

Czech University of Life Sciences Prague

Faculty of Economics and Management

Department of Information Technologies



Bachelor Thesis

**A mobile application for university students orientation:
analysis and design of prototype**

Elvin Eyvazov

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BACHELOR THESIS ASSIGNMENT

B.Sc. Elvin Eyvazov, BSc

Informatics

Thesis title

A mobile application for university students orientation: a prototype analysis and design

Objectives of thesis

The main objective of the thesis is to design a prototype of mobile application for university students, especially freshmen and exchange students, to help them with orientation at the university.

The partial objectives of the thesis are such as following:

- To make a comprehensive literature review of the mobile application market to search for similar applications both for iOS and Android;
- To characterise and evaluate current methods and tools of mobile application development;
- To make a user requirements analysis and to design a prototype of mobile application for university students orientation for a selected university.

Methodology

The theoretical part will consist of a thorough literature review of academic papers, professional books and company resources to search for secondary data and current development methods and tools. The practical part will comprise a user requirement analysis and a prototype design. Appropriate methods and software engineering tools will be selected based on the literature review. Following on comparison with similar applications and evaluation of the prototype, recommendations and final conclusion will be formulated.

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Krug, Steve. Don't Make Me Think, Revisited: A Common Sense Approach to Web Usability (3rd Edition), New Riders. ISBN 978-0321965516

Norman, Don, 2013. The Design of Everyday Things – Revised and Expanded Edition, Basic Books. ISBN 978-0465050659.

Schwarz, Daniel, 2016. Jump Start Sketch: Master the Tool Made for UI Designers 1st Edition, 2016 SitePoint Pty. Ltd. ISBN 978-0994346964

Van Hecke, William, 2013. Learning iOS Design: A Hands-On Guide for Programmers and Designers 1st Edition, RR Donnelley. ISBN 978-0321887498.

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The Bachelor Thesis Supervisor

Ing. Pavel Šimek, Ph.D.

Supervising department

Department of Information Technologies

Electronic approval: 10. 10. 2018

Ing. Jiří Vaněk, Ph.D.

Head of department

Electronic approval: 19. 10. 2018

Ing. Martin Pelikán, Ph.D.

Dean

Prague on 30. 11. 2018

Declaration

I declare that I have worked on my bachelor thesis titled “A mobile application for university students orientation: analysis and design of prototype” by myself and I have used only the sources mentioned at the end of the thesis. As the author of the bachelor thesis, I declare that the thesis does not break copyrights of any their person.

In Prague on 30.11.2018

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A mobile application for university students orientation: analysis and design of prototype

Abstract

The purpose of this work was to design an application which is supposed to help students of CULS Prague with orientation around the campus. It was designed to serve as an interactive mobile information center available 24/7. This work focuses on principles of mobile design from user experience point of view, research involving real students of CULS Prague, workflow of the application, use cases and scenarios, personas, interactive prototypes and final visuals. It is designed to be implemented for both iOS and Android operating systems and the work explains the necessity of such mobile solution.

Keywords: CULS Prague, design, information system, mobile application, user experience, user interface.

Mobilní aplikace pro orientaci studentů: analýza a návrh prototypu

Abstrakt

Cílem této práce bylo navrhnout aplikaci, která má pomáhat studentům ČZU v Praze s orientací kolem areálu. Aplikace byla navržena tak, aby sloužila jako interaktivní mobilní informační centrum, které je k dispozici nepřetržitě. Tato práce se zaměřuje na principy mobilního návrhu z pohledu uživatelské zkušenosti, výzkum zahrnující skutečné studenty ČZU v Praze, pracovní postup aplikace, případy použití a scénáře, persony, drátové rámce, interaktivní prototypy a konečné vizuály. Aplikace je navržena tak, aby byla implementována pro operační systémy iOS a Android a tato práce vysvětluje nutnost takového mobilního řešení.

Klíčová slova: ČZU v Praze, design, informační systém, mobilní aplikace, uživatelská zkušenost, uživatelské rozhraní.

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1. Introduction

Design Development of mobile applications is a new way of the digital design era. Before this, the graphic design that has gone through a long evolution in different eras since BC to digital era. Already in the modern era, web design and design of computer applications were developed.

Digital Design Era has made available more realistic, diverse, and detailed methods. Computer design with the help of universal 3D visualization programs has become part of the advertising business, entertainment and science.

Mobile devices have changed the methods of interaction with applications. The perception of design has changed, since the principles of design of desktop applications can not be applied on mobile screens. The presence of a touch screen and its smaller size on smartphones, tablets and electronic devices, the absence of input devices like mouse inputs, physical keyboards change the way users enter and interact with content.

Designers were tasked with optimizing interaction, removing excess and focusing on main tasks that satisfy user needs, as mobile devices use new input methods like touch screens for touch, click and drag interaction gestures; GPS for location, accelerometers for tilt orientation and screen orientation.

Apps went through several steps of evolution since Steve Jobs launched the App Store. Most of first applications were focused on skeuomorphism, where items mimic its real world counterpart. This transition to mobile contributed to the creation of a new design that was supposed to ensure a smooth transition for users into the world of mobile devices.

In the Modern App design, the skeuomorphism is replaced by a flat design. Flat design has a two-dimensional approach that has a positive effect on the functionality and user experience. With the advent of flat design, emphasis was placed on minimalism, which is growing in all directions of design. Flat design relies on clean, clear user interfaces, replacing obvious problems with a simplified design.

The evolution of screen size creates new challenges in how the design will be transformed into different screens in the future. The tendency of minimalism can be changed with something new.

2. Objectives and Methodology

This chapter is about the objectives of this thesis and the methodology of achieving them.

2.1 Objectives

The main objective of the thesis is to design a prototype of mobile application for university students, especially freshmen and exchange students, to help them with orientation at the university.

The partial objectives of the thesis are such as following:

- to make a comprehensive literature review of the mobile application market to search for similar applications both for iOS and Android;
- to characterise and evaluate current methods and tools of mobile application development;
- to make a user requirements analysis and to design a prototype of mobile application for university students orientation for a selected university.

2.2 Methodology

The theoretical part will consist of a thorough literature review of academic papers, professional books and company resources to search for secondary data and current development methods and tools. The practical part will comprise a user requirement analysis and a prototype design. First it is necessary to conduct a survey to define user needs and to set the right requirements for the application. Then the next step is to define the functionality of the app based on the research and the survey. After that the design of the application can be started. First stage is to focus on UX and design principles and to create first sketches of the UI. Then to create a mockup of the app and to test it using interactive prototypes. After several iterations and finding and fixing all the mistakes of the design, the main GUI can be created. Appropriate methods and software engineering tools will be selected based on the literature review. Following on comparison with similar applications and evaluation of the prototype, recommendations and final conclusion will be formulated.

3. Literature review

3.1 The importance of UX design

The user interface (UX) is a product development approach that takes into account the user's perception. Convenience and clarity in use are top priorities of User Experience (Uxpa.org, 2013).

User Experience is important as User Interface. It needs to be considered on a par with the User Interface and take into account such aspects of User Experience as research, psychology, copywriting and analysis (Belatrixsf.com, 2018).

User Experience design is very important for any business or product in a lot of ways. It makes sure that a product scores in usability, accessibility and gives a value to its users (Interaction-design.org, 2018). There are a lot of products available on the market which has literally no value to people, except maybe the creators themselves. It happens because before implementing an idea it is necessary to conduct a research, to confirm the idea. Then it is very important to make sure that people are actually able to use it. For example, a complicated payment process may lead to users who are willing to pay drop and never come back to the service or product. It is important to make sure that any user from the target audience can use the product, to listen to people so that product makes would know how their clients feel and what they want within your product.

Lack of a proper attention to user experience design may lead to big problems and sometimes even to lethal effects. A poorly designed dashboard of a plane leads to a catastrophe taking hundreds of lives, a poorly designed bank system may lead to a huge financial loss. There are a lot of other examples and all of them lead to smaller or bigger troubles. To avoid that, it is necessary to provide the best user experience possible – to minimize the error rate and increase the satisfaction with the product.

The cooperative work of User Experience designer and quality assurance (QA) team in many cases ensures the success of the job. After launching the product, developers, testers and designers can continue to update, edit and to clarify aspects of user interaction (Belatrixsf.com, 2018).

According to the Usability Professionals Association (UPA), there are 6 main advantages of applying UX to product development (Uxpa.org, 2013):

- increased productivity;
- sales increase;
- reduced training and support costs;
- reduced development time and cost;
- reduced maintenance costs;
- increase customer satisfaction.

Creating wireframes and prototypes helps to increase customer satisfaction.

Wireframe is a graphical structure of the application, containing the main components and basic information about the application. Wireframe helps to know the opinion of users about the important points of further development of the application. Since it contains a form description, you can delete a specific part or add other elements. It takes little time to create it, and it costs less than creating and further correcting flaws and removing elements. This is mainly described by lines and rectangles (Uxplanet.org, 2017).

The most basic definition of prototype is, “A simulation or sample version of a final product, which is used for testing prior to launch.” The goal of a prototype is to test products (and product ideas) before sinking lots of time and money into the final product.

Prototyping is essential for resolving usability issues before launch. It can also reveal areas that need improvement. Once a draft of product idea is in the hands of real users, it will be possible see how they want to use the product (Uxpin.com, 2018)

3.2 UX/UI design

3.2.1 Graphic Design

In a sense, all visual design begins with graphic design. Graphic designers select colors and fonts, also place elements such as images and blocks of text in layouts. This can occur both on the Internet (website and mobile applications) and in print materials. Graphic design is a static, non-interactive layout. Static images, even when created on digital media and for digital media, are considered graphic designs (Designation.io, 2018).

3.2.2 UI

User Interface Design (UI) refers to the design of interactive elements and, as such, exists exclusively on digital media, such as a computer, tablet or smartphone. Interactive elements, such as drop-down menus, form fields, clickable elements, animation, button styling, and more, are essential tools for UI designers around the world.

Thus, the meaning of a user interface design is understood as the creation and extension of a graphic design definition, since it is related to how the user interacts with the appearance. Images with some interactivity are user interfaces, even if they include static images (Designation.io, 2018).

3.2.3 UX

And then there is the UX. User interface design (UX) differs from user interface and graphic design in that it focuses on the logic and structure of the elements that you actually see and interact with. UX occurs mainly in two stages: research and verification. During the research phase, UX designers use a variety of tools and methods to better understand their intended users. Competitive analysis, user interviews, Persona creation, wireframing, heuristic analysis and journey flows may all be involved (Designation.io, 2018).

After the launch of the product, the checking stage begins. UX designers perform usability/pain point analysis to determine if the product produces the desired result. If not, refinements and changes are made based on user data to make the final result better and more efficient. Eliminating usability problems at an early stage prevents more costly redesigns / reiterations later. The UX design has many elements, but the wireframing is one

of the most important (Designation.io, 2018).

3.3 Principles of mobile design

Until fairly recently, internet access was generally carried out from a desktop or laptop computer. The user worked using a screen, keyboard and mouse combination and this was well understood by the design profession. Now, approximately 2 billion people access the internet, at least some of the time, from mobile devices. This amazing development (and it is amazing, hundreds of millions of people accessed the internet for the first time from a mobile device and for many of those people it is the only way that they can access the internet at all) brings new challenges for user experience (UX) designers (Interaction-design.org, 2018).

People use different kinds of devices nowadays – laptops, tablets and mobile phones or smartphones. Laptops are mainly used for work and content creation (e.g. working with documents, creating presentations, programming, etc.), people are focused and concentrated on the task, computer software can afford being complex and not easy to use, a lot of computer software requires additional training or refers to help centers and manuals.

Tablets, on the other hand, are used for content consumption (e.g. watching YouTube, browsing the internet, etc.) and are used mostly at home in a comfortable place and therefore tablet software should not be overwhelming and require a lot of thinking or working with the user interface.

While laptops and tablets are used in different ways, mobile phones are completely different from both of them.

Mobile devices give us an ability to interact with technologies on the go. People use them with one hand, both hands, in portrait or landscape modes, using their finger or multiple fingers or even voice. We use our phones while driving in a car mode, on the public transport, at school, at work, while walking, doing sports and even in the bathroom.

When designing for mobile it is necessary to keep in mind all of those points and provide the best user experience possible.

If users are on their mobiles, they could well be seated, but this might quickly change (e.g., as they approach their train stop), so perhaps it's best to give them just the really important news first, because the interaction with the device is likely to be interrupted at any time by other priorities. The level of interruption during mobile use is all too real. Oulasvirta et al. (2005) found that when we are using our mobile or cell phones, interactions are impulsive, fragmented and inherently short term, as our use of the mobile device continuously competes for our cognitive resources with the simultaneous performance of mobility (e.g., walking) as well as environmental (e.g., being aware of our surroundings) and social tasks (e.g., being aware of those around us and our relationship with them). It was found in that study that for these reasons, users' attention to their cells or mobiles spans between a mere 4 and 8 seconds. This means that any task (or sub-task) you would want your users to perform on their mobile devices shouldn't take longer than that amount of time (Interaction design, 2018).

Smartphones are used mostly to support our main tasks or activities, checking a map during a trip, messaging a partner on your way home, finding a taxi to get somewhere, etc. This means that constant long interactions with smartphones are not often and it's mainly occasional and fast use. People use smartphones briefly and for short periods of time for fast information retrieval processes. Smaller screens than ones of tablets or laptops mean limitations of the amount of information which can be present at once, as well as the number of interactive elements on the screen and the ways we interact with them. Mobile users don't have keyboards or touchpads with them, fingers are the input source.

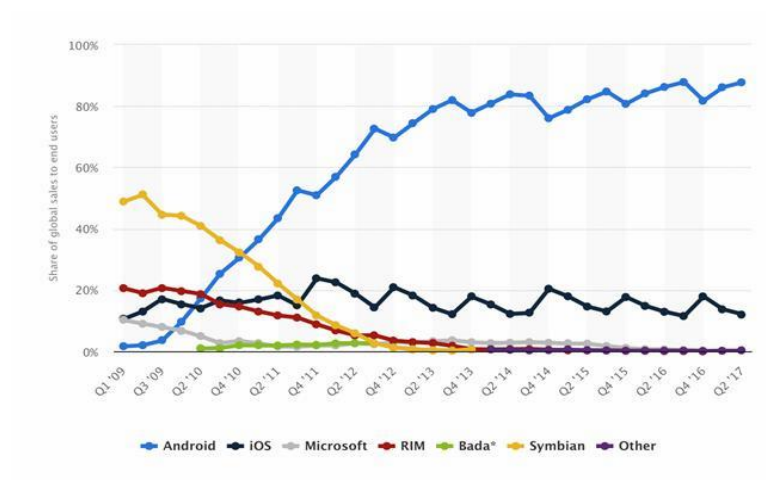
However, this tendency is slightly changing with time. Larger screen sizes are introduced, people tend to spend more and more time with their phones, it makes us rethink their needs and adapt to them. Regular phones are considered to be small, bigger phones are considered to be normal and extra-large phones created their own new market of phablets. The phablet (/ˈfæblɪt/) is a class of mobile devices combining or straddling the size format of smartphones and tablets. The word itself is a portmanteau of the words phone and tablet.

The phablet is a class of mobile devices combining or straddling the size format of smartphones and tablets. The word itself is a portmanteau of the words phone and tablet.

Phablets feature big displays that complement screen-intensive activity such as mobile web browsing and multimedia viewing. They may also include software optimized for an integral self-storing stylus to facilitate sketching, note-taking and annotation (Time, 2016). Due to the market's growth, Reuters called 2013 – “*the year of the phablet*”. In 2014, noting that phablets had overtaken laptops and desktops in global sales, The New York Times said: “*phablets could become the dominant computing device of the future – the most popular kind of phone on the market, and perhaps the only computer many of us need*” (Manjoo, 2014).

Since mobile devices become more and more popular it is important to create solutions available for mobile operating systems. Mobile operating systems which are known to the market are Symbian, Android, Windows, iOS, Blackberry OS, Bada, Palm OS and others. However the 2 dominant mobile operating systems are Android and iOS, the latter available for Apple iPhone and iPad devices exclusively.

Figure 1 Statistic graph of Global mobile OS market share



Source: Statista, 2017

Global mobile OS market share in sales to end users from 1st quarter 2009 to 2nd quarter 2017. This statistic shows the global mobile OS market share, in terms of sales to end users, from 2009 to 2017. In the first quarter of 2017, 86.1 percent of all smartphones sold to end users were phones with the Android operating system. Introduced by Google in 2007, Android is the most popular smartphone operating system in the world as of 2016. Since its release, sales of smartphones running on the Android have grown strongly over the years. In 2009, 6.8 million Android

smartphones were sold (Statista, 2017). By 2015, this figure had risen to more than 1.16 billion. Android accounted for around 85 percent of all smartphone sales to end users worldwide in the beginning of 2016 (Statista, 2017).

Android always was an operating system available on a variety of devices from different manufacturers, devices of different size, shape, price, control elements, hardware, performance, screen resolution and a lot more. It was always challenging to create software for Android, since designer had to remember all the possible differences and design something which would fit this variety of phones and tablets.

On the other hand, one advantage of iOS used to be standardization in terms of devices, there was always one phone type and it was easier to design for it, since what a designer sees on his phone is exactly what all the users will see, however with the tendency of popularization of mobile devices and content available for mobile, Apple had to adapt to market needs which led to multiple device type running iOS - iPhone SE, 5, 5S with 4 inch screen; iPhone 6, 6S, 7, 8 with 4.7 inch screen, iPhone 6 Plus, 6S Plus, 7 Plus, 8 Plus with inch screen and iPhone X with 5.8 inch screen size and a totally different approach to everything, including screen ratio, top frame and gestures controls instead of buttons.

In addition to the fact that people started paying attention to design, all this led to a huge demand of user experience and user interface designers in the industry, new study programs and university degrees, online courses, organizations and communities, and of course, to the establishment and definition of mobile design principles.

Savio and Braiterman proposed this heuristics as a starting point for mobile design (The Interaction Design Foundation, 2018):

- mobile interactions must be user-driven. Mobiles are personal devices and content must be wanted and welcomed by the user and requested by them. A key consideration is non-verbal interaction with mobile devices.
- Mobile derives from previous user models. The past use of desktop computing and even landline telephony will drive expectations even as new possibilities open. Design must take this into account.

- Mobile requires ease of use. Smaller screens, different interactions, etc. demand ease of use be placed at the forefront of mobile design.
- Mobile users do not welcome constant disruption. Design must fit into the user's life and not constantly distract from that experience.
- Mobile users are in constant contact with their devices. This opens the opportunity for interactions of varying intensity and duration. Design needs to consider that not every interaction with a mobile device will be similar.
- Mobile users will expect continuous user experiences beyond the device. There will be a need for user experiences to link to desktops, GPS software, and other services and this should be considered in the design phase.
- Mobile interactions may be smaller parts of greater user objectives. Searching for an address is not a goal in its own right – getting to the address is. The easier the interaction with the device the more likely the user is to reach that greater objective.
- Mobile users will trust peer-to-peer marketing the most. This means new marketing opportunities that lay within the social sphere. Blending the social and marketing possibilities will require careful design consideration.
- Mobile users will expect GPS to enhance their experiences. GPS capabilities will deliver the ability to interact with the world beyond the mobile.
- Mobile may lead to a dumb terminal with further processing carried out elsewhere in the network.

3.4 Design tools and methods

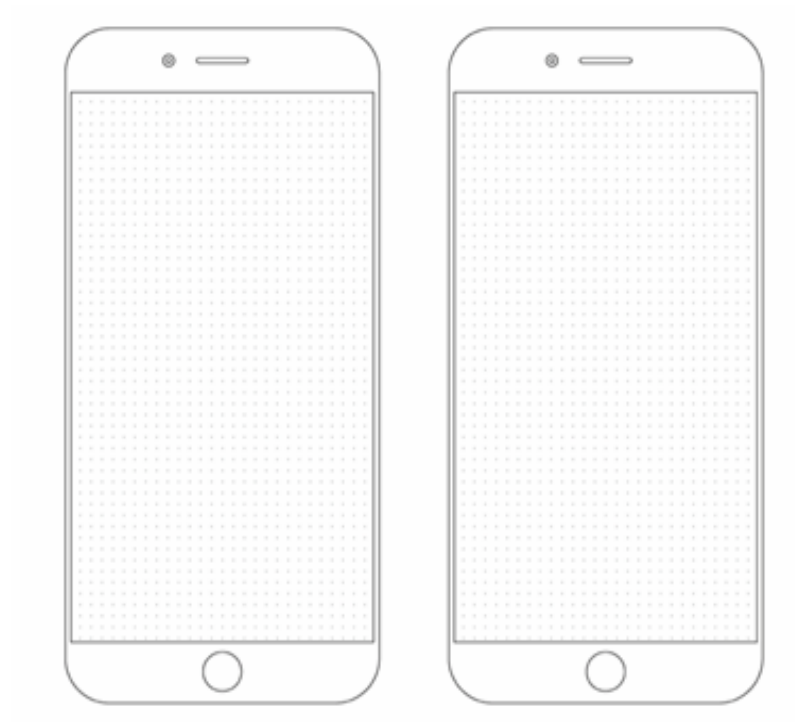
General workflow of a designer includes a lot of stages to get you from an idea to a final design of a product. Usual stages of a design process are ideation, research and analysis, formulation of a solution, sketching ideas and testing them with paper prototypes, creating wireframes with a defined user flow and structure of screen and states, prototyping and conducting usability tests, creating mockups and interactive prototypes, visualizing and creating final graphical files, exporting the files with all visual assets and preparing for developers.

For each of these stages it is necessary to use a proper tool, from pen and paper

to complex exclusive software solutions. For paper prototypes, it is good to use special paper with pixel grids, correct proportions and contours of devices or environment (e.g. mobile phone, desktop browser).

Sneakpeekit has a set of sketch sheets, templates in different formats like PDF and JPG for various purposes.

Figure 2 Prototype

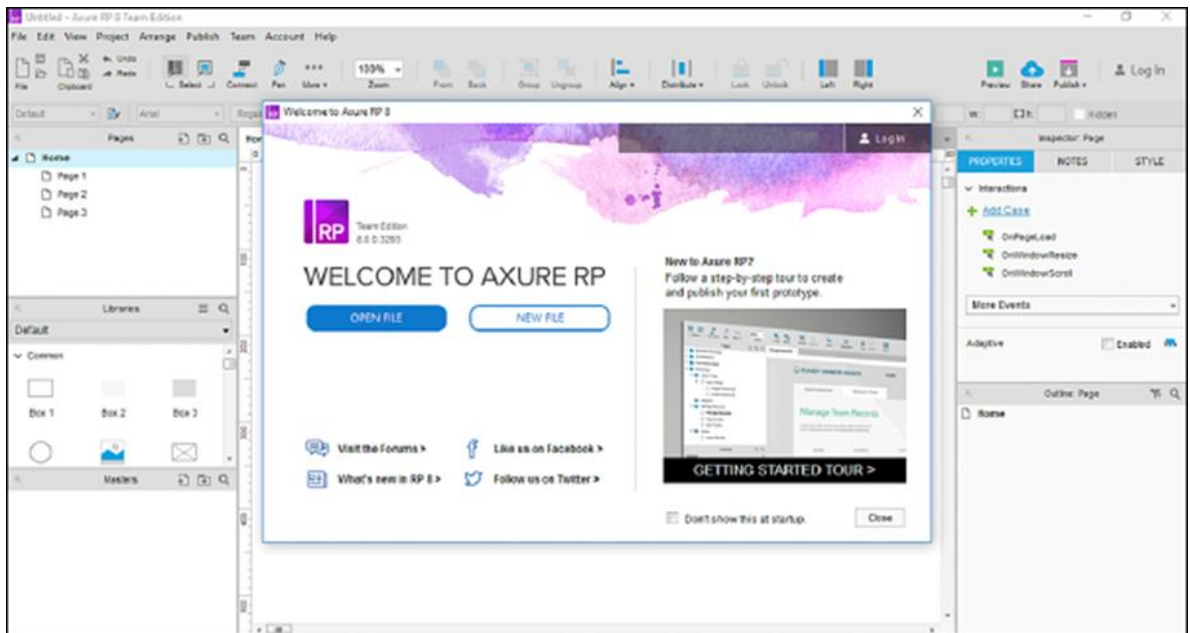


Source: Sneakpeekit, 2018

For wireframes tools like Axure RP and Adobe XD can be used.

Axure RP Pro is a software tool for creating wireframes, prototypes, making a documentation and specification at web and desktop applications. Axure RP Pro provides drag and drop placement, resizing, and formatting of widgets. (Axure Software Solutions, Inc., 2002-2018).

Figure 3 Axure RP



Source: Tutorialspoint.com, 2018

Adobe XD is a tool for UX designers included in Adobe Creative Cloud suite, it is used for wire framing and crating interactive click-through prototypes available in browsers, allowing users and stakeholders to comment on the files. Released in beta in 2016, it is a very young solution compared to other Adobe Products used for design – Adobe Photoshop and Illustrator. Before Adobe XD there was no correct software created specifically for user experience design.

Figure 4 Adobe XD



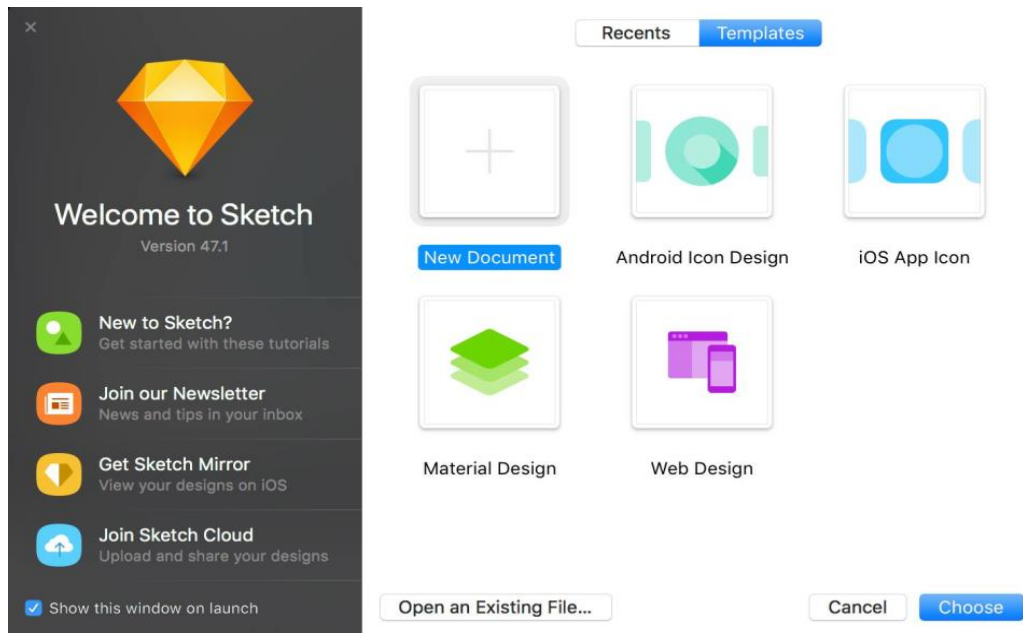
Source: Adobe, 2018

Adobe XD offers instruments for visualizing the user interface, however the most popular and widely used solution is Sketch developed by the Dutch company Bohemian Coding and released in 2010.

While Adobe XD became available for Windows after some time, Sketch is available on macOS exclusively.

Sketch is vector graphic editor focused on the design of user interfaces, it comes with a lot of useful setup features like artboards corresponding to different devices (e.g. iPhone 6 artboard of 1334 x 750 pixels), templates for icon design, material design, responsive web page design, UI kits and cloud libraries with UI elements. Sketch has changed the way designers work, with Sketch it is now possible to synchronize your work with other designers or team members, to create a design system with elements, created with interchangeable components, fonts and colors, to have a cloud library of your own design elements and much more.

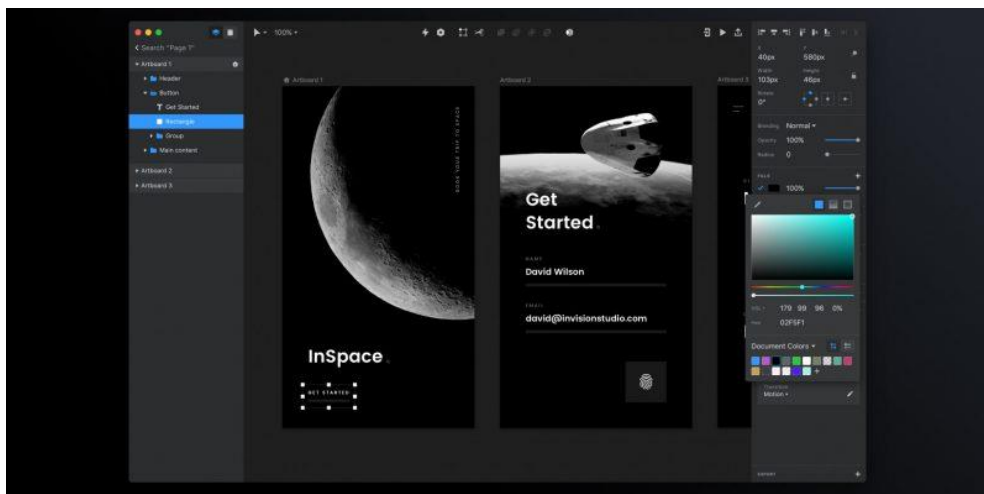
Figure 5 Sketch



Source: Capterra.com, 2018

To create an interactive prototype, tens of different solutions are available. However the level of interactions is different for different tools. For example, one of the leaders - InVision offers a relatively simple prototyping solution where designers can create connections and simple transitions between screens (rendered images) and then gets a clickable prototype which can be shared on web or accessed using their mobile application for iOS and Android or browser.

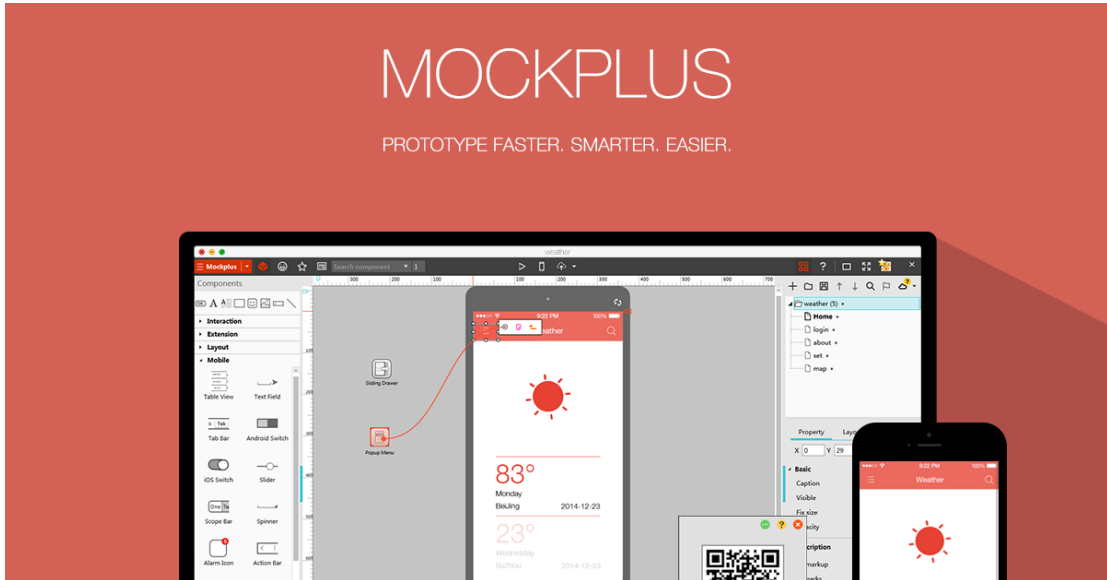
Figure 6 InVision



Source: Thenextweb.com, 2017

Mockplus is a tool for making a prototype. tool which is valuable to UI/UX designers (Medium.com, 2017).

Figure 7 Mockplus



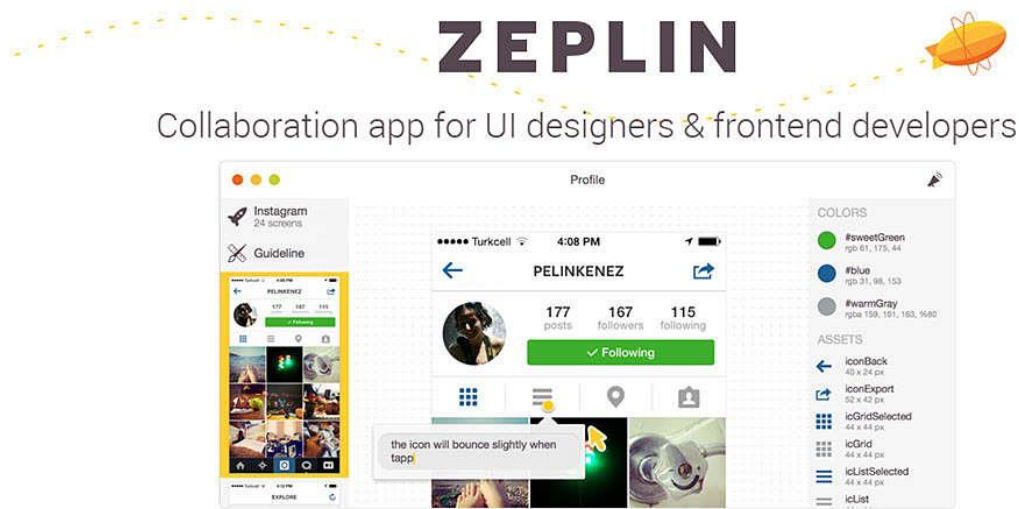
Source: Mockplus.com, 2018

But in case of more detailed and complex interactions other tools should be used. Principle and Framer are two exclusive tools for macOS and industry leading solutions. Principle offers a relatively simple interface to create animations and transitions. Framer on the other hand, requires programming skills and certain knowledge of CoffeeScript and framer.js since all the prototyping is done by means of coding. Both tools support direct import from Sketch. Using Framer is an advantage when it comes to explaining the animations to developers, because you can provide them with your code where all the interactions with properties are written in CoffeeScript.

Once everything is clear for both sides and final designs have been approved, designers should hand over their design to developers. It should be done in a proper way which will allow the implemented solution to be created precisely according to the design. For this InVision Inspect or Zeplin.

Zeplin is a tool which supports various design formats and extracting all the properties for developers – colors, fonts, sizes, spacing, etc.

Figure 8 Zeplin



Source: Superbcrew.com, 2018

Both Apple and Google offer their Human Interface Guidelines online and recommend designers to follow them to keep apps consistent within their ecosystems. Main design principles for iOS are described below.

Aesthetic Integrity

Aesthetic integrity represents how well an app's appearance and behavior integrate with its function. For example, an app that helps people perform a serious task can keep them focused by using subtle, unobtrusive graphics, standard controls, and predictable behaviors. On the other hand, an immersive app, such as a game, can deliver a captivating appearance that promises fun and excitement, while encouraging discovery.

Consistency

A consistent app implements familiar standards and paradigms by using system-provided interface elements, well-known icons, standard text styles, and uniform terminology. The app incorporates features and behaviors in ways people expect.

Direct Manipulation

The direct manipulation of onscreen content engages people and facilitates understanding. Users experience direct manipulation when they rotate the device or use gestures to affect onscreen content. Through direct manipulation, they can see the immediate, visible results of their actions.

Feedback

Feedback acknowledges actions and shows results to keep people informed. The built-in iOS apps provide perceptible feedback in response to every user action. Interactive elements are highlighted briefly when tapped, progress indicators communicate the status of long-running operations, and animation and sound help clarify the results of actions.

Metaphors

People learn more quickly when an app's virtual objects and actions are metaphors for familiar experiences – whether rooted in the real or digital world. Metaphors work well in iOS because people physically interact with the screen. They move views out of the way to expose content beneath. They drag and swipe content. They toggle switches, move sliders, and scroll through picker values. They even flick through pages of books and magazines.

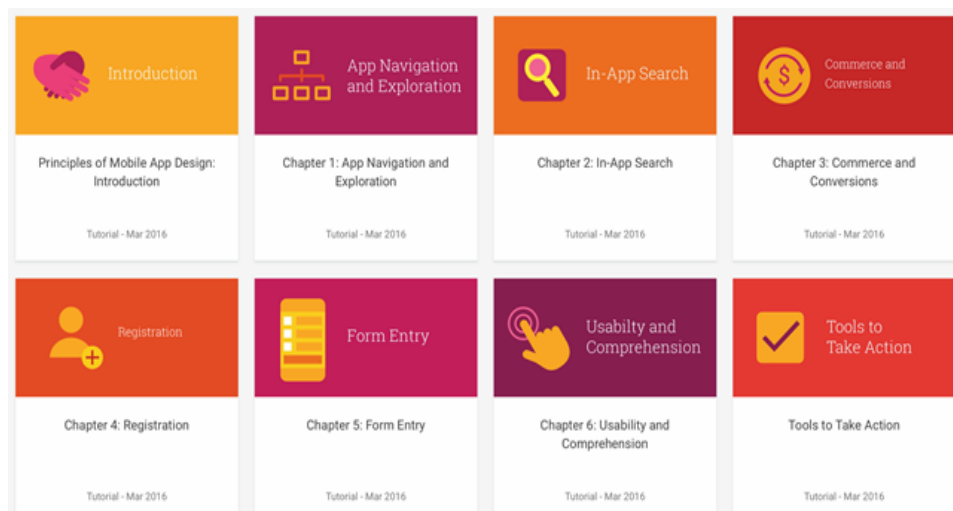
User Control

Throughout iOS, people – not apps – are in control. An app can suggest a course of action or warn about dangerous consequences, but it's usually a mistake for the app to take over the decision-making. The best apps find the correct balance between enabling users and avoiding unwanted outcomes. An app can make people feel like they're in control by keeping interactive elements familiar and predictable, confirming destructive actions, and making it easy to cancel operations, even when they're already underway (2018 Apple Inc.).

Apple gives advice and recommendation on App architecture, User interaction, System capabilities, Visual design, Icons, Images, Bars, Views, Controls, Extensions and provides designers and developers with certain resources like fonts, UI kits for Sketch, color pallets, etc.

Google in their Design Guidelines talks about general principles of mobile design, as well as Material design, its goals, ideas, principles and patterns. Google fonts and icons with other resources are available online and in addition to that, Google offers a checklist with principles of mobile app design to engage users and increase conversion rate. It consists of 6 chapters and covers topics as App navigation and Exploration, In-App Search, Commerce and Conversions, Registration, Form Entry, Usability and Comprehension.

Figure 9 Principles of Mobile App Design: Engage Users and Drive Conversions



Source: Google LLC, 2018

Following these recommendations and guidelines, conducting a proper research and having right instruments may already guarantee a partial success.

4. Practical Part

The goal of this part of the bachelor thesis is to create a design for new application for IOS platform and compare it with similar application. The design was created on macOS with the applications as InVision and Sketch.

4.1 Research

Prior to starting the design, a research has been conducted.

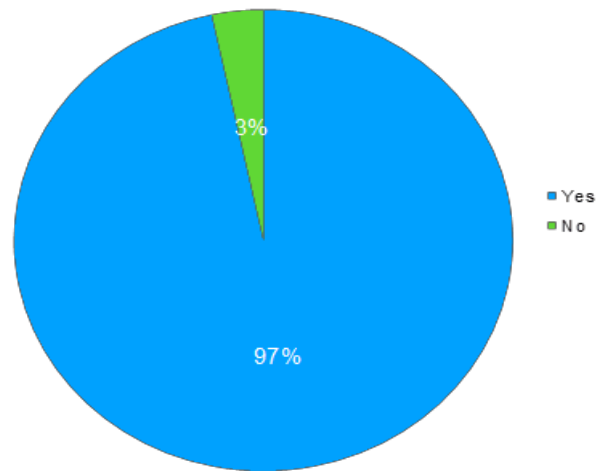
The research involved students with different formats of study and with different periods of time spent at the university, but mostly with newcomers and freshmen. All participants receive education in English and do not speak Czech at that time. By gender, the number of respondents was equal. By type of study, 25 of the respondents were regular students, 15 of the respondents were exchange students from Preparatory Professional and Language Courses and 10 Erasmus program students. By the degree of education, the students were also different, 35 of the participants were Bachelors, 14 of the Masters and 1 from the Ph.D. degree. Focus groups, interviews and personas methods of UX research were applied at this stage. Research were conducted 1 week before and up to 1 week after the start of the academic year in order to clarify the primary needs for orientation at the university campus. The lack of interactive information about university especially for freshmen, exchange students and regular students who studies in English was defined. No aggregation of the information in one place for non-Czech speakers, no proper solution for mobile phones the most frequently used device and the most demanded platform.

Students were presented with the idea of the app and were introduced to the main ideas about possible functionality. The results are represented in the following statistics percentage wise.

Question: Would you like to have such mobile application?

Results: 97 % of positive answers - a good number to confirm the demand.

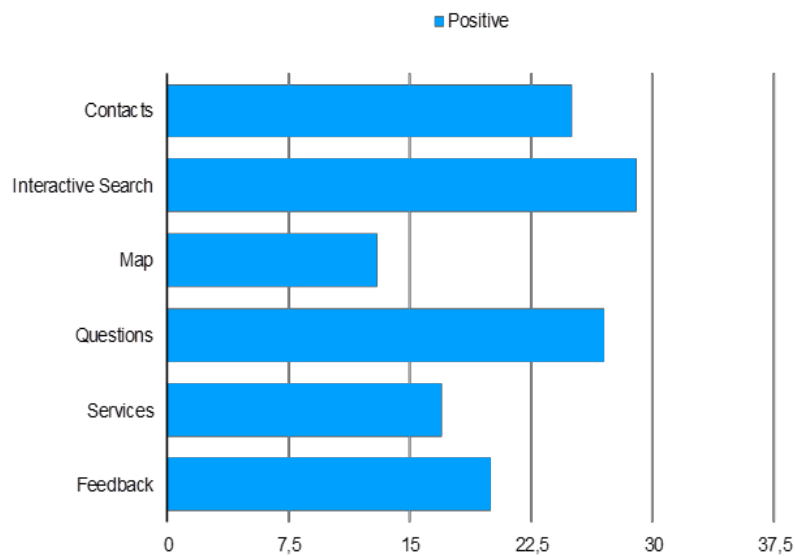
Figure 10 Results of poll



Source: own processing

Question: What do you want the app to do? / What features do you need?

Figure 11 Features



Source: own processing

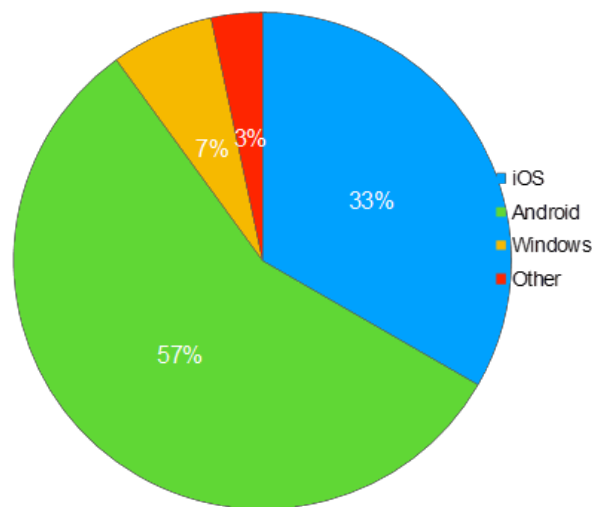
Based on the results, following answers were explained:

- Contacts - search for contacts of teachers and other university personnel, their office hours and office locations, email.

- Interactive Search – Search for a classroom, faculty or any other object and see how to get there.
- Map – Display a campus map with useful places like faculties, ATMs, bus stops, etc.
- Questions - Frequently asked questions about anything related to the university.
- Services - What services are available in the university - Library, restaurants, ATM and Banks, printing and scanning, etc.
- Feedback - Being able to send suggestions and complaints about the university.

Question: What operating system is installed on your phone?

Figure 12 Results



Source: own processing

Most of the users have either iOS or Android. It simplifies the task, since a framework could be used to utilize one code and export it to 2 native applications. According to this research, a native application for Android and iOS with the aforementioned list of features is the solution of the problem of orientation for new and graduating students of CULS Prague. Based on the people interviews, the following user personas have been formulated.

For the next step personas method of UX research was applied. The goal of personas is to create trustworthy and realistic representations of your the target audience segments for reference.

Person 1

Name: Juan Herrera Age: 22

Gender: Male

Profile: Juan is a student of Business and Administration study program at CULS Prague. Juan comes from Mexico. He came to Czech Republic to study at a summer academy and decided to stay and get an academic degree. Juan likes entrepreneurship and graphic design.

Occupation: Student, Freelance designer

Goals: Learn more about CULS Prague and be able to find all the necessary information about the university

Traits: Open, Friendly, Outgoing

Typical activities: Attending classes, Working and studying online from the university

Specific notices: Difficulties with Czech language

Devices: iPhone 7, Macbook Pro

Common environment: Campus, Dormitory, University

Person 2

Name: Alyona Chaikovskaya

Age: 18

Gender: Female

Profile: Alyona is a Russian student who came to Czechia to pursue a Bachelor degree in Business and Administration. She speaks Russian and English. She is active and social, enjoys making friends and meeting new people.

Occupation: Student

Goals: Learn more about campus, Use available services, Be comfortable with the university environment

Traits: Social, Active, Extraverted

Typical activities: Studying at home, Exercising in the gym, Attending classes, Going out with friends

Most common environment: Dormitory, University classroom, Cafeteria

Specific notices: Color-blind

Devices: Apple iPhone 6, Windows laptop

Person 3

Name: Rustam Bektukhamedov

Age: 23

Gender: Male

Profile: Rustam is a student of electrical engineering, pursuing a career of a bio-medical engineer at MSD in Prague. His background is connected with biology, chemistry and physics. He speaks English, Arabic, Uzbek and Russian. He has successfully graduated and obtained a Bachelor degree at his home country and came to Czech Republic seeking for new opportunities.

Occupation: Part-time Bio-medical Engineer, Master's student

Goals: Have quick answers to university-related questions, Prolong his ISIC, Learn more about CULS Prague scholarships

Traits: Introverted, Task-oriented, Not social

Typical activities: Working in the office, Studying in the NTK, Attending classes

Common environment: Office of MSD, Public transport, University, Library

Specific notices: Problems with communication, prefers online services over talking to people.

Figure 13 Moje ČZU



Source: Moje ČZU, 2018

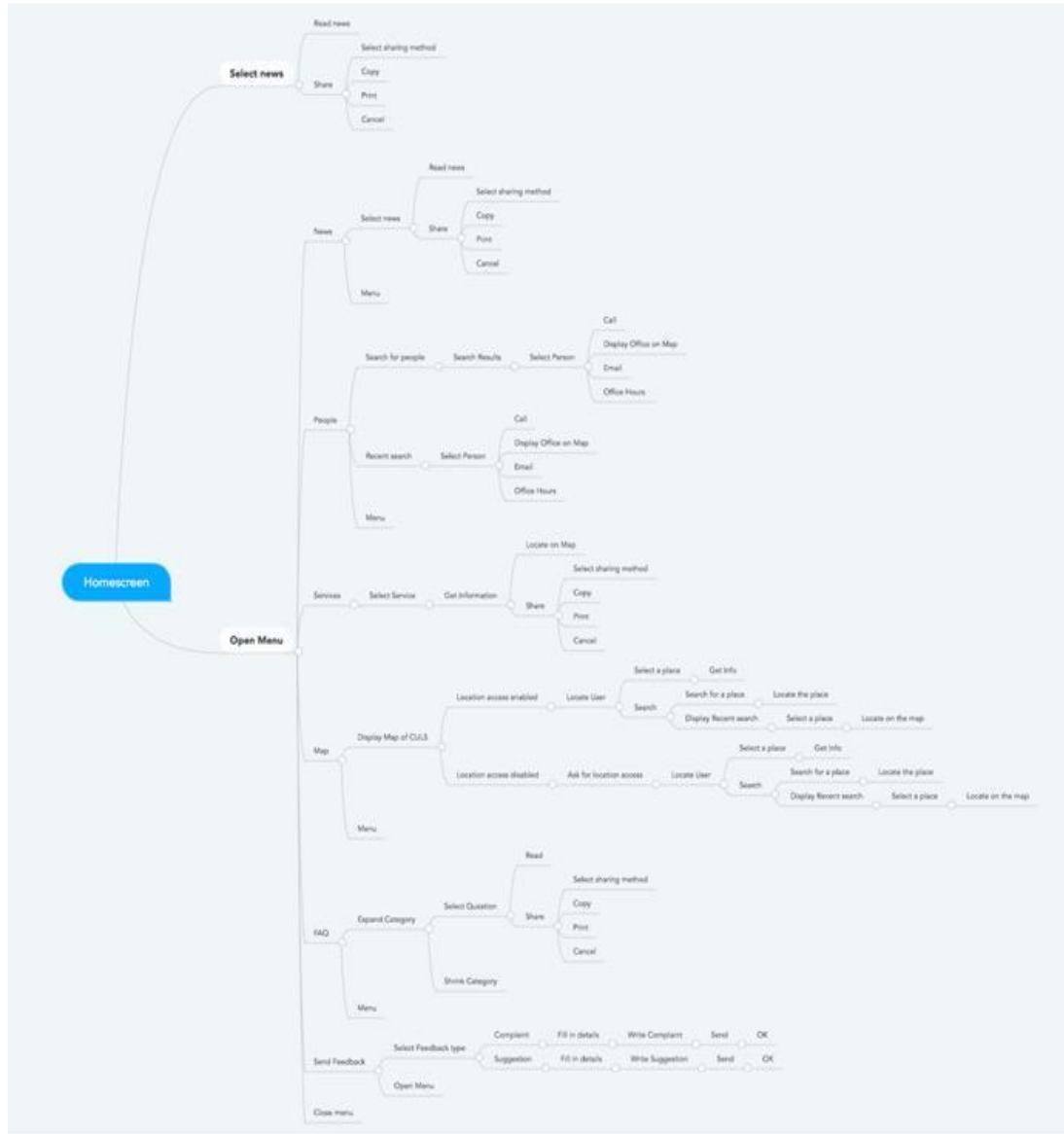
The mobile application market was reviewed to search for similar applications both for iOS and Android. There is an application called Moje CZU. This application can be considered as a competitor application. The Application is totally in Czech language and for this reason it is hard to make usability test with English speaker students.

After collecting all necessary data about end-user`s needs for the project, the application development can be started.

4.2 Information architecture: structure and previews of application

The structure of this application is not complex, it is represented by the map below.

Figure 14 Structure of application



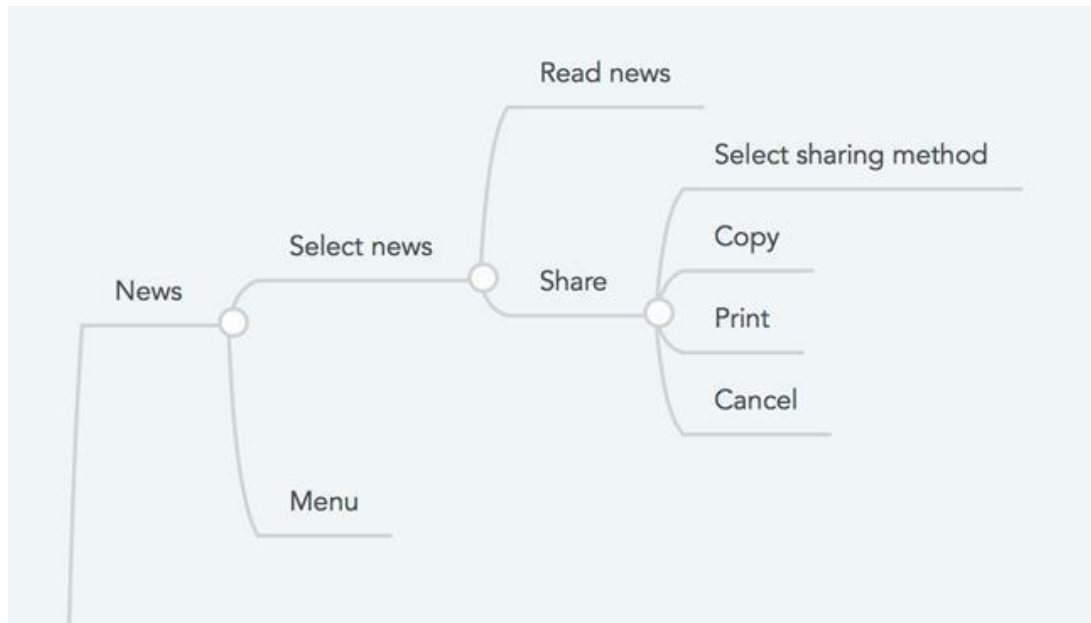
Source: own processing

Each part of the application with a corresponding preview of sections will be explained.

The default screen a user sees when launching the application is News.

The structure of this screen is described below.

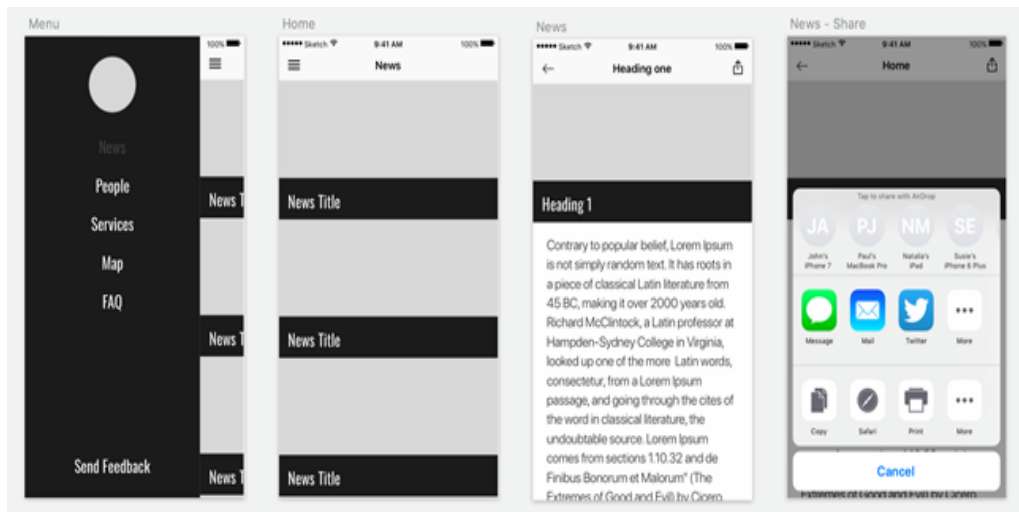
Figure 15 The structure of News section



Source: own processing

Based on this structure this preview was created.

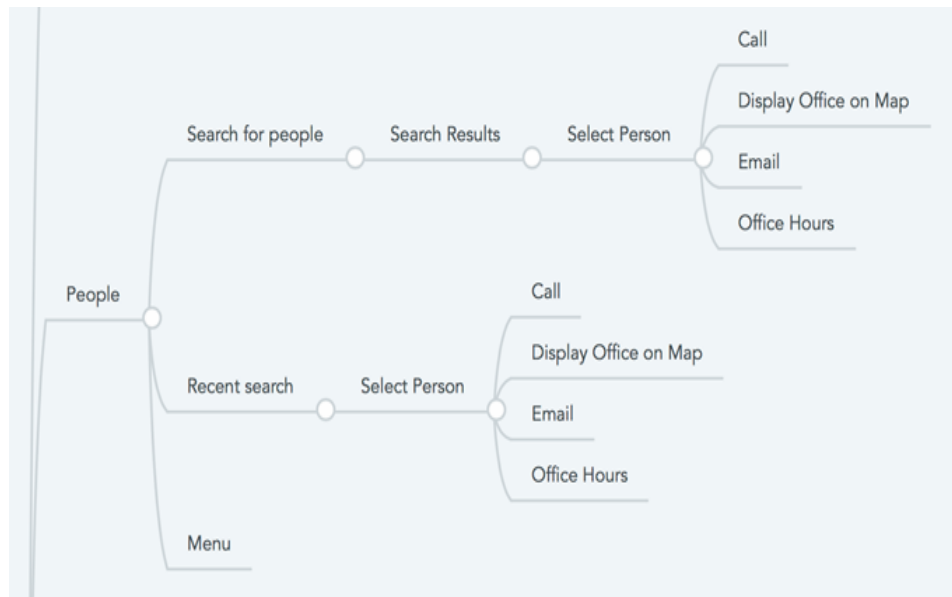
Figure 16 Preview of default screen



Source: own processing

From the side menu (drawer) users can reach 6 parts of the app. The second part is about searching for university personnel or people. The structure of this screen is described below.

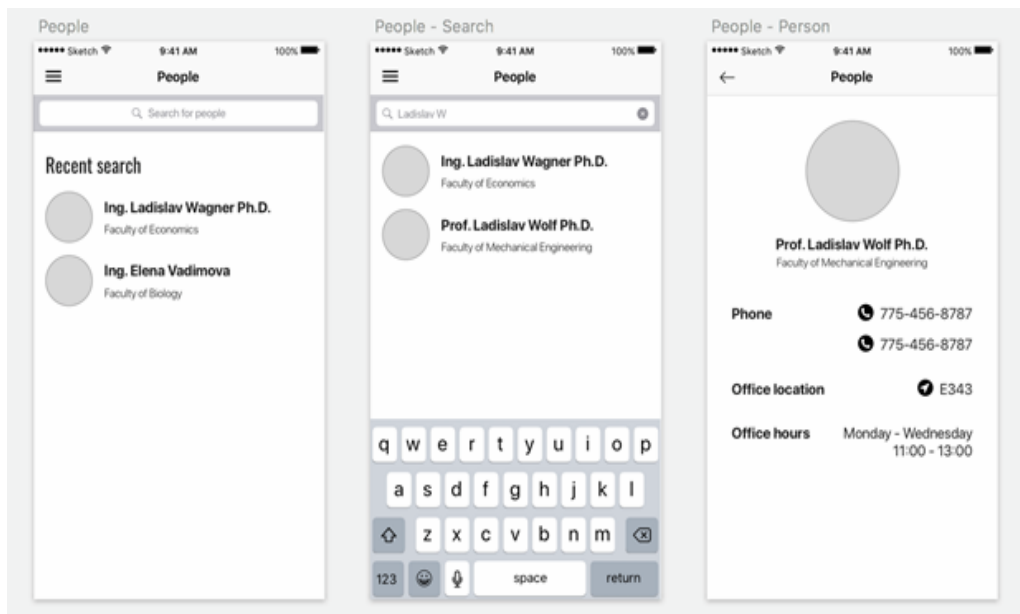
Figure 17 Structure of University personnel or people part



Source: own processing

Based on this structure this preview was created.

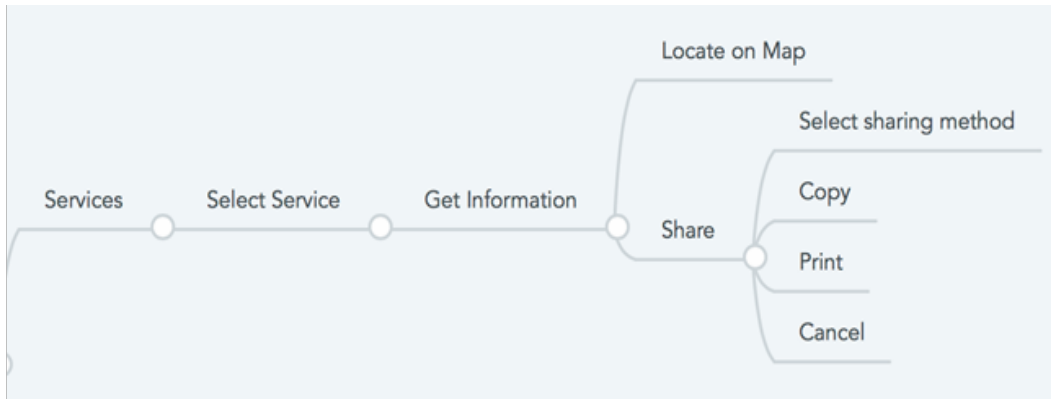
Figure 18 Preview of people section



Source: own processing

The next part is called Services. It has the following structure:

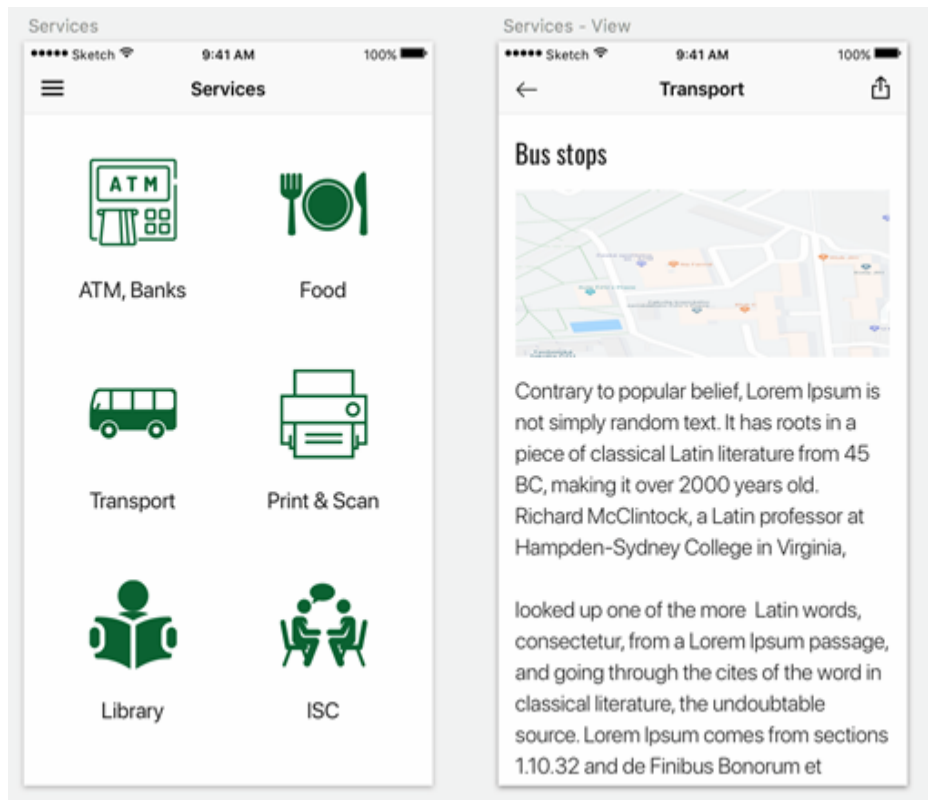
Figure 19 Preview of Services section



Source: own processing

The services are ATM and Bank branches, Restaurants, Mensa, Public transportation, Printing and Scanning, Library and International Student Club. Based on this structure this preview was created.

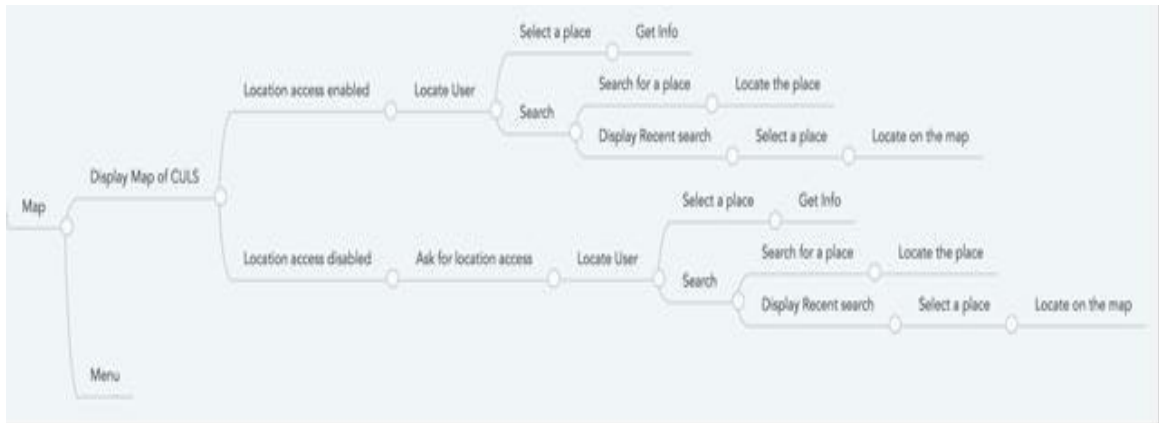
Figure 20 Services and transport



Source: own processing

Map has a more complex structure because it provides more functions and interactivity to users. It has the following structure:

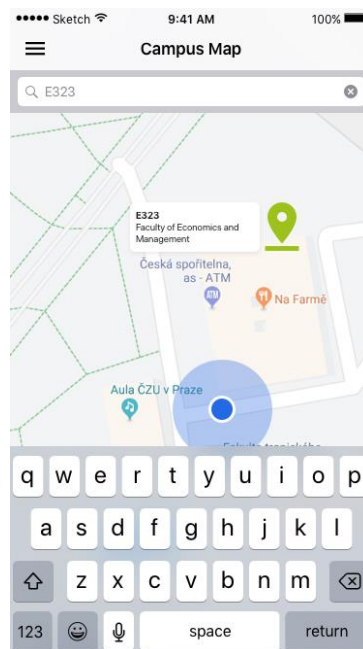
Figure 21 Map structure



Source: own processing

It allows user to access a campus map, to select and view objects on the map, to search for objects such as classrooms, dormitories, etc., to access their recent search terms. In addition to that it shows user's current location.

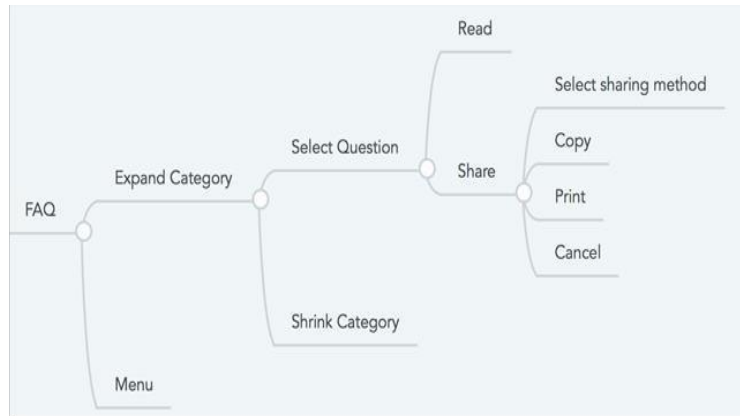
Figure 22 Preview of Campus map



Source: own processing

The last part from the main functions is Frequently Asked Questions or FAQ. The structure is relatively simple and the user flow is clear.

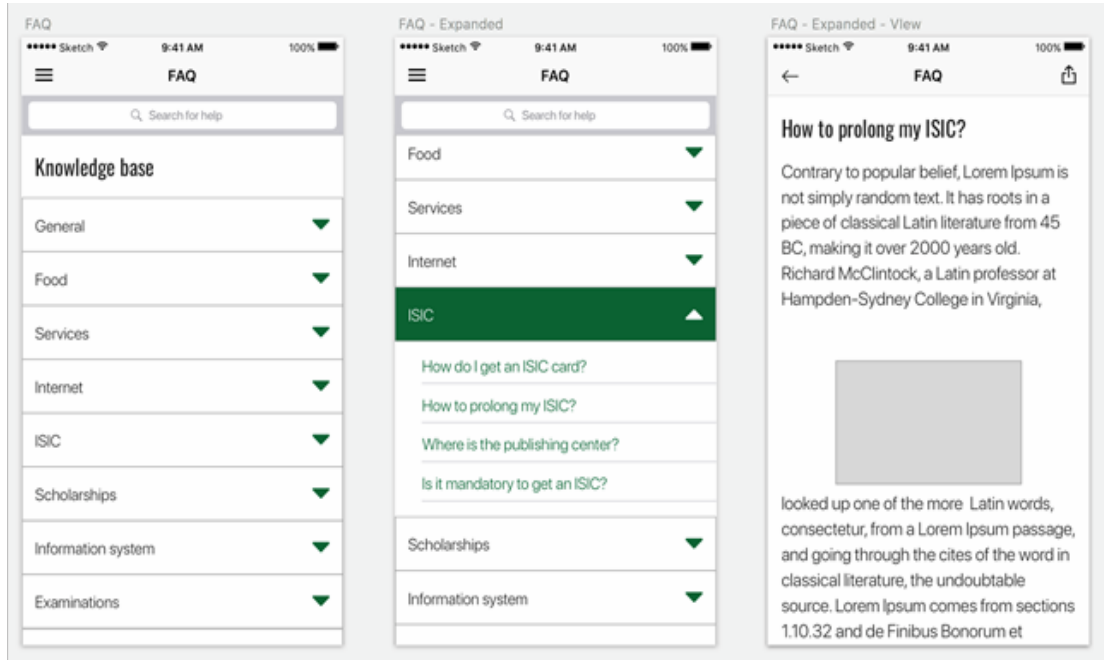
Figure 23 FAQ structure



Source: own processing

Therefore, the previews of application are not complicated too, and should be easy to develop.

Figure 24 Preview of Feedback FAQ section



Source: own processing

Those 5 parts were about providing information to students, however one great feature of the application is actually getting feedback from users using a special part called

Send Feedback.

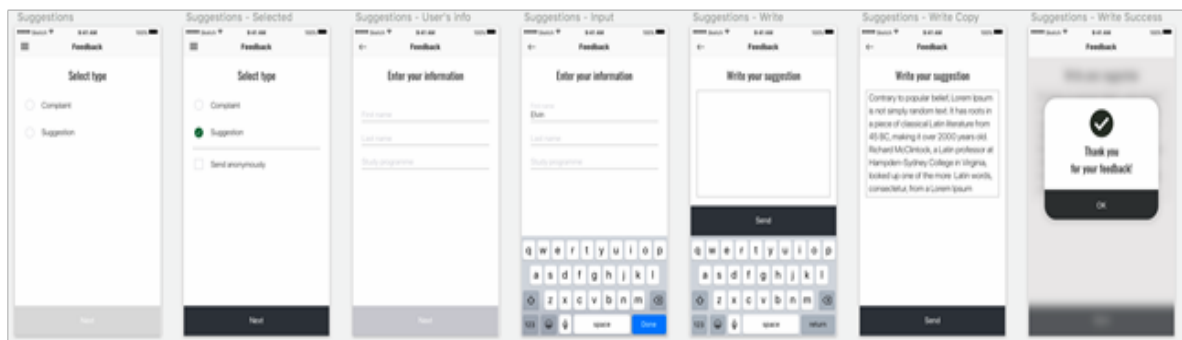
Figure 25 Feedback structure



Source: own processing

2 types of user feedback are supported – it should be a suggestion or a complaint. This should help us to improve the communication between the university and its students, solve our problems and allow CULS Prague to provide better education and conditions for studying and living on the campus.

Figure 26 Preview of Feedback section



Source: own processing

Having these previews of application and app structure allowed to run several usability tests to identify all issues and eliminate them. The process was held in an iterative manner, for each function there was a separate micro-test to see how each component is understood by users. In case of 2 solutions for one feature A/B tests were held. After all parts were tested, one usability test covering the whole app was conducted, the focus was mainly navigating inside the app and understanding what functionally it offers. Interactive prototypes were used for this purpose, They were created using InVision since it allows designer to test their ideas efficiently in terms of time and effectively in terms of usability – InVision prototypes are simple click-through prototypes available for mobile.

The users were watched and their feedback were documented to understand current mistakes and potential issues, some of the elements were misleading and had to be changed. After all errors were eliminated, it was necessary to create the user interface design by visualizing the previews of application.

4.3 User Interface Design

Sketch allows designers to create user interfaces, because previews of application are created in Sketch it was more effective to start the process of visualizing since all the elements and art boards are properly copied to a UI pages in Sketch and are ready for work.

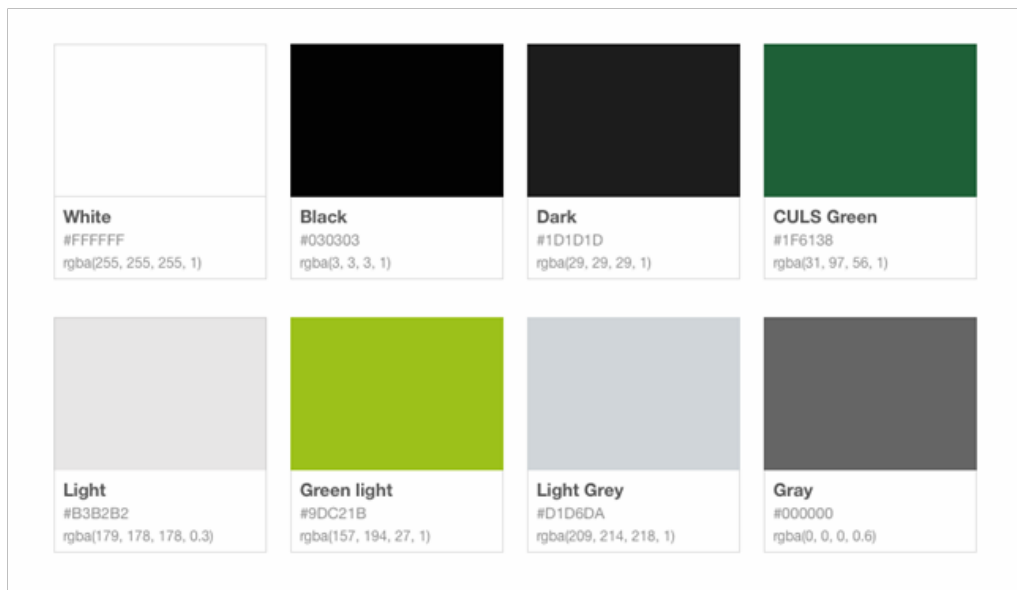
Figure 27 Text font families



Source: own processing

San Francisco Pro Display and Text font families were used for iOS and Roboto for Android, together with Oswald font family for headings and menu elements.

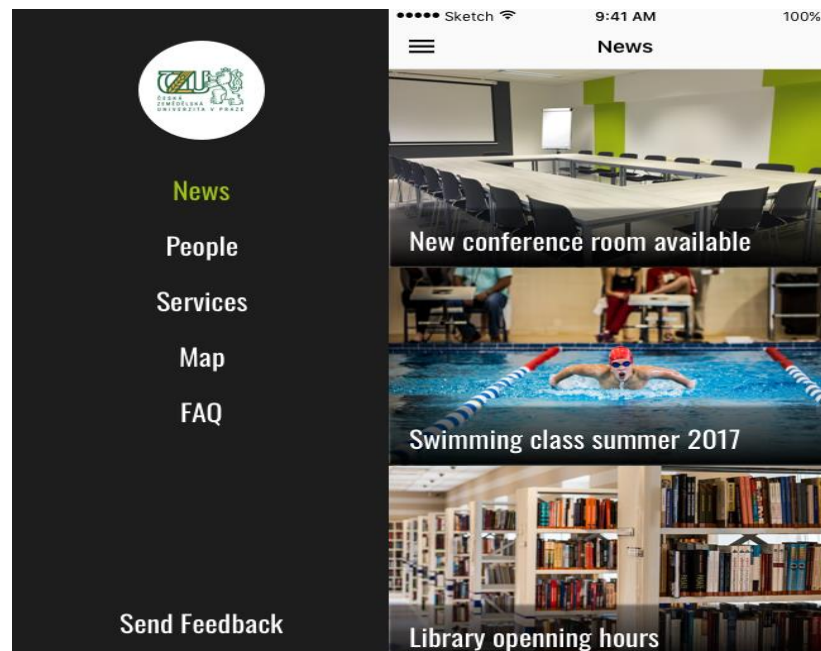
Figure 28 Colors



Source: own processing

CULS Prague green color was used as a primary color of the interface which supports the brand of our university and can be easily identified by students.

Figure 29 News Screen



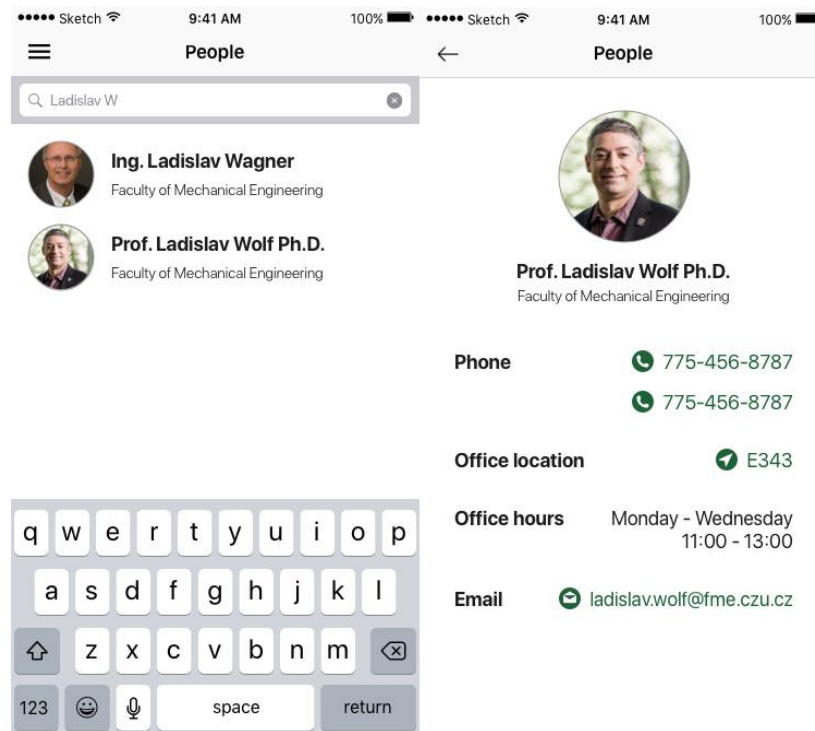
Source: own processing

News screen is also user's home screen because it's the first screen user sees. It contains the latest news and announcements of CULS Prague which can be interesting

or important for students. News and all other articles can be shared, because it is very important to be able to tell other students about important information.

The side menu is always available from the left part of the app and contains navigation to all categories or parts of the application.

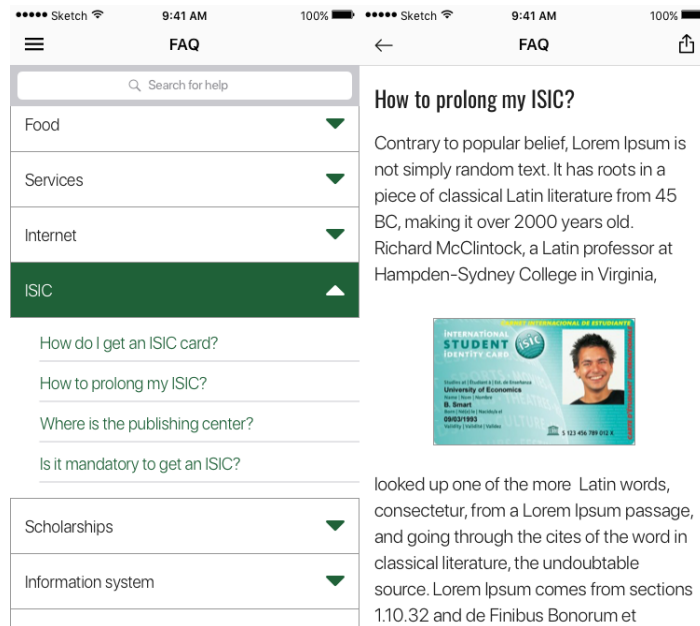
Figure 30 People section



Source: own processing

Students can search for people of CULS Prague using the People part of the application. It shows user's recent search and allows finding contact details of the university staff. Interactive tappable elements are highlighted with green color (main UI color) and have an descriptive icon next to them, so that when user sees a phone number in green color and an icon next to it, he directly understands that tapping on the phone number will start a phone call, similar logic applies to email and office location.

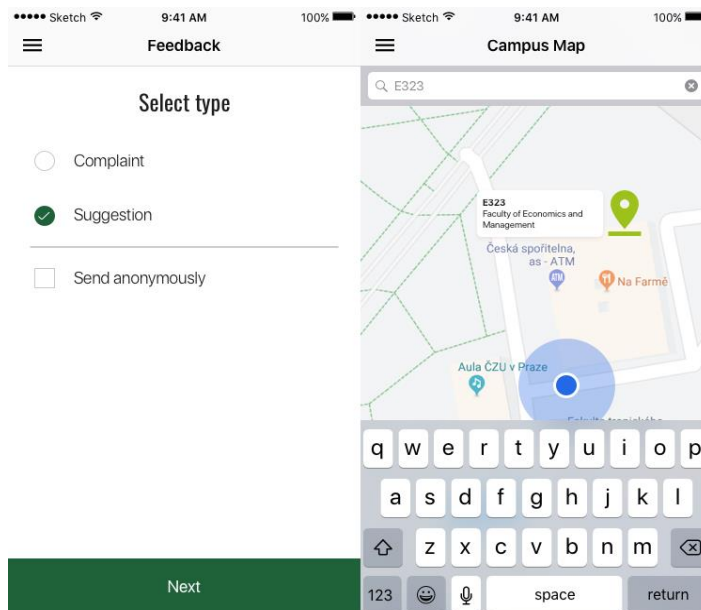
Figure 31 FAQ section



Source: own processing

FAQ section contains frequently asked questions sorted and organized into several logical categories. Tapping on a category expands it and lets the user select a question to read an answer to it. All answers can be shared with other students using Share icon in the top right corner.

Figure 32 Feedback and Campus map



Source: own processing

Feedback is a very straightforward section. This section stayed the same starting from the first design iteration and did not require any changes or clarifications. No users experienced any difficulties with this part and this is very important since it ensures the communication between CULS Prague and its students.

Campus map is also quite clear to all users involved in the testing process due to users' experience with other mobile maps like Google Maps or Apple Maps. This is very beneficial since it makes it easier for users to navigate and find places they need. Campus map displays things like ATMs, shops, cafes, faculties, etc.

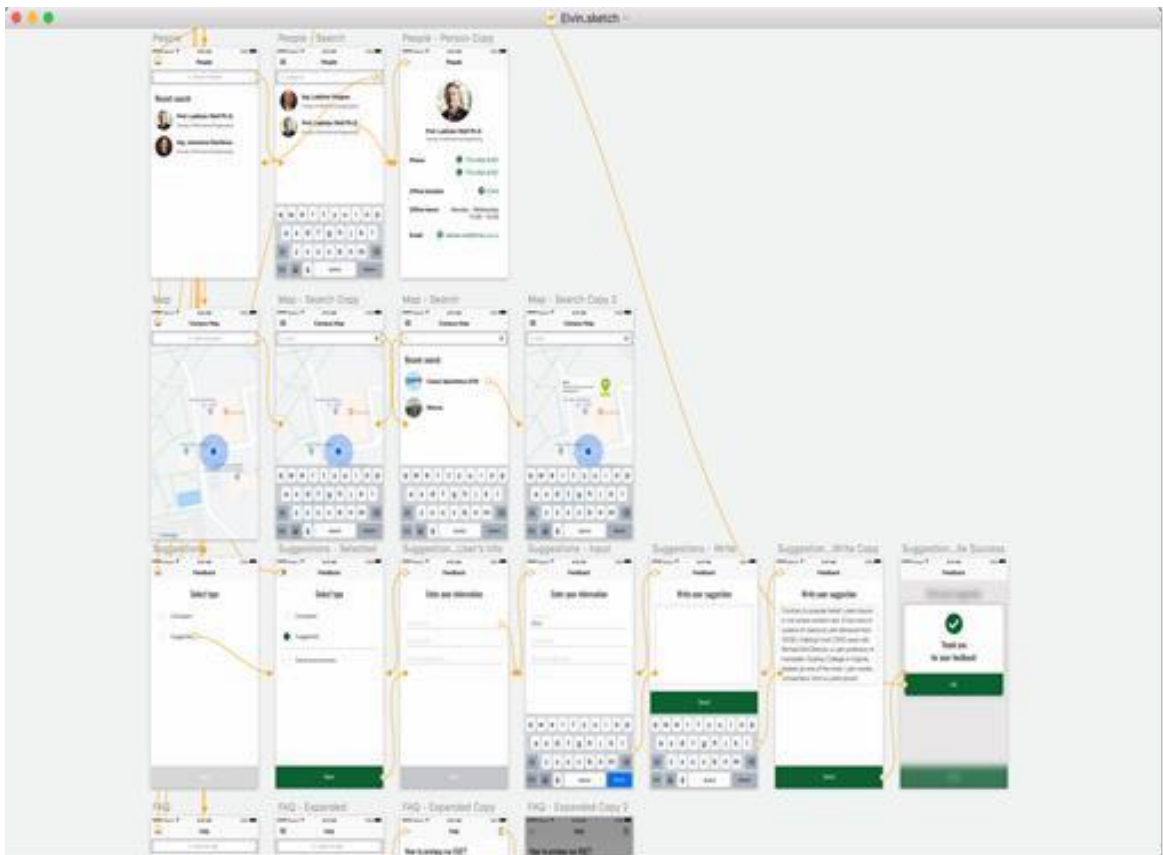
4.4 Exporting for developers

Proper hand-off is very essential for any project. It ensures that stakeholders understand the process, the behavior and everything else related to the product. It requires special attention when delivering designs to developers, it needs to be sure that the implemented solution repeats and strictly follows the designs in a very precise way.

Nowadays there are several solutions for improving this process – various version control, collaboration, hand-off and discussion platforms, making it easier to communicate and explain ideas.

The InVision solutions are used for this project. The clickable prototype is created with final visuals of the UI so that the logic of the application and the behavior of elements can always be checked from any machine for any user having the right link. In addition, to that, InVision Inspect is used to ensure proper handoff and make the product ready for implementation.

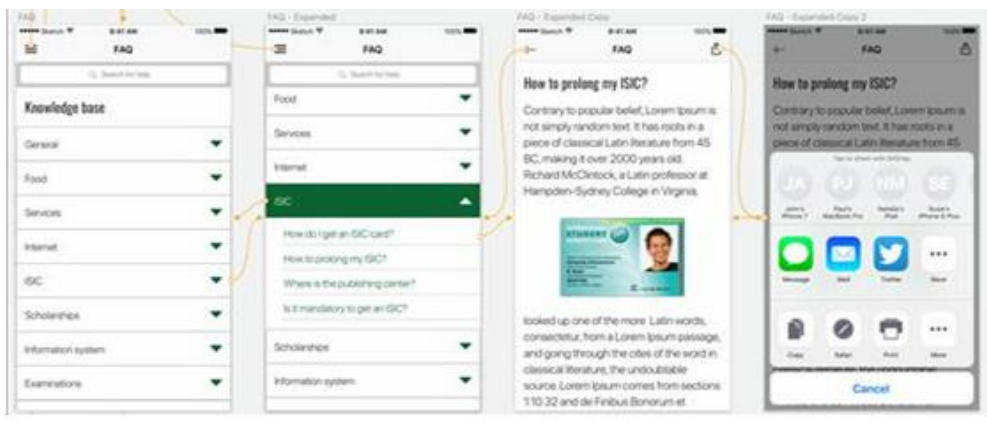
Figure 33 A proper handoff



Source: own processing

The logic of the app is represented by connector (links) between screen and elements and their behavior. Here is how the FAQ section preview works:

Figure 34 FAQ section preview



Source: own processing

InVision Inspect can generate ready to use code for UI elements, such as HTML and CSS codes of a button, it provides easy and fast access to measurements, colors, and design assets, it allows developers to browse and access screen dimensions – including position, palette, typeface, fonts, code, asset preview, asset download function, and more – and customize your export settings to your unique needs (Invision App, 2018).

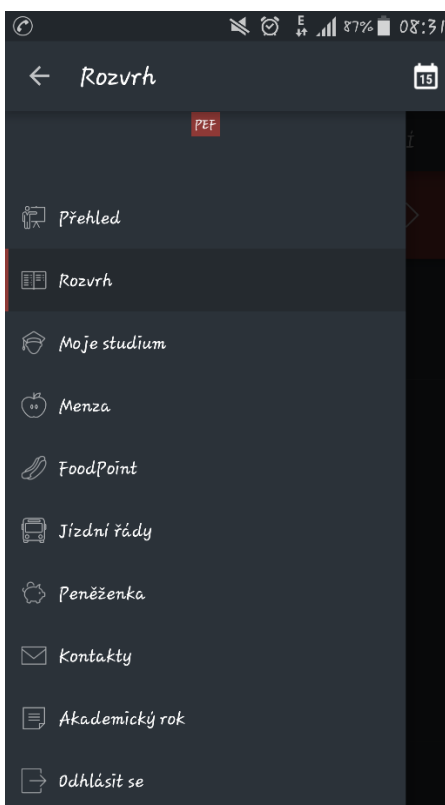
After the implementation of the English version, it can be localized and translated to other languages of students who study at CULS Prague - Czech, Russian, Spanish and others. This could be achieved by involving volunteers willing to help CULS Prague and its success.

4.5 Comparison with competitor application

The application Moje CZU has following features and main sections (Moje ČZU, 2018):

- overview;
- schedule;
- my study;
- menza (student's canteen);
- foodPoint;
- bus time tables;
- wallet;
- contacts;
- academic year.

Figure 35 Side menu of Moje CZU application



Source: Moje ČZU, 2018

Overview – section is the home screen. It contains a profile photo, 6 main sections as: Contacts, Schedule, Menza (student's canteen), Academic year, Bus Time tables, Wallet. On the left side of the screen are icons of Schedule, Time tables, Menza (student's canteen) and My study. By using the profile settings, you can set options from left side of the screen on the central screen and scroll between them (Moje ČZU, 2018).

Schedule – list of current lectures, exercises and seminars. Teachers and students have their own schedule. The timetable can be displayed as a daily, weekly, or monthly overview. For each event in the timetable, students can set a notification that is then displayed on the main application screen and can add a text note to each event (Moje ČZU, 2018).

Teachers also have an opportunity to send a message to all students of the event. Students who have an application installed will see this information as a notification.

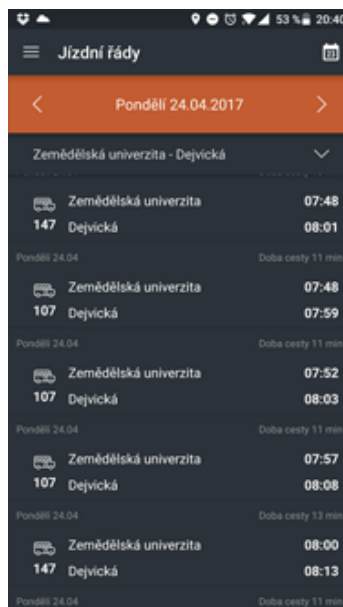
Figure 36 Schedule



Source: Moje ČZU, 2018

Bus time tables – information about bus connections to the university. The timetables are provided for 5 days in advance and are updated with DPP data. If users experience any internet problems, it is available offline.

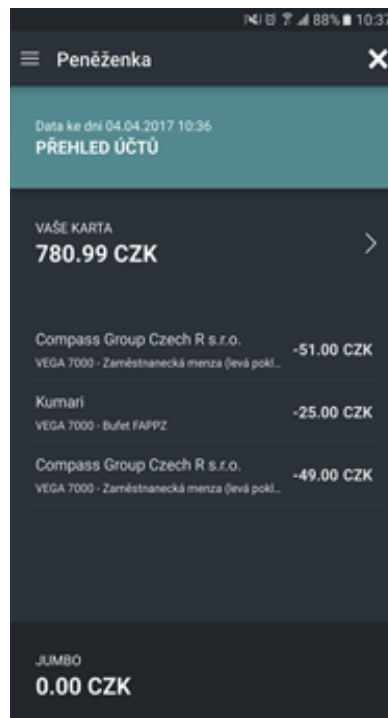
Figure 37 Bus time tables



Source: Moje ČZU, 2018

Wallet – overview of payments made. The current credit / money status on your employee or student card have shown in this section. The status of the UEP account is also listed. There is a detailed overview of the transactions made on the card. In case of losing the card, it can be blocked through the application (Moje ČZU, 2018).

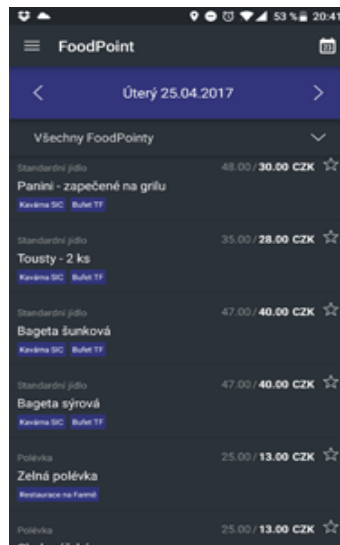
Figure 38 Wallet



Source: Moje ČZU, 2018

Food point – An overview of the favorite restaurants and operations involved in the Food Point project. Data is provided for a week in advance and, like the Menza module, users have the option to mark your favorite meal. The application will alert user when it is available again in the menu (Moje ČZU, 2018).

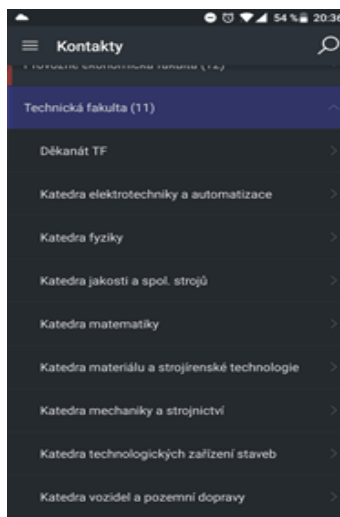
Figure 39 FoodPoint



Source: Moje ČZU, 2018

Contacts – contact links to university staff. A directory of teachers and staff of the CULS Prague is available within the application. Searching by name by name or surname is available. E-mail, phone number, and office information are available for each contact. (Moje ČZU, 2018).

Figure 40 Contacts

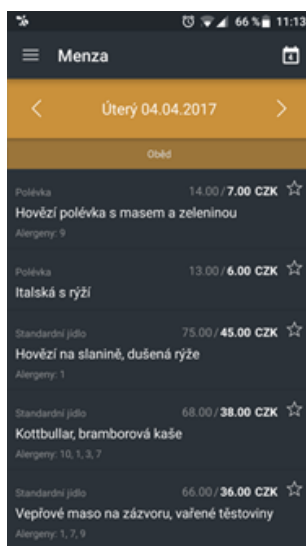


Source: Moje ČZU, 2018

Menza – A list of meals served in the Menza of CULS Prague. For each meal, type, allergens, full meal price and discounted meal cost for employees or students of the CULS Prague. Users can mark the desirable meal by clicking on the star. The app will

notify user, once the meal is back on offer. (Moje ČZU, 2018).

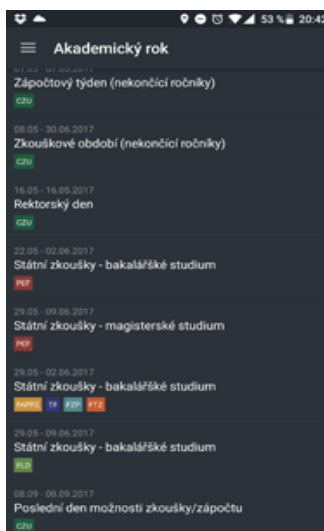
Figure 41 Menza



Source: Moje ČZU, 2018

Academic year – a list of all major events in the given academic year. The module displays clearly the most important events of the academic year. (Moje ČZU, 2018).

Figure 42 Academic year



Source: Moje ČZU, 2018

Offline mode – the application works even without having to connect to the Internet. In case of connection loss, it will notify user and use the data from last accessed session (Moje ČZU, 2018).

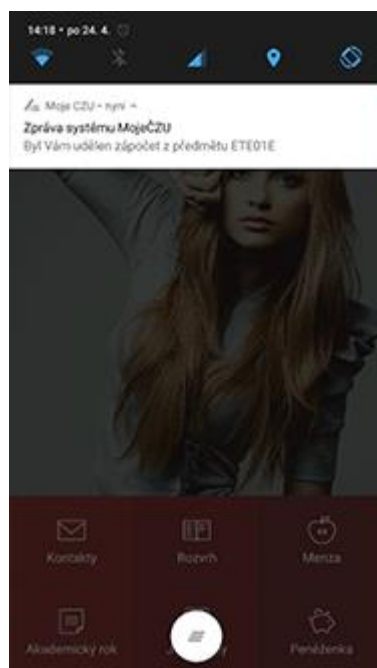
Figure 43 Offline mode



Source: Moje ČZU, 2018

Push notifications – notification of updated information. The application allows push notifications, which are reports of different events sent from the university's internal systems. Users will be informed about the amount of money on their UEP account, a low credit on your UEP card, Students are informed about enrollment or test result (Moje ČZU, 2018).

Figure 44 Push notifications



Source: Moje ČZU, 2018

Both applications are free and customized for CULS Prague. Application for English speakers satisfies the needs of our students to provide the best experience and cover all the desired use cases. Since the solution is not complex, everything can be implemented by means of CULS Prague employees or students who would like to volunteer and participate in this project.

The Moje CZU application is mainly focused on local and Czech-speaking students. Developed application is aimed for international students. Moje CZU application is more useful for students who have already adapted and studying at university more than one semester, because Moje CZU application requires a username and password from the University information system. Newcomers who arrived within a week do not have access to the system and therefore cannot use the application. Even the first weeks of study not all of newcomers have access to the University information system due to different reasons. Adding „Login as a guest“ option will remove this obstacle. Since the login is performed from the University information system account, it would be better to make an option for password reset or unlock for students who have forgotten or mistyped the password several times.

In Moje CZU there is no navigation map with GPS and a knowledge base for basic procedures. With the help of the map, students can quickly navigate and find the right building of faculty, library and ATMs. In the Knowledge Base, students and newcomers can find out how to get ISIC card and how to refill the balance, Menza opening hours, payment methods, scholarship and exam procedures and credit tests rules. Both applications contain data about university staff.

The difference is that developed application shows teacher's office hours, has the possibility to find the building and the office on the map. Developed application has News section which contains the latest news and announcements of CULS Prague and news can be shared, copied, scanned or printed. Another advantage of developed application is Feedback section. Feedback is useful option for further development of application. It has suggestions and complaints sections. For each section students can write with personal details or anonymously. In addition to all of the above, there is a frequently asked questions section in developed application that will help freshmen quickly find answers to their questions.

In the main menu of Moje CZU there are all those options that are on the sidebar and different variations of settings. Considering the fact that the sidebar is very convenient, there is no reason to add the same options to the main page.

Conclusion

The goal of this thesis was to make a design and analysis of prototype of a mobile application for university students orientation.

For the purpose of this project detailed research with CULS Prague students has been conducted. During the interview, students were asked questions about preferred options and useful features. The results of the research were used to understand the problem and the needs of our students. According to the received answers, the main features were determined: Contacts, Interactive Search, Map, Questions, Services, Feedback.

After creating the structure and the preview of application, the design of the application was started. As a result of a search for similar applications in the market, an application named Moje CZU was found. The application is useful for local students, also suitable for experienced students who know the locations of buildings and other objects on the territory of the university, the application has access to personal data of the information system which make a difficult to access for newcomers who still have no access to the system.

From usability approach Moje CZU does not meet all above-mentioned expectations of students. Users are expected to see Map of CZU with GPS, Office hours of teachers, share, copy, print and scan options, library, ISC, FAQ and Feedback sections.

This project was a great opportunity to apply existing knowledge, to acquire new knowledge and skills. This research helped to formulate a solution and to design it in a way which covers all use cases proposed by students who are the target audience of this product. Once implemented, this application can be very useful for exchange students and freshmen, as well as other students of CULS Prague.

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