Medclick Mobile Application: Mobile Marketing in Health

Tiago Filipe Bravo Fernandes

tiago.f.b.fernandes@tecnico.ulisboa.pt

Instituto Superior Técnico
Universidade de Lisboa

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Abstract. Medical appointments booking applications allow an easy way of accessing information about a healthcare provider like the possibility to see the CV of a medical health professional, an easy acquisition of a healthcare service or being able to see other patients reviews of the service. This thesis describes the development of a mobile application for MedClick, having mobile marketing as a main feature of it. This mobile application will be an extension of the MedClick online platform which will be a medical care appointment booking service, once the platform is fully functional and deployed to the public. This thesis explores the various possibilities of mobile marketing within the application and reviews User Interface (UI) and User Experience (UX) guidelines to provide the best user experience possible. The mobile marketing side of the application will be used to offer the patient suggestions for booking an appointment based on location, medical history and recent searches on the application. Regarding the User Experience, multiple efforts were made like simplifying the medical appointment booking process, presenting an onboard screen for easier user interaction and prioritizing all possible interactions before asking for a login.

Keywords: Medclick, Application, Mobile, Marketing, UI, UX.

1 Introduction

Medical services (web platforms or mobile applications) have arrived to allow an easy way of accessing information about a healthcare provider like the possibility to see the CV of a medical health professional, an easy acquisition of a healthcare service or being able to see other patients reviews of the service. These applications also allow features that overcome problems like patient's transportation, large waiting lists to perform a medical appointment and provide the user the power to search for the service easily and anywhere.

There are already some medical booking applications on the market, however most only provide appointments in their own healthcare provider and few take advantage of the technologies available in mobile devices nowadays, like the location sensor and the ability to start the interaction with the user. With this in mind, this thesis was focused on developing a mobile application for MedClick having mobile marketing as a main feature of it. This mobile application will be an extension of the MedClick online platform which will be a medical care appointment booking service, once the platform is fully functional and deployed to the public.

1.1 Objectives

MedClick will provide to the users of the platform a fast and user friendly way to find a health professional across multiple medical service providers. The patients will be able to book the appointment based on date, location, price, insurance providers or customer reviews and the goal is for the service to be available online and on smartphones and tablets.

The mobile marketing on the application will be used to offer the patient suggestions for booking an

appointment based on location, medical history and recent searches on the application.

Together with mobile marketing, this application will follow some User Interface (UI) guidelines from the makers of the mobile operating systems the application will be developed to, in this case Android and iOS. It will also gather feedback from test users in order to enrich the User Experience (UX) and make the experience of booking an appointment the easiest and fastest possible.

1.2 Document Outline

This paper has a structure composed of 6 main sections and is organized as follows: Section 2 includes an overview of the background investigated. Section 3 describes the requirements of this solution. Section 4 defines the implementation of the solution. Section 5 provides an overview of the evaluation methodologies. Section 6 summarizes the developed work and its limitations.

2 Background

This section is composed of several subsections that show all the research and analysis performed that corresponds to all the knowledge obtained to reach the solution definition.

2.1 Frameworks

The goal for the MedClick mobile application is to be available in the two most popular mobile operating systems in the world, iOS and Android [1]. One way to make this possible would be to code natively for both operating systems, however this would be very time consuming because it is the same as creating two different applications in two different programing languages and with two different frameworks, in this case XCode for iOS and Android Studio for Android, for the same purpose. Other way to make the solution possible is to use a cross-platform development framework.

Cross-platform mobile application development frameworks have emerged with the goal of simplify the development of cross-platform mobile applications, reduce the development, maintenance costs and the time-to-market of the applications. With these frameworks, the developer is able to share the code between the platforms, achieving the principle of “code once, deploy everywhere”.

2.2 Mobile Marketing

“Mobile marketing refers to the two or multi-way communication and promotion of an offer between a firm and its customers using a mobile medium, device, or technology” [2]. This is a different way of communicating with the customers, not just waiting for the customer to interact with the company mobile application for example, but giving incentives to use it [3]. Mobile marketing can provide customers with time, location sensitive and personalized information that promotes goods, services and ideas.

2.3 User interface (UI) / User Experience (UX)

When developing a mobile application, one of the most important aspects of it is the user interface and user experience. What the user sees and feels when using the application can determine the success of it. The application might do what a user needs but if it does it in a very unintuitive way, does it slow or confusingly, users will stop using it.

2.3.1 User Testing

User testing should be performed on every project because even the best product designer cannot predict every possible action and interaction of the user. The best way to ensure a good User Experience is to have insights from the users themselves. It allows the designers to identify resistance and flaws in the user experience they are designing. This way, that design flaw can be addressed before entering in production or being deployed. Usually, the sooner the user testing starts, the better it is to find problems with the solution proposed and solve them with less work required.

2.3.2 Mobile Applications User Experience Design.

There is no single definition of a good user experience. A good user experience is one that meets a particular user's needs in the specific context of using the product. However, there are some overall principles to ensure that a mobile application has a good experience. First of all, when designing native platforms, the designer should respect the platform and consistently refer to the native operating system design guidelines. Popular mobile operating systems are now providing usability guidelines which focus mainly on maintaining coherent interaction and presentation through applications over the whole platform. For iOS there are Apple's Human Interface Guidelines [4] and for Android there is Google's Material Design Guidelines [5].

But only following the design guidelines won't result automatically in a good user experience. Other good principle to keep in mind is to always design for the customer benefit. This means that in every use case the designer should focus on how it will benefit the customer. With this, the designer should prioritize features because adding as many features as possible will rarely result in a better experience. It is better for the application to be simple with a refined experience around its core objectives and not clutter the user interface with too much information. "Perfection is achieved, not when there is nothing more to add, but when there is nothing left to take away" [6].

2.4 Analysis of Medical Appointments Booking Applications

There are several applications already available to the patients, that can schedule Medical Appointments. However, all have different features and characteristics. This analysis consists of the strong and weak points of each one, highlighting them in order to improve the solution proposed.

From all the information presented in Table 1 is possible to conclude that the service who can reach more people is Zocdoc [7] because it is not restricted to a single medical provider, has all the features mentioned and is available in every platform. All services have agreements with insurance and keep track of the patient appointment history. Both My CUF [8] and Joaquim Chaves Saúde [9], the two services that only offer appointments in their own medical facilities, have the same main functionalities, the only difference

Table 1. Systems Features

	Service			
Functionalities	My CUF	Zocdoc	Knok [10]	Joaquim Chaves Saúde
Medical Appointment Type	In provider	Multiple provider	At home/video	In provider
Health professional CV	Yes	Yes	No	Yes[1]
Rating	No	Yes	Yes	No
Insurance	Yes	Yes	Yes	Yes
Patient History	Yes	Yes	Yes[2]	Yes
Platforms	Web, iOS, Android	Web, iOS, Android	iOS, Android	Web, iOS, Android
Recommendation to users	Yes[3]	Yes	No	No

[1] Not working in the majority of health professionals

[2] There seems to be a section for it but it shows just a blank page

[3] Not user specific, just general health articles

being the recommendations made to its patients and the design of the applications and web portal.

3 Requirements

The objective of this thesis is to create a mobile application for the MedClick platform having mobile marketing integrated with it. This mobile application will be an extension of the Medclick online platform, a medical care appointment booking service.

The concept of the MedClick platform already exists: it will be a web platform in which users will be able to schedule medical appointments based on date, location, price, insurance providers and customer reviews. The idea for the mobile application is to integrate all the functionality the web platform will provide and enhancing it with mobile marketing techniques. This will add value to the whole MedClick platform, that in this way can reach more users and in different devices, giving the user the ability to do same task regardless of the device used. It will also take advantage of the location sensors of mobile devices to facilitate in the medical appointment search process and in providing the user with useful push notifications.

3.1 Proposed Requirements

The Medclick mobile application will have to integrate the main features of the Medclick platform. Those are:

• Searching for a medical appointment - The user, authenticated or not, can search for a medical appointment by specialty, location, date, health professional, price, insurance providers or customer reviews. It is not required authentication for this feature, to allow for a wider user base and for a better user experience, not having to login or sign up before exploring anything on the application;

• Booking a medical appointment – After reviewing all the previous point parameters, location, date, health professional, price, insurance providers and reviews, and selecting an available time slot for the appointment, the user is required to login or sign up in order to book the appointment;

• History of medical appointments – The authenticated user can review all the previews attended appointments. In this section will also appear the future appointments so that the user can keep track and cancel them if needed.

• Alerts for future appointments – The application sends a push notification to the user when the appointment date is close to make sure the user did not forget about it.

• Mobile Marketing – Depending on the mobile marketing campaign available in the Medclick platform, the application sends a push notification to the user.

4 Implementation

Based on the research made about cross platform mobile application frameworks, the framework chosen was the React Native with Expo toolchain. With Native React it is possible to build a mobile application that is indistinguishable from a native mobile application built using Swift or Java because it uses the same building blocks as regular iOS and Android applications. It will provide a superior user experience than hybrid applications. All this using just JavaScript code without the need to learn swift or C#. Features like hot reloading and simpler application deployment helped in the decision.

After deciding the framework, the approach was to wireframe the application and all the functionalities it will have built in. It is in these wireframes where is important to check if the usability guidelines are being followed.

The next step was to start developing the application. The expo toolchain makes the initialization of the project a straightforward process. The command “expo init” gives several options to start the project. It was chosen a template with several example screens and tabs that were very similar to the design in the wireframes. After that it was a matter of developing screen by screen and feature by feature, testing them when implemented.

4.1 Main process – Booking a Medical Appointment

The medical appointment process starts in the main screen of the application, as represented below in the Figure 1, presenting the users with the MedClick logo and suggesting them to book their medical appointment.

Figure 1 - Main Search Screen

Users have 3 options in this screen: choosing a specialty, choosing a health professional or entering advanced search. After pressing the specialty button, users navigate to the screen shown in. A section list of the specialties, divided by letter and sorted alphabetically. Users can also use the search bar to quickly find the wanted specialty.

On the next screen, the user is presented with a map that includes the locations of the healthcare providers that have medical services of the selected specialty. In here, users can tap on any map pin to select a healthcare provider or skip this step and choose by name the health professional wanted.

In the main screen (Figure 1), if users pressed the health Providers instead of the specialties, they would skip the list specialties screen and the map screen and navigate directly to the screen where they can choose the preferred health professional.

After choosing the specialty, the health provider and the health professional, the user is presented with a screen containing all the information about the health professional. In this screen, users can view the name of the health provider, contact, location, next availabilities, map with providers, rating and curriculum.

When users select the desired date of the medical appointment, an alert appears on the screen to confirm all the choices made by the user.

The next screen depends if the users are already logged in or not. If they are not logged in, a login screen will be presented.

If the users are already logged in, they will be redirected to the Appointments tab, where they can review all past and future medical appointments booked through MedClick. An alert is shown letting the user know that the appointment is booked.

4.2 Onboarding

Having an Onboarding screen is a very important aspect of the user experience of a mobile application. It gives users a quick and simple introduction the first time they open the application, explaining the basic functionality of it. For this solution it was chosen a simple swipeable card interface with four cards in total, showing just one at a time. The four cards chosen represent the four tabs of the application: Search, Appointments, Profile and Notifications. In each card, below the name of the tab is a small description of that section, in this case what the users will find and can do in that section. This way, before even interacting with the application, the users already know what to expect and where to find the functionality they are looking for. Only one card appears in the screen at a time, however it is possible to see part of the next card, giving users the idea that there are more cards to see and interact. Below the cards there is an always visible button to skip this introduction screen. This gives users the chance to see all cards or just ignore the tutorial all together, not making them lose time with something they are not interested in.

Figure 2 - Onboarding Screens

4.3 Prioritize search before login

All medical booking applications tested above, with the exception of Zocdoc, requested the user to login or register before even starting to use the application. This is a major obstacle to the users because when they are expecting to start to interact with the application, they have to go through a tedious login or register process. The objective with the MedClick mobile app is exactly the opposite, it is given freedom to the user to search and use all the functionalities that do not need login or registration. This includes searching for an appointment, either by specialty or by health professional, seeing the available healthcare providers and even receiving notifications based on the search history. This is achieved by creating a session linked to the device token, which can give the platform the ability to analyse the patients search history and notify them of a discounted appointment.

In the appointment tab and in the profile tab, when the user is not logged in, it is shown a simple button in the middle of the screen asking the user to login to access that information.

4.4 Notifications

One of most important part of the solution are the notifications the application sends to the user. There are several scenarios where a notification should be deployed to the application:

- When users enter a predetermined area, established by the MedClick platform, where it is available a mobile marketing campaign or some suggestion to the users of a certain location;
- All the search history of the users is saved on the MedClick platform, where it can then be analysed to send suggestions of appointments and schedules based on that user's history. When this happens it should be sent a notification to the user.
- To remind users of upcoming medical appointments. The application sends a push notification to the user when the appointment date is close to make sure the user did not forget about it.

For this to happen, when the user logs in the application, it sends to the server the token that identifies the device when receiving notifications, the ExpoPushToken. This token is then associated to the

logged user. This way, anytime a notification is triggered to a specific user, the server knows what is the device to send the notification.

4.5 Weblogging of User Information

All the requests made by the application to the platform are saved in order keep track of the users habits inside the application. This way it is possible for the users to receive notifications based on their search history, with suggestions for appointments or even discounted appointments.

5 Evaluation

In this section it is described the iterative testing methodology and its contribution to the final solution. Then it is described all the Focused Group Test Scenarios and its results. Lastly it is discussed the limitations of these tests and the ideal test scenario.

5.1 Iterative Testing Methodology

The idea behind this methodology was for real users to test each iteration of the application. The thought was to have a mocked functional React Native Expo Client application that was shareable to a defined amount of users. Test users had to download the Expo Client application from their devices app store. Users on the Android platform received access to the test application simply by scanning a QR code on the Expo Client application. On the iOS side, the process was not that simple because the iOS Expo Client app does not support QR code application loading, due to system restrictions. So, in order to test on iOS systems, users had to login with provided test credentials on the Expo Client application. This account has the test application loaded so that the user can test it. When testing, users will always have access to a feedback tab on the application where they can give feedback about the current screen. After concluding the testing process, it is presented a small questionnaire to the users with questions about their age, gender, profession and education. All this information is sent to the MedClick servers, as well as the users' location and information about the time spent on each screen of the application.

This was planned to receive real users' feedback and to improve the application in iterative steps, with the first functionality to be tested being the appointment booking process. The application was sent to several users however some flaws were discovered very quickly. In the logs it was visible that some users were not completing the full testing process. And others were stuck on the same screen for a long period of time. There were also duplicated logs, of users that reloaded the application and interacted again. Without more user feedback or closer monitoring, it is very difficult to be sure the cause of these errors, if they were happening because of user disinterest or because of user confusion and bad experience.

In total, in this small first iteration test, it was gathered data from 11 trustworthy tests, 8 male test users and 3 female test users, with the average age being 29,4 years old. It was concluded that with these errors leading to such a small amount of data gathered, the testing approach should change and rely on focused group testing.

5.2 Focused Group Test Scenarios

After the first small Iterative testing, it was decided to change the approach to a focused group testing, where the idea was to gather a small group of people to test the application in person. Each person was given three test scenarios where they had to perform certain tasks in both the MedClick mobile application and in two other medical booking applications reviewed in section 2.4, in this case the My CUF and the Joaquim Chaves Saúde applications. These applications were chosen because they were the most similar ones to the proposed solution, in the Portuguese market.

To measure the impact of not having a login screen as the first interaction of the user with the application, users had to start each test without a logged session or any other preference in the application. Another reason for this was that neither My CUF or Joaquim Chaves Saúde retain the user login after exiting the application. So to make testing similar

across all applications, login was needed in all scenarios.

5.2.1 Scenario 1 – Appointment Booking by Health professional

The first scenario given to the test users was to book an appointment for a specific health professional. This scenario tries to measure the impact of having a quick option to select the desired health professional and test the premise that if a patient wants to have a medical appointment with a specific health professional, all other parameters are not that relevant.

Application	Average Time to Complete Scenario
My CUF (Health Professional Maria de Vasconcelos)	≈1m25s
Joaquim Chaves Saúde (Health Professional Maria de Fátima Miguel)	≈1m43s
MedClick Mobile Application (Health Professional Maria Fernandes)	≈53s

Table 2 – Scenario 1 results

Most users had no problems in quickly identifying the search by health professional on the Medclick mobile application. This translated in the results above in Table 2, where users were in average more than 30 seconds quicker to complete the task comparing to the other two applications.

Another reason for this results were some bugs with the My CUF application that sometimes just loads blank screens and the user has to go back and try to submit the request again for the process to continue.

Also, on the Joaquim Chaves Saúde application, even when choosing a specific health professional and as referred in section 2.4.4, the application requires users to select the type of appointment. This translated in an extra step users had to go through, most of times to select the only option present, making this action completely unnecessary.

Lastly, one feedback received multiple times was to change the alert to after the login screen when login is needed. That way the last step before booking the appointment was actually confirming it.

5.2.2 Scenario 2 – Appointment Booking by Specialty

The second test scenario was to give users the task of booking another medical appointment but this time with the specialty as a main focus. All other parameters such as location, health professionals, date or others were completely optional and up to the user. This test tries to validate having the specialty parameter in the first step when trying to book a medical appointment.

Application	Average Time to Complete Scenario
My CUF (Dermatology)	≈1m08s
Joaquim Chaves Saúde (Dermatology)	≈1m11s
MedClick Mobile Application (Dermatology)	≈1m04s

Table 3 – Scenario 2 results

In this test scenario, results were very similar across all applications, mainly because users had to through every step when booking the appointment. This confirms the importance of having an option for the user to search directly for health professionals.

5.2.3 Scenario 3 – Past and Future Appointments

The third test scenario is simpler than scenario 1 and 2. It was given to the user the simple task of checking their past and future appointments. This scenario tests the utility of having a quick access to the patient's past and future appointments, accessing it via a main tab in the main screen of the application.

Application	Average Time to Complete Scenario
My CUF	≈44s
Joaquim Chaves Saúde	≈1m08s
MedClick Mobile Application	≈38s

Table 4 – Scenario 3 results

The times referring My CUF and Medclick mobile application are mainly the time users spent logging in because both applications have the appointments tab quickly accessible and in an intuitive manner. The Medclick mobile application has a label below the icon on that tab, however numerous users pointed the lack of contrast making it difficult to read and quickly identify it. Several users were completely lost in the Joaquim Chaves Saúde application, because this tab does not have an intuitive name and many were looking in the appointments search section, confirming that having an option to search inside the tab with the past and future appointments is a good idea.

5.2.4 Scenario 4 – User Profile Information

The fourth and last test scenario is very similar to the third one. It is simply asked for users to review their profile information in the application.

Application	Average Time to Complete Scenario
My CUF	≈42s
Joaquim Chaves Saúde	≈46s
MedClick Mobile Application	≈37s

Table 5 – Scenario 4 results

Once again, most of the time spent in this scenario was due to login, and in here the majority of users had no problems finding the profile tab and completing the task. It should be noted that in a real world scenario, Medclick mobile application saves the user login when closing the application, dramatically improving these times.

5.3 Limitations

In the Iterative Testing Methodology, as described in section 4.1, there was several user created errors which translated in false results and made it hard to understand when the above average time spent in each screen was due to a bad user experience or simply due to user disinterest.

After the failure of the first methodology, it was taken a focused group test with various test scenarios. This also has the limitation of not testing a broad enough audience and does not proof the advantages of the application contrasting with the web platform.

The best test scenario would be with the platform fully functional and already deployed to a wide range of users and patients. In this case, it would be possible to verify if users use more the web platform or the mobile application, if the mobile application brings new users to the platform and if they engage more with the platform because of the marketing efforts, mainly the mobile push notifications about location and history.

6 Conclusions

The Medclick application is a fundamental part to the whole Medclick platform. As referred before, modern customers in most industries are already accustomed to frictionless booking, so having the ability to book a medical appointment in any device is a must have for the users.

This thesis is focused in three main aspects: the development of a mobile application for the MedClick platform, exploring the mobile marketing

possibilities available and ensuring the best user experience possible to all users of the application. The first aspect was dependent of the development of the platform however the research performed on the other two aspects introduced relevant features to the project. Introducing this application together with the platform will not only give more options to the users, but will also provide more features like relevant notifications to the user. This, complemented with ease of use, will ensure the customers a great experience when using the whole platform.

Through various scenarios, the application gave satisfying user experience results, even when not taking advantage of features like retaining the user login. This gives great confidence that the application would be well received by real world users.

6.1 Limitations and Future Work

During the development of this thesis, some difficulties and limitations were found. One of the major limitations of this thesis is that there are features whose impact can only be measured once the MedClick application is finished and deployed in a real world environment. For example, sending of marketing notifications. The main test scenario would be with the platform already deployed and working for a period of time, to be able to obtain usage data from real users and patients of the platform. After that, introducing the MedClick application fully functional would give more relevant data. It would be possible to measure if the users using the platform increased. It would be possible to determine if users receiving a mobile notification reduced the probability of not showing up for the appointment. It would be possible to measure if users book more medical appointments because of the mobile marketing efforts. This is the ultimate test the MedClick mobile application should go through, however it is only possible once the platform is fully operational.

Besides testing other iterations of the application based on the user feedback received in testing, to test the location tracking feature on iOS it is required an Apple Developer account enrolled in the Developer program. This is important to test all features in all platforms before releasing the application to the public.

Other important aspect is the development of the features of the MedClick platform to trigger the mobile marketing notifications, as well as getting protocols with the healthcare providers to give users relevant discounts.

References:

[1] GlobalStats statcounter: Mobile Operating System Market Share Worldwide – Dec 2017 Dec 2018 http://gs.statcounter.com/os-market-share/mobile/worldwide - Accessed on 05/10/2019.

[2] Shankar, Venkatesh and Sridhar Balasubramanian, “Mobile Marketing: A Synthesis and Prognosis,” Journal of Interactive Marketing, 23, 2, 2009, pp. 118–29.

[3] Matti Leppaniemi, “Mobile Marketing Communications in Consumer Markets”, Oulin Yliopisto, Oulu 2008.

[4] Apple Developer Human Interface Guidelines. https://developer.apple.com/design/human-interface-guidelines/ - Accessed on 05/10/2019.

[5] Google’s Material Design Guidelines. https://material.io/design/ - Accessed on 05/10/2019.

[6] Antoine de Saint-Exupéry, “Airman's Odyssey”, 1984.

[7] Zocdoc Homepage. https://www.zocdoc.com - Accessed on 05/10/2019.

[8] CUF Homepage. https://www.saudecuf.pt/ - Accessed on 05/10/2019.

[9] Joaquim Chaves Saúde Homepage. https://www.jcs.pt/pt/home - Accessed on 05/10/2019.

[10] Knok Healthcare Homepage. https://www.knokcare.com - Accessed on 05/10/2019.