mentioned by Sousa, (2017).

Reshmi & Balakrishnan, (2016) describes the chatbot as a piece of software that responds to natural language input and attempts to hold a conversation in a way that imitates a real person.

During interviews, Woebot was referred to as a successful example on how a bot should treat a patient. Woebot aims to help reduce stress and increase its users happiness index through cognitive behavioral therapy,[4] and tracking of their mood. It is an application based on a computerized self-help intervention with 20 years of research, and with some awards, like the Google Play Award in 2019. Although it was not designed to deal with cancer patients, an analysis on Woebot helped us understand how interaction between robot and patient could happen. We inspected the aspects that called our attention, dividing them into three categories: 1) functionalities, 2) relevant features, and 3) presentation (Table 4).

Table 4. Woebot's functionalities, features and presentation

Functionalities	➔ Login features a slideshow explaining chatbot features; ➔ Terms and Privacy; ➔ Account creation; ➔ Explains app interactions and iconography; ➔ The text field is deactivated when presenting users a closed answer (pre-defined); ➔ Users can choose how often they want to interact with the chatbot;
Relevant Features	➔ First interaction: Chatbot presents itself to users and asks them for personal information, such as their name; ➔ The chatbot suggests taking positive attitudes, e.g. asks users to name positive things about their day and compliments them; ➔ It presents two types of answers: 1) closed, where users can choose from multiple pre-written answers (pre-defined); and 2) open, where users can write the answer); ➔ The chat pane/screen resorts to animated dots, indicating to users that a message is being written by the chatbot, an attempt to humanize it or provide an indication of immediate feedback; ➔ Chatbot resorts to the use of GIFs and emojis to create a familiar relationship with its users; ➔ It presents an informed consent form to the user;
Presentation	➔ Clear and minimalist; ➔ Use of colorful illustrations on key elements like options of topics of conversation; ➔ Informal visual language, resorting to emojis and GIFs; ➔ Familiar aspect, relating itself with commonly used applications today, like Facebook and WhatsApp.

This analysis was relevant to evidence how a chatbot could behave with someone that needs psychological help, but now the goal was to define a chatbot for disease monitoring. The concept of patient navigation was helpful to define how it should behave in our case: more as a virtual manager of the disease, able to respond quickly in help of users and forward them to doctors or the administrative services when needed. Patient Navigation is a healthcare service intervention centered on patients, focused on their continuous monitoring during medical care. It is a journey that starts from the moment the disease is diagnosed until the end of treatment and rehabilitation of the patient, aiming to eliminate barriers between different sections of the healthcare continuum, and to articulate systems of care, such as primary and tertiary care sites. Its scope has been expanded to be applied across the entire healthcare continuum, including prevention, detection, diagnosis, treatment, and survivorship to the end of life (Freeman & Rodriguez, 2011).

Following the guidelines from the Colorado Patient Navigator Training Program[5] the following initial objectives for the application and its chatbot were defined:

1. Ensure good communication between patients and the IPO;
2. Use notifications for patients to remember their appointments;
3. Ensure that medical records are available for scheduled appointments, and remember patients to bring them to said appointments;
4. Provide information about the health of the patients;
5. Teach patients how to guide themselves at the IPO and other medical establishments they need to go to.

In what concerns the chatbot conversational design, it is important to ensure that a good conversation flows while simultaneously reminding users that they are speaking to a bot. The humanization of the chatbot is a dangerous path, people tend to communicate with computers as humans Reeves & Nass, (1996) as they “benefit from basic social conventions” (Pearl, 2017) and the way to disappointment shortens.

In order to respond to the questions about how a good chatbot should be and what aspects to consider and due to the lack of information about the use of chatbots in healthcare, we looked for guidelines for chatbots in general (Jassova, n.d.; Pearl, 2017). During the project, we made sure that some of these recommendations were respected:

- to ensure a good conversational design, the chatbot needed to show interest in helping with the use of expressions like "How can I be useful?" and "Do you want to know more?";
- to give the chance for users to respond, the chatbot should only send a max of three messages in a row;
- to increase user's trust, engagement and comfort; the chatbot would only share information based on the patient’s pathology, in this case: cancer and stage of cancer.

According to the definition of patient navigation by Babu (2019), it was noticed it would be possible to implement the concept of patient navigation in the form of chatbot conversations as long as users were able to navigate easily through complex systems, to find what’s possible and what is not, and to achieve their goals, ensuring a good conversational design. It is also known that the patient navigation model is being applied in other contexts, such as those dealing with cerebrovascular and cardiac diseases (Fiscella et al., 2011)

5. Conclusions and Future Work

The User-centered approach proved to be quite effective in the redesign of the application, as we were able to understand what barriers were preventing Bem-me-ker from truly addressing the needs and mental models of the users. Although IPO stakeholders presented the chatbot solution to solve their problem, thanks to an user-centered approach we were able to understand the other side, with

those who really use the application in their day-to-day lives. They showed us other problems that could not be solved with just a chatbot and we ended up creating other ways to help both sides.

More than ever it is necessary to develop mHealth, raise awareness and captivate citizens to use digital tools. The role of the team, as designers, consisted of understanding why patients did not use the app as the IPO stakeholders expected. Since, according to the users, the biggest barriers in the use of Bem-me-ker were the lack of functionality and joy, adding a chatbot was not enough. The team needed to work on the applications visual design.

Despite the greater focus on the elderly, the application managed to captivate other age groups, ensuring that none had difficulty using or understanding it. And, even when patients are unable to use it, the Account Sharing functionality with caregivers was designed as a way to ensure said patients were not ignored.

The IPO was quite satisfied with the final result, intending to proceed with the implementation of this design. This implementation is to be accomplished in phases to avoid drastic changes in the users' experience: first the visual design and then the new functionalities are implemented, and further developments on the chatbot and back office.

Although a large part of the application's problems for patients was solved, more IPO stakeholders' needs could be identified. This will require more tests and interviews with doctors and the administrative staff and may lead to a new version of the application.

Patient navigation research programs have been funded and promoted for different types of cancer. With that in mind, it would be interesting to apply this same approach in other institutions that deal with other contexts, patients, and diseases.

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[1] Suggested by an interviewed patient, the Patient's Passport consists of a printable document that provides important information for doctors, nurses and administratives who can access it immediately in an easy to read form. Some of the information may be personal information such as address and telephone, a list of allergies, medication and even ways the patient wants to be treated.
[2] InVision prototype: https://projects.invisionapp.com/share/7WXF00YKPQF#/screens
[3] A concept acquired during the interviews. It consists of a printable document that provides important information for doctors, nurses and administratives who can access it immediately in an easy to read form.
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