Czech University of Life Sciences Prague

Faculty of Economics and Management

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Bachelor Thesis

Collaborative versus traditional UI Study methodology

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Thesis title

Collaborative versus traditional UI Study methodology

Objectives of thesis

Study the traditional UI test methodologies and according to your findings to try define the main differences between the traditional and collaboratvie UI Study. Prepare list of typical use cases, when is a collaborative approach better in comparison with classical.

Methodology

Define you own (for selected information system):

- Heuristic study,

- Cognitive study,

- Collaborative study partially cognitive, partially heuristic.

Compare these studies and define results.

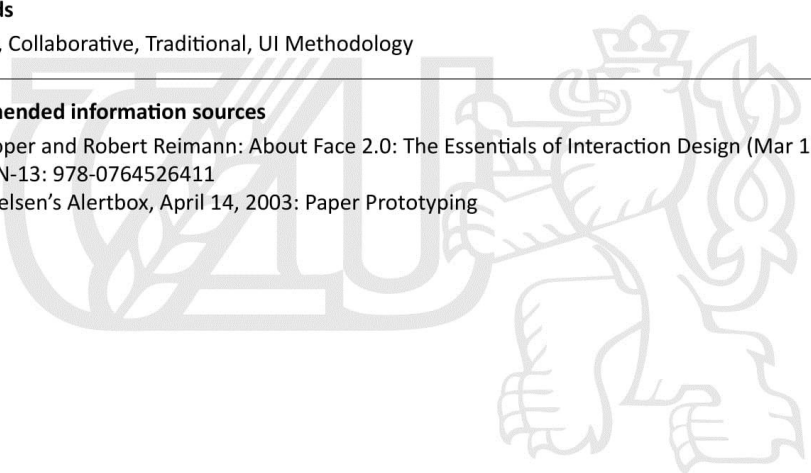**The proposed extent of the thesis**
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Alan Cooper and Robert Reimann: About Face 2.0: The Essentials of Interaction Design (Mar 17, 2003),
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Jakob Nielsen's Alertbox, April 14, 2003: Paper Prototyping

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Declaration

I declare that I have worked on my bachelor thesis titled "Collaborative versus traditional UI Study methodology" 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 15.03.2018   _____

                                                      Giancarlo Braschi Velasquez

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Collaborative versus traditional UI Study methodology

Summary

The goal of this bachelor thesis is to define and compare the main differences between the traditional and collaborative User Interface Study.

The first part contains a brief introduction to Interaction Design and Human-Computer Interaction followed by theory of Usability testing.

The second part is the creation of a directory website for doctors in Prague.
The usability of this website will be tested in Laboratory and remotely using heuristic ,cognitive and collaborative methodology

Keywords: Usability , Usability Testing, Heuristic, Cognitive, Collaborative, Remote Testing,Laboratory Testing

Metodika spolupráce versus tradiční uživatelská rozhraní

Souhrn:

Cílem této bakalářské práce je vymezit a porovnat hlavní rozdíly mezi tradiční a společnou studií uživatelského rozhraní.

První část obsahuje stručný úvod do "Interaction Design" a "Human Computer Interaction", po kterém následuje teorie testování použitelnosti.

Druhou částí je vytvoření adresáře pro lékaře v Praze.
Použitelnost této webové stránky bude testována v laboratoři a dálkově pomocí heuristické, kognitivní a metodologické spolupráce.

Klíčová slova: Testování použitelnosti, heuristická, kognitivní, spolupráce

1 Introduction

Nowadays usability of a website is critical even if not everyone considers it. Often those who want a website think first of the aesthetic aspect and only later to practicality.
What we need to focus on instead is the usability of the website.

Steve Krug in his famous book "Don't Make Me Think"(1) defines usability as "The idea that a normal person should be able to use your products without finding the process frustrating or annoying. Usability is making sure things work well and are easy to use"

Whenever a user opens a web page or an app, they should be able to understand immediately what it's for. Users will leave the system if it is ineffective or if an error occurs every second step. For any website, app, software there are a lot of alternatives solutions, so if a user leaves a website, is highly probabilistic that will not come back.

A usability test is an evaluation process where the usability of the system is measured. In this thesis, I will compare the main traditional methodologies as: Heuristic methodology and Cognitive Walkthrough against the Collaborative Methodology.

The website that will be tested is www.DoctorsInPrague.com , a new directory website created specifically for this thesis that aims to help foreign people in Prague when needs a doctor.

2 Objectives and Methodology

2.1 Objectives

Study the traditional UI test methodologies and according to your findings to try define the main differences between the traditional and collaborative UI Study. Prepare list of typical use cases, when is a collaborative approach better in comparison with classical.

2.2 Methodology

Define your own (for selected information system):

- Heuristic study,

- Cognitive study,

- Collaborative study partially cognitive, partially heuristic.

Compare these studies and define results.

3 Literature Review

3.1 Human-Computer Interaction

The interaction computer-human, know it internationally as "Human-Computer Interaction" (HCI) is defined by ACM (Association for Computer Machinery) as "discipline concerned with the design, evaluation, and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them**.**" (2)

Human Computer Interaction (HCI) is a huge field that deals with how humans interact with computers and how computer technology is influencing their activities.

HCI as an independent branch began to develop in the late 70's - early 80's. Before then, the only humans who interacted with computers were information technology professionals and dedicated hobbyists. The systems were easy to operate only by people who possessed the necessary knowledge about these systems.

This changed radically with the development of personals computers and personal software (text documents, spreadsheets, interactive computer games), that made everyone in the world a potential computer user.

From here the need to design Graphical User Interfaces (GUI) that could make the interaction between human-computer the most comfortable possible. Psychologists provided knowledge about the human mind, while the computer scientists developed the GUI.

As a result, the most popular software became intuitive and user-friendly in a way that could be controlled by almost anyone with basic knowledge.

20 years ago Donald Norman, co-founder, and principal of Nielsen Norman Group, pointed out that when systems would be more usable, safe and functional, it will make it possible to bring the person closer to the computer. Eventually, one could arrive at the ideal case in which the computer is considered as invisible (3)

3.2 Usability

The term "usability" refers to multiple concepts taken together: user experience (which itself can include different kinds of experiences depending on the context), user satisfaction with the performance of the system, and learnability (i.e. 'ease of learning how to use the system) (4)

There are many definitions of 'usability,' as the desired meaning of this word is changed depending on the context it is used in.

Many authors have tried to define this term, some of the most relevant contributions are those mentioned below.

From the point of view of Jacob Nielsen, a pioneer in the dissemination of usability, this is a multidimensional term. Indicates that a usable system must possess the following attributes: Learning ability, efficiency in use, ease of memorization, fault tolerant and subjectively satisfactory (5) .

In this author's model, usability is :
"Part of the utility of the system, which is part of the practical acceptability and finally part of the acceptability of the system." (5)

Steve Krug, usability consultant whose book "Do not make me think" marked a milestone in the disclosure of it, provides one of the most practical definitions (1)

"Usability really means being sure something works well: that a person of average (or even below average) ability and experience can use the thing - whether it's a Web site, a fighter jet, or a revolving door - for its intended purpose without getting hopelessly frustrated. "

Whitney Quesenbery proposes to extend the definition provided by ISO 9241 to make it more comprehensible, at its discretion. It aims to define the usability based on the characteristics that the users should find in the interactive system: Effectiveness, Efficiency, Attractiveness, Tolerance to errors and Ease of learning (6) .

"Usability starts with a philosophy - a belief in designing to meet user needs and to focus on creating an excellent user experience - but it is the specific process and methodology that produce the real goal of usability. A new usability process starts by looking at who uses a product, understanding their goals and needs, and selecting the right techniques to answer the question, "How well does this product meet the usability requirements of our users?" (6)

Jenny Preece, the author of a multitude of usability studies and several well-known books on usability, refers to usability as (7) :

"The development of easy to use and learn systems."

For Janice Redish (8) The term usability does not only refer to making systems simple but also includes an understanding of the users' objectives, the context of their work and what their knowledge and experience are. Based on this approach, it guides the definition of usability towards the goal of the people who work in it, which is none other than:

" Usability means that the people who use the product can do so quickly and easily to accomplish their own tasks. This definition rests on four points: (1) Usability means focusing on users; (2) people use products to be productive; (3) users are busy people trying to accomplish tasks, and (4) users decide when a product is easy to use."

According to Tom Brinck, usability is defined as (9):
"The degree to which users can perform a series of tasks required."

To sum up, usability is defined as a "measure of effectiveness, efficiency, and satisfaction with which the product can be used by specified users to achieve certain tasks in a specific context" (Standard ISO 9241-11, 1998).

3.3 Why is Usability Important?

Good usability of a system is essential for users because it means they will achieve their goals without problems. If users cannot meet their goals efficiently, efficiently and satisfactorily, they are likely to seek an alternative solution to reach their goals.

Usability is a necessary condition for survive for any website, mobile application, software. If the system is ineffective for users - they leave. If it is inefficient, they leave. An error occurs every second step, they leave, the design features blue text on red background, they leave,. For any website, app, software there are a lot of alternatives solutions.

In 2015, a research by Huff Industrial Marketing, KoMarketing and BuyerZone (10) on Business to Business (B2B) web users showed that 46% of users leave a website because they can't tell what the company does (i.e., a lack of effective messaging) which ties back to establishing credibility and trust, 44% of users leave due to lack of contact information/phone number, 37% of users leave due to poor design or navigation and 33% for Video or Audio that Plays Automatically.

This result shows the potential harm bad usability can bring to a website.
Usability goals are business goals. Badly-built websites are hard to use, which results in growing users' frustration [5].

Eventually, the user just leaves, and every user that left means loss of profit for the business.

For intranets systems, poor usability leads to the loss of employee productivity, growth rate of frustration and loss of profit for the company (11)

According to Jakob Nielsen , a leading professional in HCI, usability is associated with **five attributes**. (11)

Learnability: How easy is it for users to accomplish basic tasks the first time they encounter the design? (11)

Efficiency: Once users have learned the design, how quickly can they perform tasks? (11)

Memorability: When users return to the design after a period of not using it, how easily can they reestablish proficiency? (11)

Errors: How many errors do users make, how severe are these errors, and how easily can they recover from the errors? (11)

Satisfaction: How pleasant is it to use the design? (11)

3.4   Evaluation Methods

There are many proposals for methods for evaluating the usability, and several classifications of them have been established attending to various criteria. Some of these methods require great material means, like a complete usability laboratory with independent spaces for the development of tests and technology such as video cameras and eye tracking equipment, and others can carry out with little more than a semi-formal interaction between the development group and end users.

In the opinion of Jacob Nielsen (5) even with a relatively small investment in some method of usability, can be obtained a significant improvement of the usability of the system.

In any evaluation method, the purpose of it could be summarized as a process with the following objectives:

- Provide feedback to improve the design
- Assess the extent to which the goals are being achieved against users and the organization itself
-Monitor the long-term use of products or systems.

3.4.1 Expert-centered evaluation: inspection methods

The expert-centered evaluation is based on the critical inspection of a user interface based on a set of design principles. The principles of design are rules that describe common

properties of a usable interface and serve as a guide to detecting which aspects are not met in the same.

Evaluators can be specialists in usability, software development consultants with design experience of human-computer interfaces or any person related to disciplines related to the web.

3.4.2 Heuristic Evaluation

It is a widely evaluated method accepted to diagnose potential usability problems in the user interface. Heuristic evaluations are performed by a group of expert evaluators who inspects if a Graphical User Interface (GUI) is consistent with heuristics or usability principles relevant to the system (12). The primary goal of heuristic evaluation is to uncover potential usability problems. They are conducted without involving users and can be applied in the different stages of the development cycle, providing a good percentage of usability problems.

This inspection method was developed by Nielsen (12) as a way to test interfaces in a fast and economical way. About the number of evaluators who must carry out the review, there are different opinions. Nielsen, after the completion of several studies with experts, points out that the number of evaluators that should carry out the review should be between three and five(12).

The ten usability heuristics enumerated by Nielsen(13) are aimed at user interfaces in general. These heuristics make a series of recommendations to verify critical points in the interfaces that are significant when it comes to improving the Degree of usability of the system:

Visibility of system status
The system should always keep users informed about what is going on, through appropriate feedback within reasonable time. (13)

Match between system and the real world The system should speak the users' language, with words, phrases, and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order. (13)

User control and freedom

Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support undo and redo. (13)

Consistency and standards

Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions. (13)

Error prevention

Even better than good error messages is a careful design which prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action. (13)

Recognition rather than recall

Minimize the user's memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate. (13)

Flexibility and efficiency of use

Accelerators -- unseen by the novice user -- may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions. (13)

Aesthetic and minimalist design

Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility. (13)

Help users recognize, diagnose, and recover from errors

Error messages should be expressed in plain language (no codes), precisely indicate the problem and constructively suggest a solution. (13)

Help and documentation Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large. (13)

3.4.3 Cognitive Method

In contrast to "Heuristic Method" that use a holistic usability inspection, a Cognitive method or "Cognitive Walkthrough" It is a task-specific approach to usability.

The cognitive method focuses on evaluating through exploration the learning facility of a design. Is motivated by that many users prefer to learn to use an application based on exploring their possibilities rather than to read a manual or follow a set of instructions. (14)

Blackmon and Polson (15) offer four questions to be used by an assessor during a cognitive walkthrough:

-**Will the user try and achieve the right outcome?** (i.e does the user understand that this step is needed to reach their goal?

-**Will the user notice that the correct action is available to them?** (visibility)

-**Will the user associate the correct action with the outcome they expect to achieve?** (Or will they select a different action instead?)

-**If the right operation is performed; will the user see that progress is being made towards their intended outcome?** (if users performed the correct action, will be they be able to tell that they made progress toward their expected outcome?)

Cognitive Methods are often very good identifying particular problems in the system, especially showing how easy or difficult a system is to learn or explore efficiently. It also permits early evaluation of designs at the prototyping stage, they also provide indications of the users' mental processes and are cheap and easy to conduct.

On the other hand, cognitive methods

- Can be quite time-consuming when used for tasks with higher complexity

 -Focuses on first-time users.

 -Identifies problems, doesn't (automatically) produce solutions

- Does not tell you how frequent or severe problems are

3.4.4 Collaborative Method (focus groups)

Is when participants perform the tasks together while they are being observed. Such circumstance is close to the actual situation of the context of use and provides more data.

Focus group has the advantage of providing a diverse range of skills and perspectives to bear on usability problems. As with any inspection, the more people looking for problems, the higher the probability of finding issues. Also, the interaction between the group during the walkthrough helps to resolve usability issues faster. (16)

This method reduces test-redesign cycle by generating immediate feedback and discussion of design problems and possible solutions while users are present. The group atmosphere encourages collaborative, constructive comments from users, developers, and other members of the product team. (16)

3.5 Usability testing

Usability Testing is the method of testing how easy a product is to use on a group of target users.In Usability Testing users are given tasks to perform using the product and observed to see if they have any problems performing the tasks.
Test can be done for different types of designs, from user interfaces to physical products.
It is often conducted repeatedly, from early development until a product's release.
Usability study helps eliminate usability problems for the product which should improve the end user experience .

According to 'Handbook of Usability Testing' (17) the process for conducting a test has following steps:

1. Develop the Test Plan

2. Setup a testing Environment

3. Find and Select Participants

4. Prepare Test Materials

5. Conduct the Test Sessions

6. Analyze Data and Observations

7. Report findings and Recommendations

3.5.1 Usability testing in Laboratory

A usability lab is a place where usability testing is done. It is an environment where users are studied interacting with a system for the sake of evaluating the system's usability (17) The laboratories allow evaluators to observe and analyze a group of end users using the application, record sensations or opinions expressed by them during and after the completion of the tasks, provide help in case they require it, or ask direct questions.

The evaluators make a record of the problems of use with which the users are to be able to solve them later. Usability testing in laboratory is a very powerful test; it allows evaluating the action of an isolated user without distractions or interruptions, allows the creation of unusual and controlled situations.

The amount of data collected and users involved in the testing is generally higher than in other methods, this will allow a better analysis, but it will also require more time both to implement it and to obtain the results.

A disadvantage is great demand for time and the need for economic resources, both to set up the laboratory as to organize each evaluation session (logistics, travel expenses). Also the absence of a context as is an unnatural situation. In the laboratory study distractions

Few things are essential to set up a usability lab:

-A dedicated room that can comfortably fit the user, the moderator, and one or two others as observers.

-Desk and chairs

-A computer, laptop, mobile device laptop (or whatever standard equipment is needed to support the product) and Internet access if is tested a live website or web application

Figure 1. Usability Testing in a Laboratory. Source http://www.usertesting.com

Beyond the minimum requirements to set up a usability lab, is better to have also:

- A camera to record the session:

- A microphone

- More than one camera to get different views from the session

- A logging computer

- Logging software

In two-room labs, it's also nice to have:

-Headsets in the control room that allow the team to hear the user while also being able to speak to each other at a low voice level. Is very useful in situations where there is not sufficient soundproofing.

-Intercom or telephone that the participant can use to call for help if he or she gets stuck. This might not be needed if the moderator sits with the participant.

-A white-noise generator : Turning this device on before testing when soundproofing between the control room and the participant's room is not effective, it creates a background sound with a random character, which sounds like a rushing waterfall or wind blowing through trees, that is not distracting to the participant but that masks noises in the hallway or from the control room.

Specialized Equipment might neeeded in certain situations:

Eye-tracking equipment:
This equipment allows to see exactly what users see and where they look by tracking their eye movements and the length of time they fixate on a certain part of a screen or a word, phrase, or object on the screen. A color-coded heat map reveals the focus of visual attention of the partecipants during the test
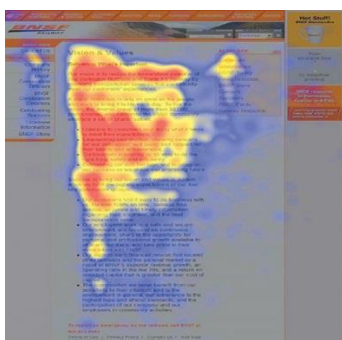
Figure 2. Eye tracking heat map.
Source Nielsen "F-Shaped Pattern for Reading Web Content," 2006

The red color on the heat map shows the highest concentration for fixations, followed by yellow and then blue.

The hardware is attached below the computer monitor. The software performs a quick calibration of the participant's eye-gaze movements, and the results of a study are presented in those handy heat maps, as well as some other reporting options are possible to choose.

Figure 3 EyeTech's eye-tracking device attached to the participant's monitor displays
Source EyeTech https://www.eyetechds.com/

Equipment for testing mobile devices

Testing mobile devices require specialized equipment to hold the device in place or keep the device within the range of a camera to capture the interaction between the tester and the mobile device. Some labs have a camera mounted in the ceiling directly over the user's workspace, which can be used for testing mobile or other handheld devices.

Figure 4 Camera for testing mobile devices .
Source https://graphicmint.com/blog/evolution-usability-testing/

3.5.2 Usability testing Remote

Remote testing provides options and opportunities to learn from users wherever they might be. It allows to conduct user research with participants in their natural environment by employing screen sharing software or online remote usability vendor services. In general,

tests should be about 15–30 minutes long made up of about 3-5 tasks (18)

Remote testing can be divided in:

-Moderated testing means having a moderator "present" when the testing takes place.

-Unmoderated testing means using a web-based application to conduct the testing.

Moderated remote testing is very much like lab testing. The significant difference is the spatial distance between moderator and participant. During a moderated remote testing, the moderator and participant are connected in real time.

Advantages of Moderated Remote Testing

Remote testing has many benefits:

-Generally remote testing is much lower less expensive than a traditional lab test.

-Allows reaching a diverse user population that is geographically dispersed.

-Eliminates the need for a lab environment and the effect of a lab environment on participants

-The testing schedule extends over a period of time (a week, a month) rather than in full session of a day or two in the usability lab. This flexibility allows the remote test to be set up whenever users are available

- Allows learning how the software works in the real user environment, on their computer, with their browser.

Disadvantages of Moderated Remote Testing

Remote testing is a great way to conduct a test without a lab,it has many benefits, but also has some drawbacks:

-Technical difficulties like software conflict in user machine, slow internet connections, company firewalls that could block access, the plugins or software that participants are unable or unwilling to download.

-Moderating a remote test is harder because is not possible to see directly physically the participant.

-Security could be compromised if testing sensitive, privileged, or intellectual property.

3.6 Ways to collect data from partecipants during the test

3.6.1 Thinking Aloud

For Jakob Nielsesen *is t*he single most valuable usability engineering method. *(12)*
"In a thinking aloud test, you ask test participants to use the system while continuously thinking out loud, that is, simply verbalizing their thoughts as they move through the user interface." (12)
During the test, the moderator will ask to the participant to express thoughts, feelings, intentions, and opinions aloud while interacting with the product. It is particularly useful in the initial stages of product development when the margin and flexibility to perform the changes is high.
Thinking Aloud is useful to detect many usability problems of the information systems. The user, with his behavior and comments during the task, contributes to the analysis of the problem.

3.6.2 Interviews

This usability test method is best for obtaining information in details and for interacting with the participant to achieve more on how they react while answering questions. The testers prepare questions about the system, and then they interview the users to obtain answers.
 In the interview, the interviewer asks questions verbally, and the participants respond verbally. Then the interview takes down notes based on the responses.

The primary goal is to get as much information as possible on how the user interacts with the system and their expectations about the system. These methods are mostly used in the design, coding, testing, and deployment of the system. They are useful and satisfying but not efficient.

3.6.3 Questionnaires

Questionnaires are prepared lists of questions used to gather information from the users of a system. They are an inexpensive way of collecting data mainly from a large number of people. A well-structured questionnaire can help obtain information both on the general usage of a system as well as the needed specific parts of the system.. The two main reasons for writing questionnaires is to ask the same kind of questions to all users and to be able to remember to ask the question.

3.7 Why DoctorsInPrague.com?

As an expat living seven years in Prague, I always found hard to find an English speaker doctor or dentist in Prague.
In the last years, I had many experiences from friends or colleagues that found very difficult to register with a practitioner doctor. Also in social networks, happen to see very often people asking information about doctors in Prague.

Figure 5. Mix of different post from users in social network asking information about doctors. Source www.facebook.com

The typical scenario is that after a long queue in doctor office, the visitor is informed that doctor is not taking new patients as they are overbooked or perhaps doctor can register new patients but doesnt speak english . Foreign people searching for doctor end jumping from one doctor to another, and the previous scenarios are the same. Health is an important topic, every foreign person living in Prague should be able to find a doctor easily.

The website that will be tested in the practical part of this thesis is www.DoctorsInPrague.com , a new directory website specifically created for this thesis that aims to solve the current messy situation that faces an expat person in Prague when searching for a doctor.This website will facilitate the research process of an English speaker doctor in Prague.

The practical part describes, in brief, the creation of a directory website for doctors in Prague. Then, the website www.DoctorsinPrague.com will be tested in the laboratory and remotely using three different evaluation methodology.

The goal of this work is to define and compare the main differences between the traditional and collaborative User Interface Study in the website www.doctorsInPrague.com. The results of this tests will help to get a conclusion about in which cases collaborative approach is better than to classical methodology

4   Practical Part

In this part, will be described the design and development processes briefly. Then the rest of the practical part will be about the testing process and the conclusion.

4.1   Design

For this website, four prototypes were developed in JustInMind and were offered to 20 users to test the look and feel of the graphical user interface and to choose the most suitable one.

Figure 6 . Prototype one elaborated with JustInMind software. Source: own processing
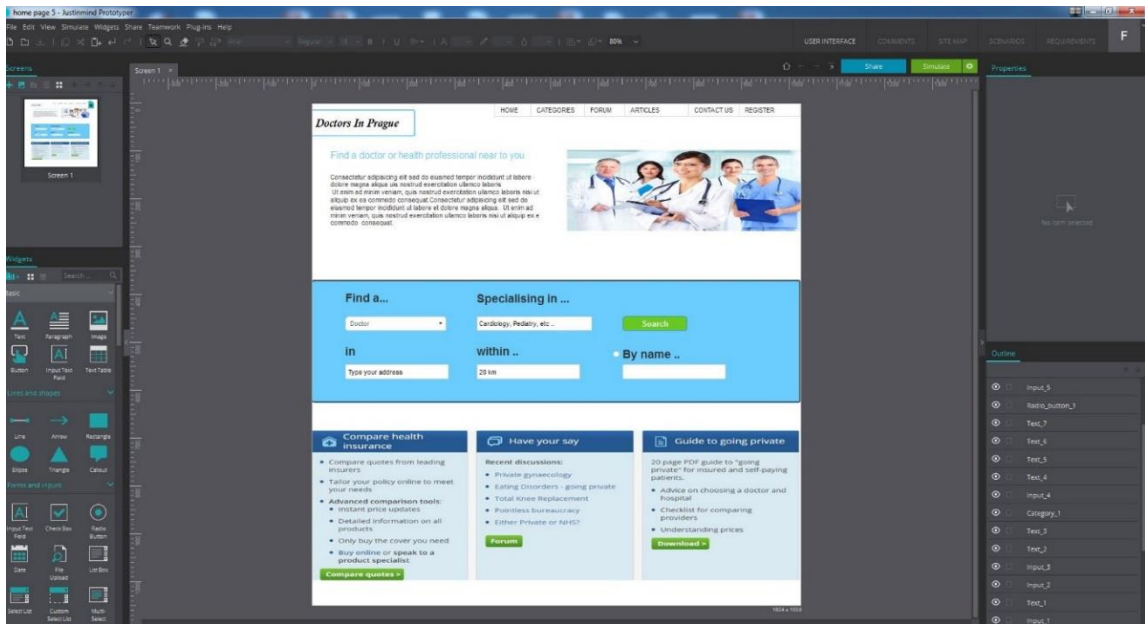
Figure 7 . Prototype two elaborated with JustInMind software. Source: own processing
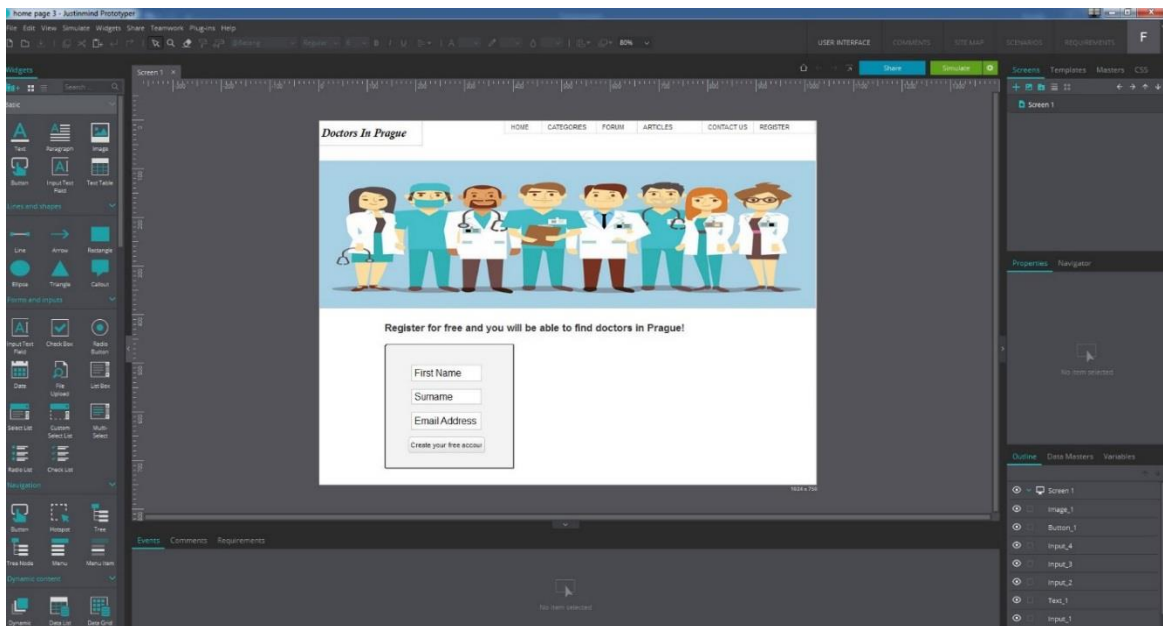
Figure 8 . Prototype three elaborated with JustInMind software. Source: own processing
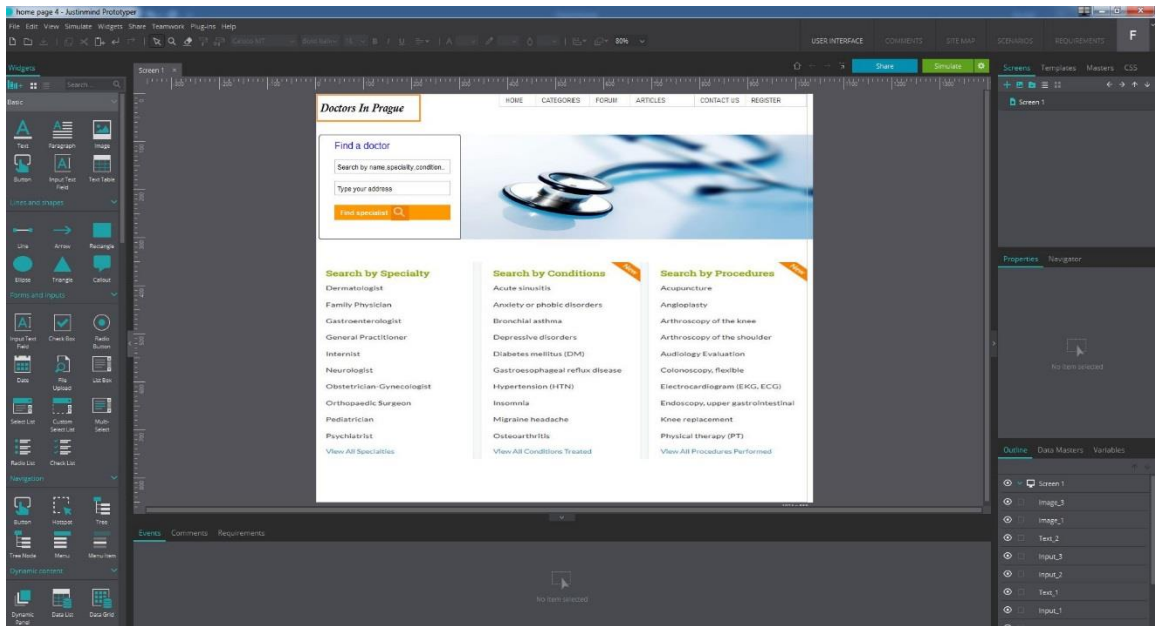
Figure 9 . Prototype four with JustInMind software. Source: own processing

All prototypes

Figure 10: Final version of prototypes.Source: own processing

After testing the interactive prototypes on PC with 20 users, the majority of users preferred 1st prototype
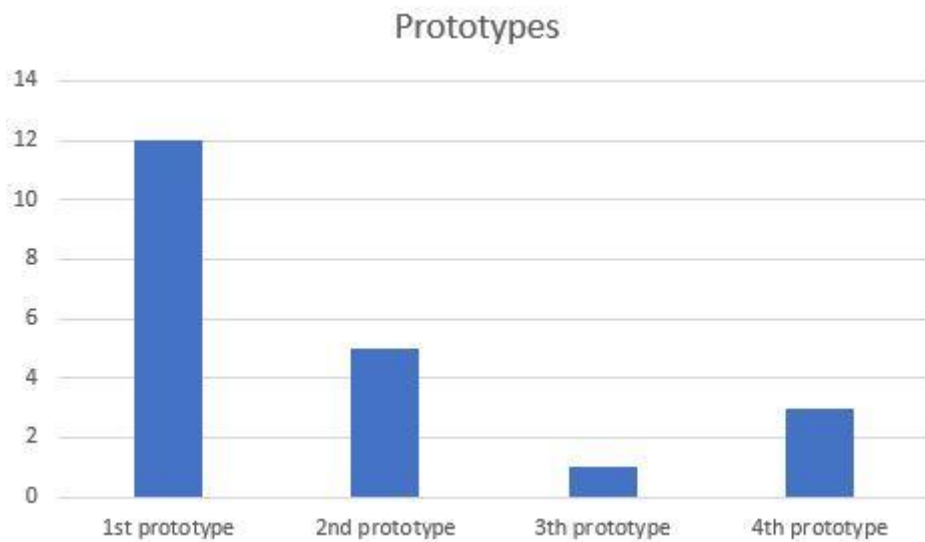
Figure 11: User Vote result. Source: own processing

4.2 Development

In this chapter, the development process is described, how I have implemented the solution and tested in the laboratory.

4.2.1 Implementation

The website was developed using the content management system "Wordpress" an online, open source website creation tool written in PHP.
Wordpress is considered the most accessible and powerful blogging and website content management system in existence today.

In the early stage, the website was developed in local. Using the software "XAMPP" was possible to emulate a server Apache in my notebook.

Figure 12: Xampp software Control Panel. Source: own processing

After the first part of the site was completed locally, it was necessary to purchase a domain and a hosting plan to have the site online and subsequently be able to test the site in the Laboratory.

To register the domain and the hosting I chose the famous provider Godaddy (www.godaddy.com).
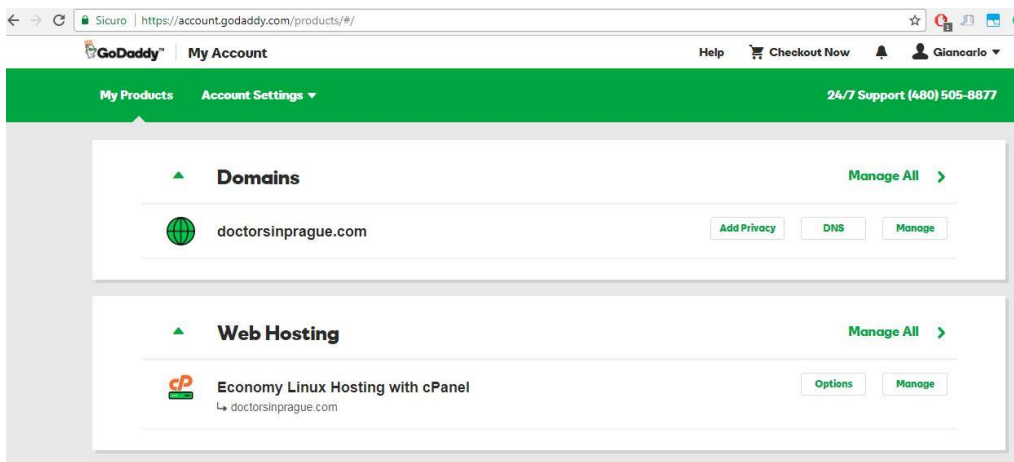
Figure 13: Godaddy.com Account settings. Source: own processing

Godaddy provides a control panel from where it is possible to manage the hosting space purchased easily.
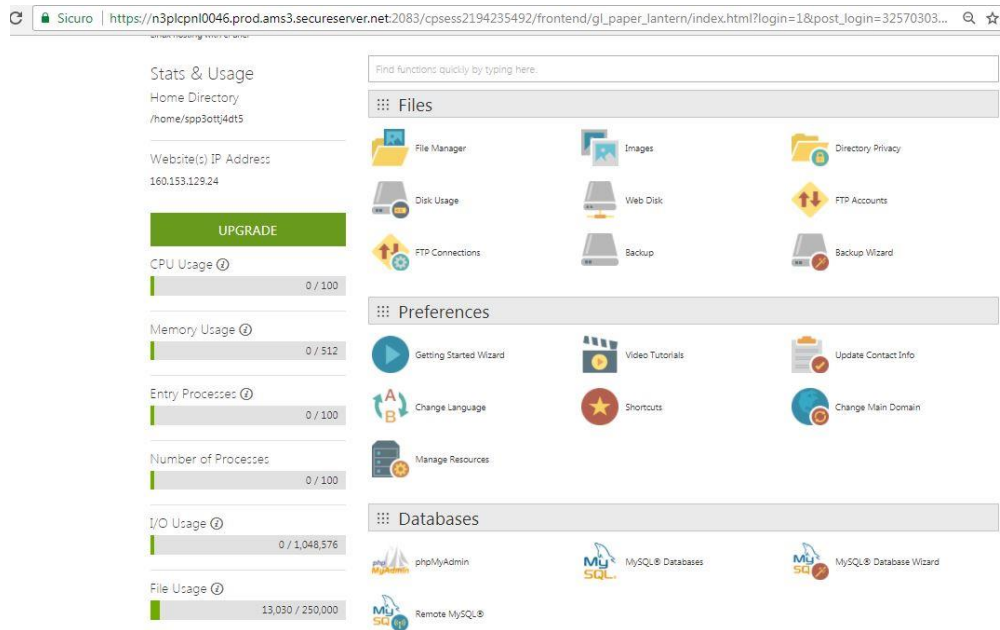
Figure 14: Godaddy.com Dashboard. Source: own processing

Using software Filezilla, a simple and powerful FPT program that allows connecting to a remote server, was possible to upload the files to the server.
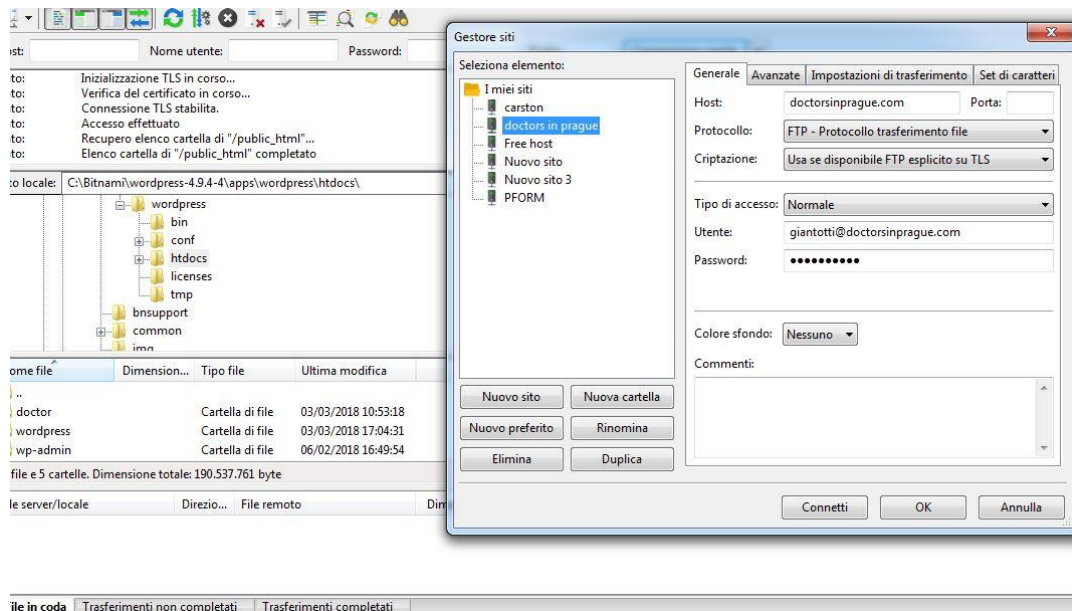
Figure 15: Filezilla configuration. Source: own processing

After Filezilla has finished loading the files, finally www.DoctorsInPrague.com is online.

4.3 Usability testing of the website www.DoctorsInPrague.com

4.3.1 Test structure

Methodology	Laboratory test (6 participants)	Remote Test (8 participants)
Heuristic methodology	1 individual task	1 individual task
Cognitive methodology	1 individual task	1 individual task
Collaborative/Group Methodology	2 group tasks (1 task heuristic + 1 task cognitive).	2 group tasks (1 task heuristic + 1 task cognitive).

Table 1: Structure of the test. Source: Own processing

4.4 Laboratory Test Description

The test was performed in CULS UI lab with 6 participants, foreign university IT students between 24-30 years old.

One day before the start of the test, participants received a word document by email with all the information about the test. Also a printed version of the document was given to the participants during the test.

The tasks from the usability test in the laboratory were the following:

4.4.1 First individual task (Heuristic)

1)Open Google Chrome browser

2) Search the address https://www.doctorsinprague.com

3)Search for Doctors in Prague that accepts insurance VPZ.

4)After load the new page, filter this result selecting English speakers doctors

5) Then filter this result again searching for doctors in Prague 6

6) Sort the result by "distance."

7) Click on the doctor near to your location

8) Check opening hours of the clinic, email and telephone number

9) Fill the form asking general information. (you can type anything in the form fields)

10) Go back to the homepage

After this, please compile the form (*participants received a paper form*) and also compile the electronic version

https://docs.google.com/forms/d/e/1FAIpQLScZ2wm819tc1QAYrH0KqIONSaHgx448Eik Yu9sPdtOxkCnn1g/viewform?usp=sf_link

4.4.2   Second individual task (Cognitive)

You just arrive in Prague from few days and unfortunately, you feel pain in your teeth, so you need to contact a dentist as soon as possible.

Your friend advice you a very dentist in Prague 2, your friend doesn't remember the name of the dentist, the only thing he remembers is that the dentist is the number 1 by rating/ likes. Find all the English speaker's dentists located in location Prague 2 and identify the dentist with more "likes."

4.4.3 Collaborative (group) task description

As described before, in website www.DoctorsInPrague we have two central figures:

1) Users searching for a health structure
2) Health Structure

The collaborative part will be done from the Health structure perspective (it can be doctor, dentist, hospital, pharmacy) . Any of them can manage their own page setting services, prices, location, opening hours, etc**.**

Please make this task in pairs, each of you has an account already created.

1st account	Test1	Welcome123
2nd account	Test2	Welcome123
3th account	Test3	Welcome123

4.4.4 First Collaborative task (collaborative-heuristic)

1) Open browser Google Chrome

2) Search the address https://www.doctorsinprague.com

3) Login using your credentials

4) Go to your Profile Dashboard

5) Select option to manage your schedule, modify it from Monday to Friday from 9 to 18 and update it.

6)In privacy settings, select "Email" as private

7)From profile settings section, update the telephone number (you can type any number you want)

8) In the same page, scroll down until "Insurances" and add 3 new insurances

9)In the same page add video https://www.youtube.com/watch?v=slNYMBN-yYQ

10) Update and check your profile page.

After this task is complete, please compile the form (*participants received a paper form*) and also compile the electronic version :

https://docs.google.com/forms/d/e/1FAIpQLScS5JUDpaNW4oKyh2cOmExygBDADKOp BKm7d65pxKltXn7NUw/viewform?usp=sf_link

4.4.5 Second Collaborative task (collaborative-cognitive)

Before start this last task, please download this 2 pictures and save it in the desktop, will be useful during the registration scenario.

Photo profile:

https://drive.google.com/open?id=1sFqKORQcq1Ut8DiMl-SCDTihHSlYDgw0

(clicking on this link user will download a picture of a doctor)

Banner

https://drive.google.com/open?id=1sPpuWWFO4fP8vUmzQImRkV2W-onVSHP-

(clicking on this link user will download the banner picture to upload in own profile.)

Scenario:

You own a clinic; recently you invest a lot of money renting a new office in the centrum, buying equipment and also hiring international doctors so now you want to marketize your business showing your new services to your clients.

From your doctor profile page in https://doctorsinprague.com please:

-Update your profile photo and write a short description about you

(you can type anything or just copy -paste random test like this "Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliquat enim ad minim veniam"

-Add 3 new specialties

-Add 2 new services with their price

(Example : Service "Orthodontic treatment Price25 000kr Description: Best orthodontic treatment in Prague ..you can type anything you want)

-Add 3 languages

-Set your location to vaclavske namesti 15 , prague 1

-Select phone number, email, contact form, and opening hours as "Public."

-Update and check your profile page .

4.5 Remote Test

For this practical part, also a remote test was performed.

Thanks to web software HotJar (http://www.hotjar.com) was possible to set up easily the remote tests with eight participants. During each test, I was connected by Skype with the tester, and the video session was recorded by software HotJar.

Structure of the remote test was precisely the same as the laboratory test.

-One individual task heuristic

-One individual task cognitive

-One collaborative-heuristic task

-One collaborative cognitive task

The participants for the remote test were eight people, friends and colleagues from work, all expats between 25 -37 years old.

Individual tasks were done in two days from testers home; they choose a most suitable time to perform the test.

Group tasks were done in one day, as all the participants live near to each other, so it was easy to arrange everything. Participants performed the test in pairs, each group from one home.

Hotjar, the tool used to perform this test, is an extremely efficient software for remote testing. It helps to understand what users want, care about and do during the visit in the website. HotJar creates heatmaps in automatic, helping to understand the areas where users click more often.
Is also possible to create polls, surveys and track all the activities from the user, page of land, page of exit, time of visit, etc
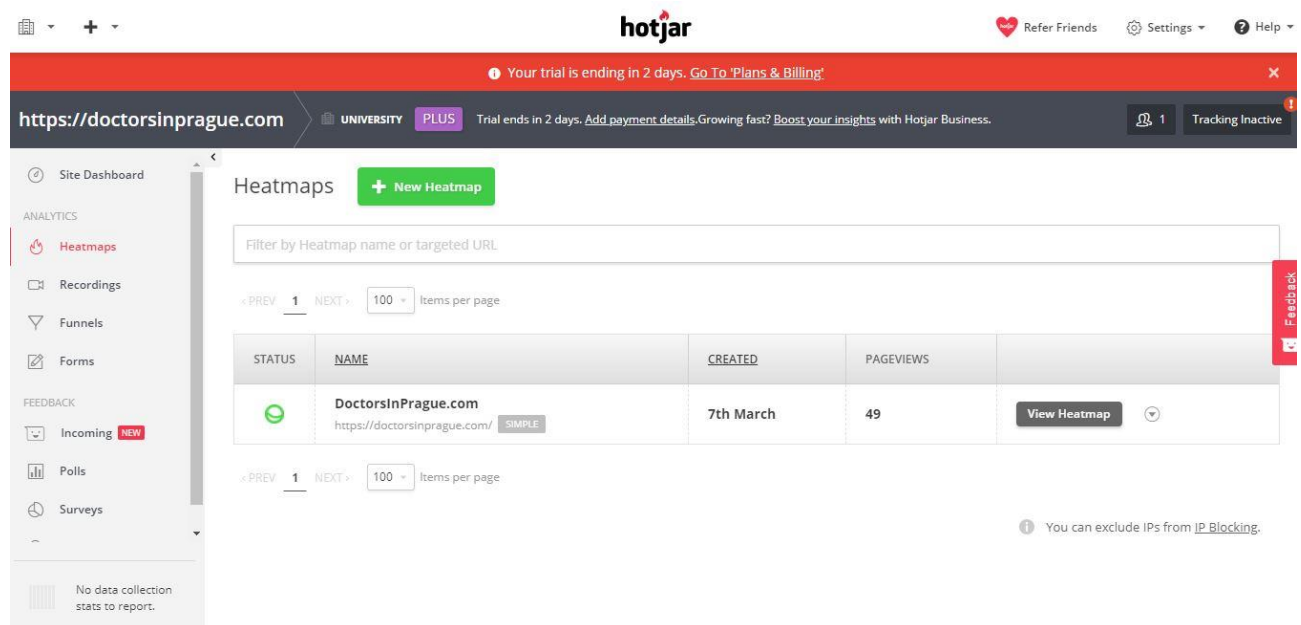
Figure 16: Hotjar Dashboard. Source: Own processing

One of the best features of this software is an automatic video recording of the participant screen. The user doesn't need to install any plugin or software; all the record is in automatic.

Figure 17: Hotjar Recording List. Source: Own processing
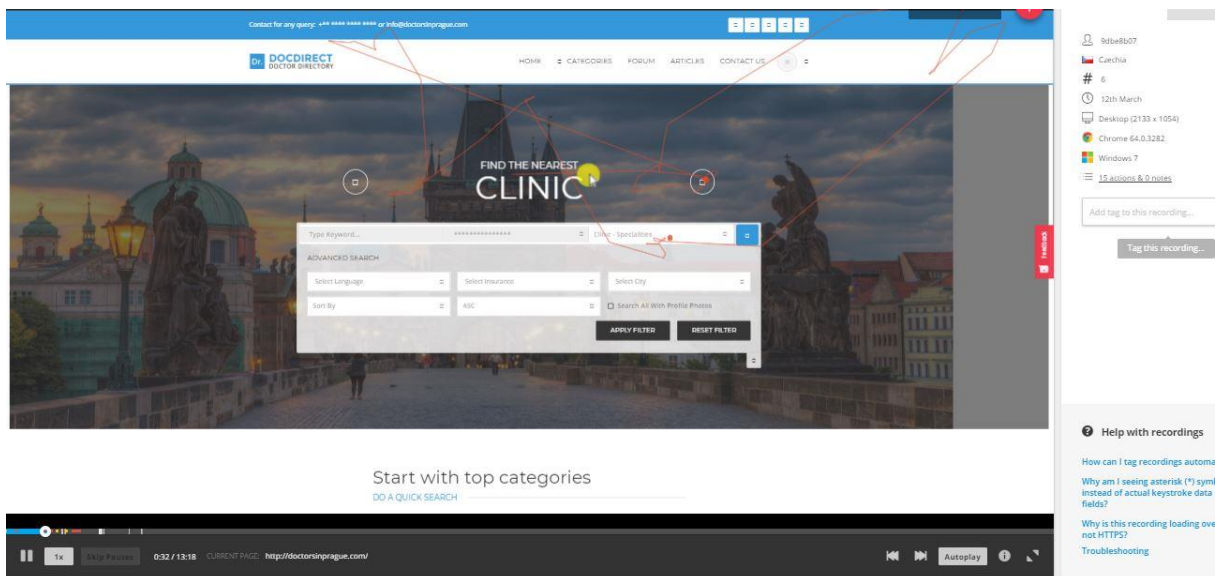
Figure 18: HotJar Video Recording from participant. Source: own processing

Tasks from the remote test were the same as Laboratory Test (page 35).

User received by email all the instructions days before the test.

5 Results

5.1 Laboratory Test Results

5.1.1 First Individual Task in Laboratory (heuristic)
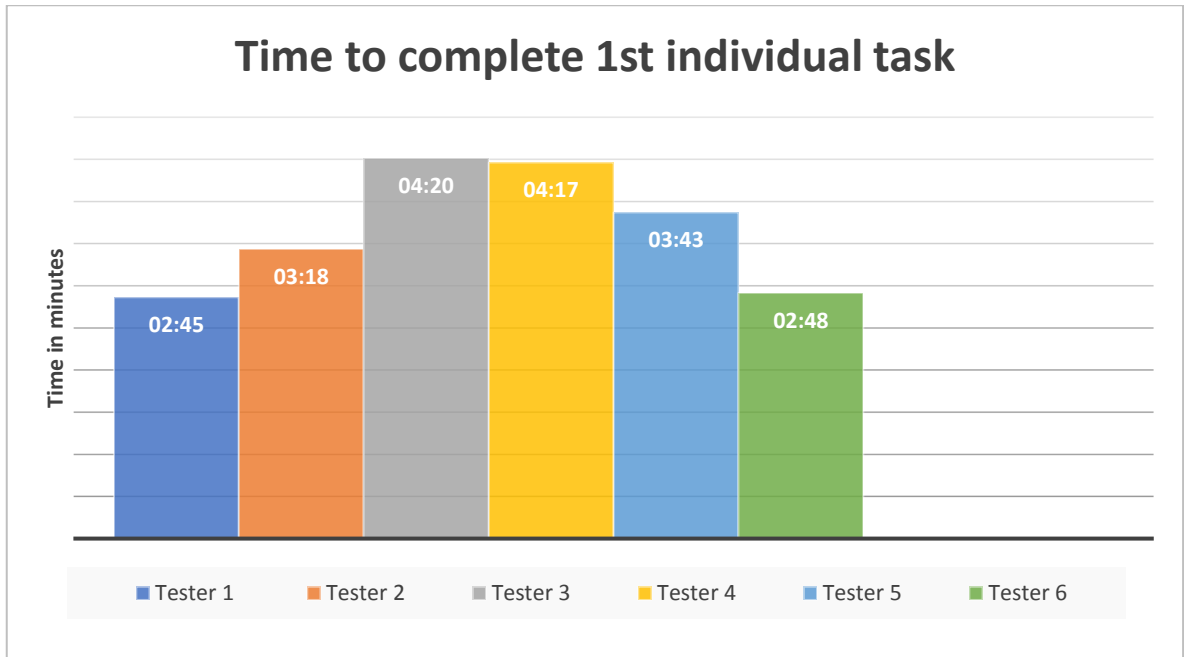
Figure 19: Time used by participants to complete the task 1.Source: own processing

Questionnaire post-task

Questionnaire data	Test group average
Computer Skills (1 -Very bad..5 -Very Good)	4.3
Knowledge of directory websites (1 - Very little ... 5 - Very good)	4
Have you faced any problems while using DoctorsInPrague? (1 -I faced a lot of problems , 5- No problem)	3.6
Do you have prior experience or training on such an interface? (1 no experience - 5 a lot of experience)	3

Scenarios were easily understandable? (1- don't agree at all ...5 -Absolutely agree)	3.83
Scenarios describe the steps you would do in a directory website?	4
The system was easy to use ?	4.16
I feel like I did not need any help using the system (1 don't agree at all... 5 Absolutely agree)	3.5
Rate the look of the website (1 very ugly, 5 very good looking)	4.33
Please write any issues you found in the website or any suggestions would you give to improve this website.	-finding doctors near my location was difficult -The geolocation drop down option doesn't disappear when you click outside of it The confirmation message of a sent message is not easily located or is too small The results were not showing fast , Geolocation doesn't work I couldn't sort by distance

Table 2: Questionnaire post 1st task. Source: Own processing

Analysis Results first individual task in Laboratory (heuristic)

Average time to complete the first individual task was 3 minutes 31 seconds

The participants found one main problem due to geolocation that didn't work during the test.

The reason is that participants typed in the browser the address doctorsinprague.com without the https:// Geolocation from google works only with SSL connections, that are those addresses starting with https:// .

This is a good bug found by the testers, correct behavior of the website should be that if user type only "doctorsinprague.com" then the user should be redirected in automatic to https:/doctorsinprague.com

For the rest, testers were satisfied with the system; it was easy to use, good looking, didn't need help while utilizing the system.

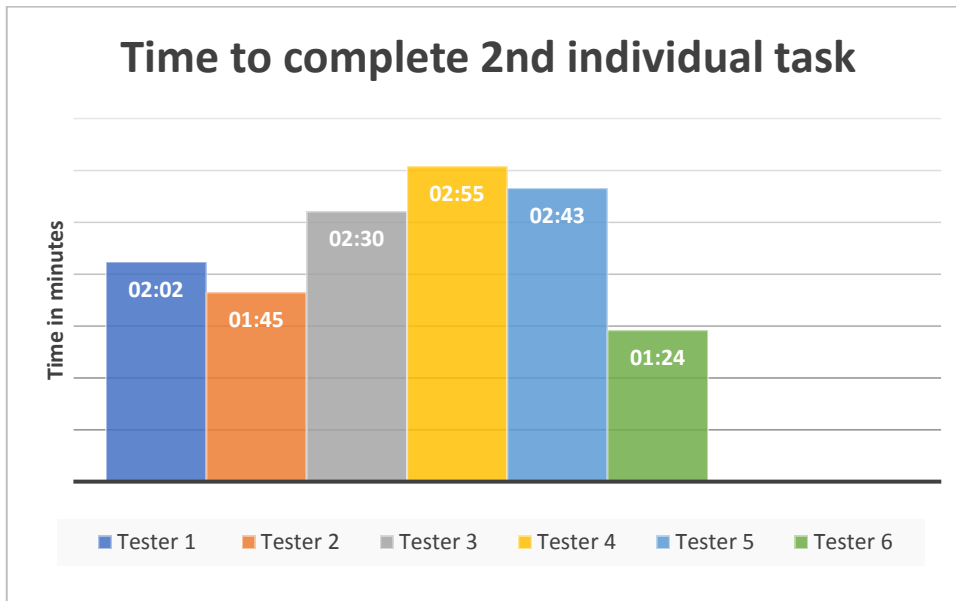**5.1.2 Second Individual Task in Laboratory (cognitive)**

Figure 20. Time used by participants to complete the 2nd task.Source: own processing

Cognitive Evaluation		
1)	Will the user try and achieve the right outcome?	Yes, all the users were able to perform the task correctly.
2)	Will the user notice that the correct action is available to them?	Yes, menus and search fields were clear enough to allow participants to find the correct answer easily All the procedure was smooth and precise for them
3)	Will the user associate the correct action with the outcome they expect to achieve?	Yes, instructions were clear for participants.
4)	If the correct action is performed; will the user see that progress is being made towards their intended outcome?	Yes, participants always were notified by the system about the progress during the task.

Table 3: Cognitive Evaluation individual task . Source: Own processing

Analysis Results Second Task in Laboratory (cognitive)

Average time to complete the task was 2 minutes, 13 seconds.

In task two, participants didn't find any problem, all the procedure was smooth and precise for them. The final result was the same for all the participants.
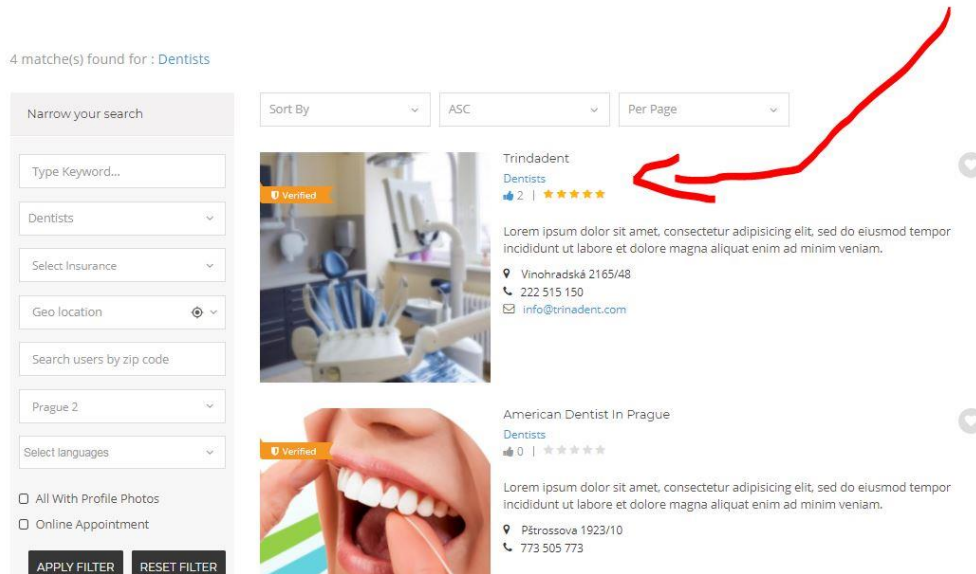
Figure 21. Final result from the task 1.Source: own processing

5.1.3 First Group Task in Laboratory (collaborative-heuristic)
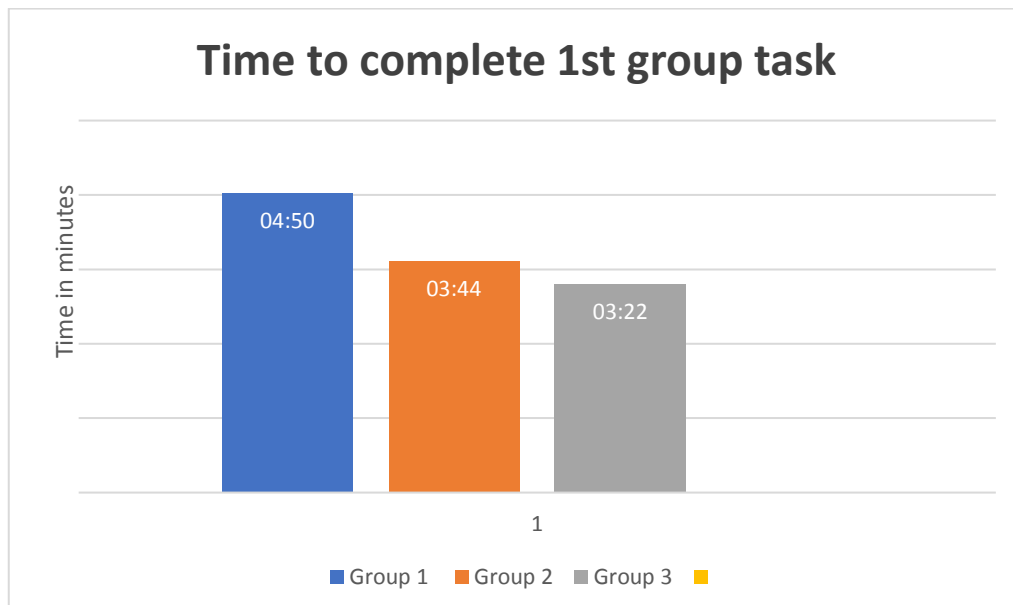
Figure 22. Time used by participants to complete the 1st group task.

Source: own processing

Questionnaire post task

Questionnaire data	Test groups average
Scenarios were easily understandable? (1- dont agree at all ...5 -Absolutely agree)	3.6
Scenarios describe the steps you would do in a directory website?	4
The system was easy to use ?	3.8
I feel like I did not need any help using the system (1 dont agree at all... 5 Absolutly agree)	3.6
what suggestions would you give to improve the dashboard profile from the website ?	-it was a little complicated for me to find the phone number, otherwise everything was clear, easy, pleasant -it was hard to find the save button -I think information was a little bit messy, overall is a good admin panel but would be better if items are more clear. -Everything was clear, maybe only a little bit slow -Everything was clear

Table 4: Questionnaire post collaborative heuristic task. Source: Own processing

Analysis Results First Group Task in Laboratory (collaborative-heuristic)

Average time to complete the task was 3 minutes, 58 seconds

2 groups found complicated some information in the dashboard of the profile page. They were confused between"my profile," "forum profile" and "Profile settings." At the end, they complete the task successfully, but they needed to spend more time to think about the correct way to solve the task , instead for the other group the procedure was easy.
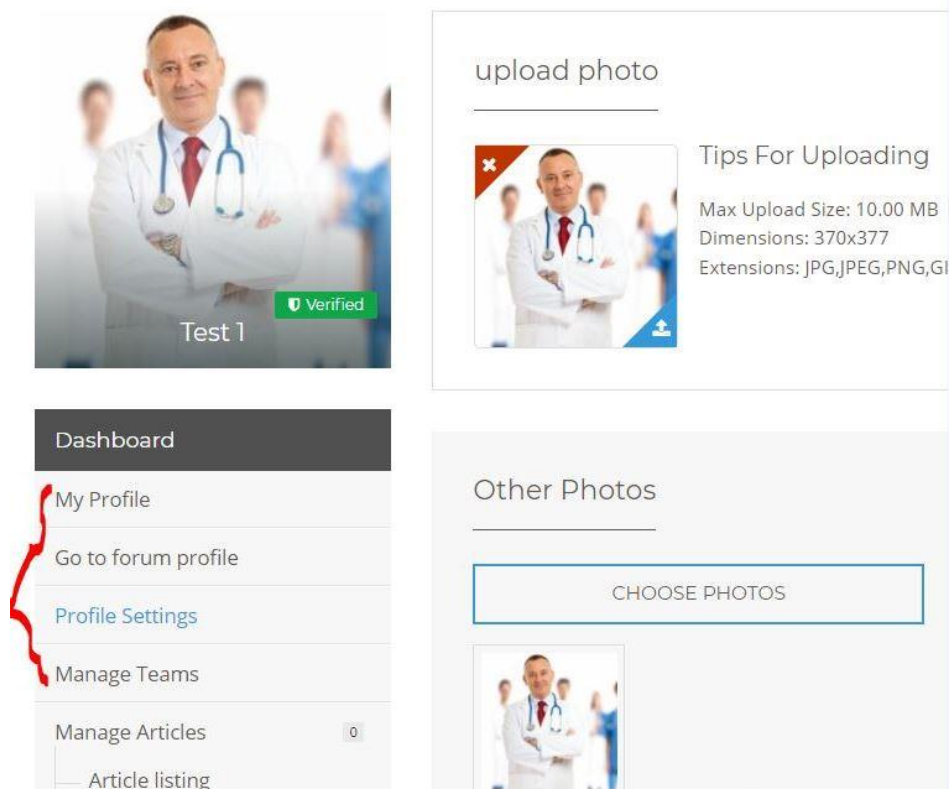
Figure 22. Area from the dashboard where partecipants found issues.

Source: own processing

5.1.4 Second Group Task in Laboratory (collaborative-cognitive)
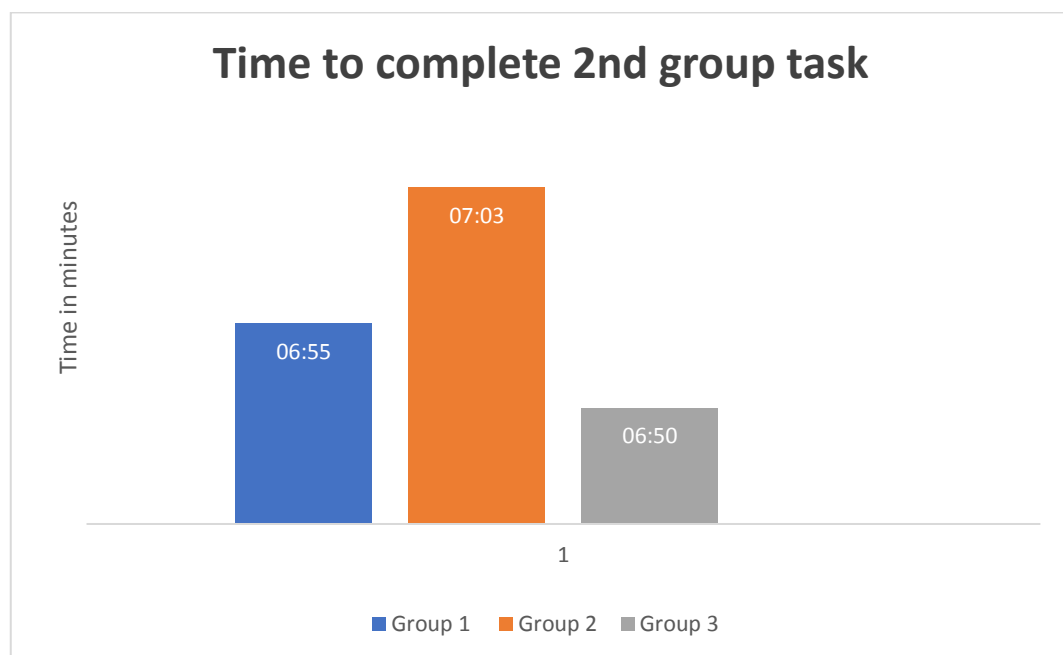
Figure 23. Time used by participants to complete the collaborative group task.

Cognitive Evaluation		
1)	Will the users try and achieve the right outcome?	Yes, users were able to perform the task successfully but the process was harder. Usability of dashboard should be improved
2)	Will the users notice that the correct action is available to them?	No, menus items inside the dashboard were not clear enough to allow participants to perform the task quickly. They needed to spend time thinking and trying different options before finding the correct path.
3)	Will the users associate the correct action with the outcome they expect to achieve?	Yes, instructions were clear for participants.
4)	If the correct action is performed; will the users see that progress is being made towards their intended outcome?	No, SAVE button was at the button of the page, participants needed to scroll to save their modifications. In some cases, the SAVE button wasn't present (automatic save) , but participants didn't get any feedback about it.

Table 5: Cognitive Evaluation collaborative task . Source: Own processing

Analysis Results second group task in Laboratory (collaborative-heuristic)

Average time to complete the task was 6 minutes, 56 seconds

This last task probably was the longest and complicated, but at the end, all groups managed to finish successfully. Most of them found challenging to add the services, as to insert a value the tester must click first in the blue circle, while they didn't expect this extra step.
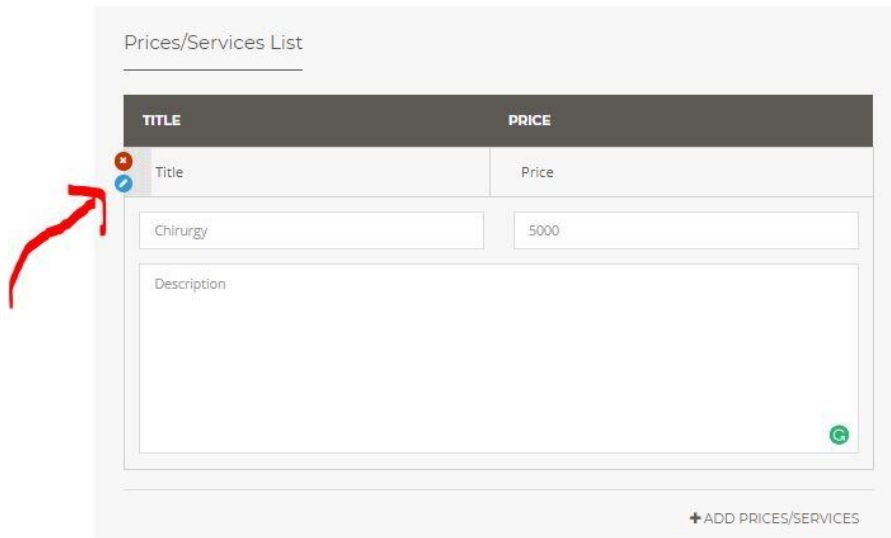
Figure 24. Area from the dashboard where partecipants found some issues

Also, testers spent time searching for the SAVE button that is down on the page, is needed to scroll until the end to find the SAVE button. Usability of the dashboard should be improved

5.2 Remote Test Results
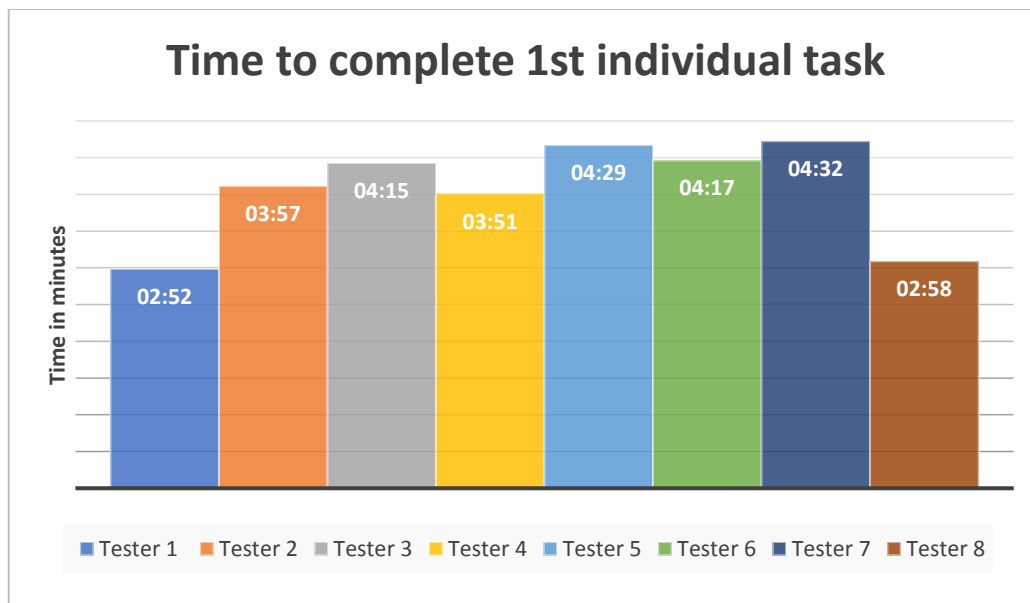
5.2.1 First Individual Remote Task (heuristic)

Figure 25: Time to complete 1st individual heuristic task (Remote). Source: own processing

Questionnaire post-task

Questionnaire data	Test group average
Computer Skills (1 -Very bad..5 -Very Good)	4.5
Knowledge of directory websites (1 - Very little ... 5 - Very good)	3.8
Have you faced any problems while using DoctorsInPrague? (1 -I faced a lot of problems , 5- No problem)	4
Do you have prior experience or training on such an interface? (1 no experience - 5 a lot of experience)	3
Were scenarios easily understandable? (1- dont agree at all ...5 -Absolutely agree)	4
Scenarios describe the steps you would do in a directory website?	4
The system was easy to use ?	4.2
I feel like I did not need any help using the system (1 don't agree at all... 5 Absolutely agree)	3.9
Rate the look of the website (1 very ugly, 5 very good looking)	4.5
Please write any issues you found on the website or any suggestions would you give to improve this website.	-Very slow at the start -When performing a search, the results were not so fast -I coudnt set my location in automatic -Everything was clear -Geolocation didn't work properly -it was impossible to sort results by distance -Nothing -No issues

Table 6: Questionnaire post 1st remote task. Source: Own processing

Analysis Results first individual remote task (heuristic)

The average time to complete the task 1 was 3:53 minutes

As in laboratory test, users were able to perform the task successfully, but they had problems with geolocation and to sort results by distance.

I also notice that the website was extremely slow for participants using browser Firefox.

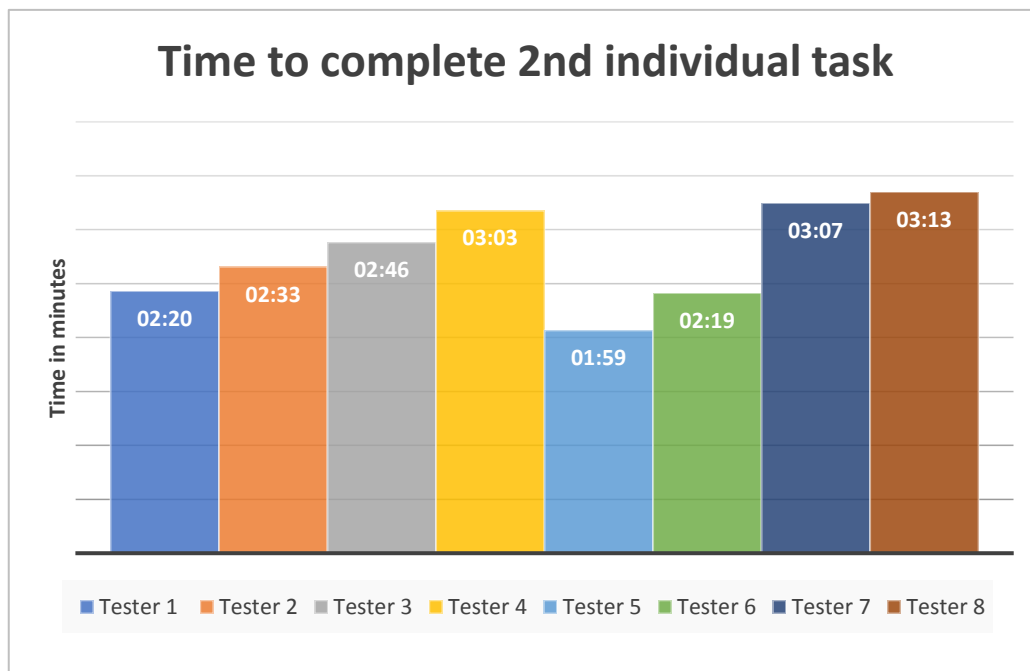**5.2.2 Second individual Remote task (cognitive)**

Figure 26: Time to complete the 2nd individual task (Cognitive-Remote). Source: own processing

Cognitive Evaluation		
1)	Will the user try and achieve the right outcome?	Yes, all the users were able to perform the task correctly.
2)	Will the user notice that the correct action is available to them?	Yes, menus and search fields were clear enough to allow participants to find the correct answer easily All the procedure was smooth and precise for them
3)	Will the user associate the correct action with the outcome they expect to achieve?	Yes, instructions were clear for partecipants.

4)	If the correct action is performed; will the user see that progress is being made towards their intended outcome?	Yes, participants always were notified by the system about the progress during the task.

Table 7: Cognitive Evaluation individual task . Source: Own processing

Analysis Results Second Individual Remote Task (cognitive)

Average time to complete this task was 2:40 minutes

The testers didn't find any problem, all the procedure was easy to follow for them.

The final result was the same for all the participants.
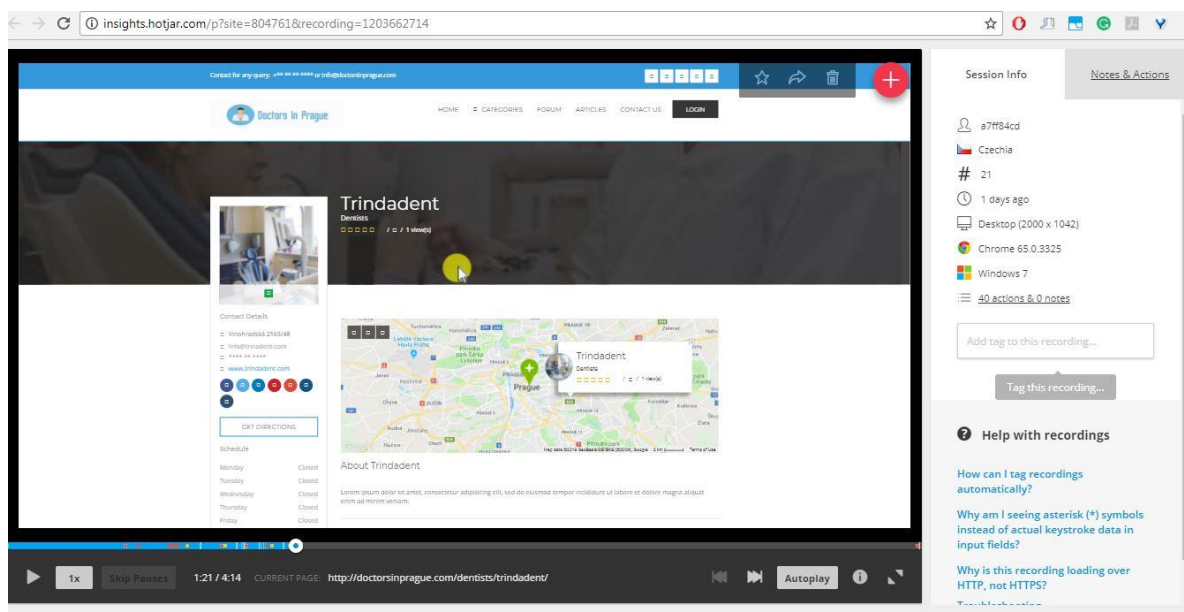
Figure 27: HotJar Result task 2, video Recording from screen participant. Source: own processing

5.2.3 First Group Remote Task (collaborative-heuristic)
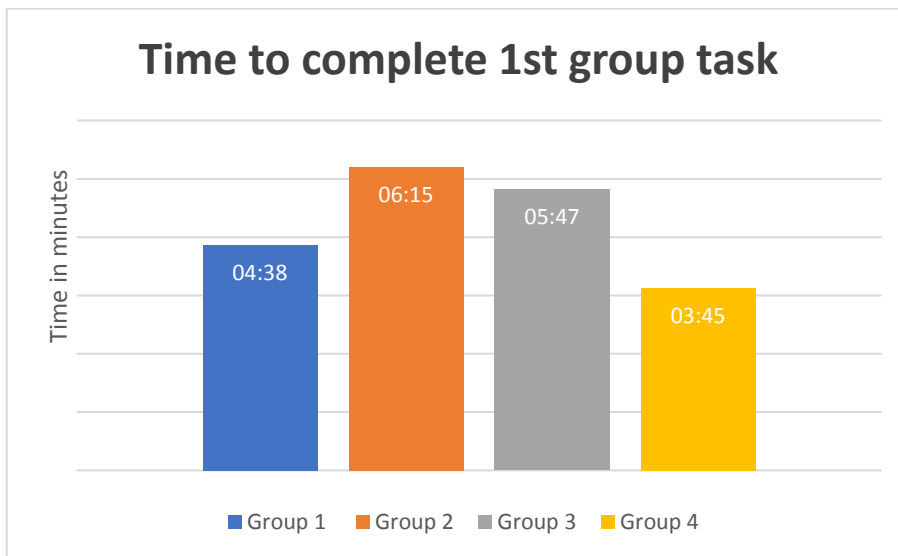
Figure 28. Time to complete first remote group task

Questionnaire post-task

Questionnaire data	Test groups average
Scenarios were easily understandable? (1- dont agree at all ...5 -Absolutely agree)	3.2
Scenarios describe the steps you would do in a directory website?	3.8
The system was easy to use ?	3.1
I feel like I did not need any help using the system (1 dont agree at all... 5 Absolutly agree)	3.2
what suggestions would you give to improve the dashboard profile from the website ?	-I think there are lot of unnecessary options in the dashboard -Dashboard is fine, but could be simpler -Had problems finding the "Save" button, it take me so time to understood that needed to scroll down -Everything was fine.

Table 8: Questionnaire post collaborative-heuristic task. Source: Own processing

Analysis Results First e task (co)

The average time for all groups was 5 minutes 05 seconds.

Two groups had slow network issues, was complicated to perform the test.

Skype connection was often dropping.

3 groups found complicated some information in the dashboard of the profile page.

5.2.4 Second collaborative remote task (cognitive)
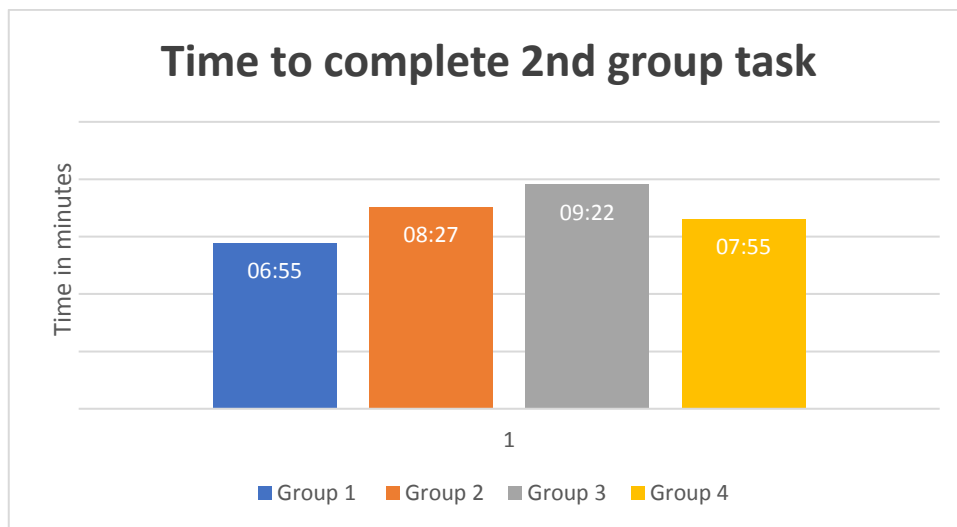
Figure 29. Time to complete 2nd remote group task

Cognitive Evaluation		
1)	Will the users try and achieve the right outcome?	Yes, users were able to perform the task successfully, but the process was little confusing. Issues were mainly because of the dashboard. Nothing critical but usability could be improved so that users would have a better user experience.
2)	Will the users notice that the correct action is available to them?	No, menus items inside the dashboard were not clear enough to allow participants to perform the task efficiently. They needed to spend time thinking and trying different options before finding the correct path. Some group had issues setting the location
3)	Will the users associate the correct action with the outcome they expect to achieve?	Yes, instructions were clear for participants.

4)	If the correct action is performed; will the users see that progress is being made towards their intended outcome?	No, users couldn't find the option to see a preview of their profile after modifications. To check it, they needed to went to home page and searched their profile.

Table 9: Cognitive Evaluation collaborative remote task . Source: Own processing

Analysis Results Second Collaborative Remote Task (cognitive)

Average time for all groups was 8 minutes 9 seconds.Participants were able to perform the task correctly, but again faced issues with the dashboard, it should be improved.

Preview function should be implemented so that user could see in real time their modifications.

6 Conclusion

As a result of the questionnaire and Think -Aloud method with screen and video recording from both, laboratory and remote test, there is a considerable amount of data that was captured during the Usability Study (about 2 TB).
All the tests were very productive, lots of bugs and suggestions to improve user experience were found during the tests sessions.

The heuristic evaluation reveals to be a robust method, quick and easy to implement, exposing many smalls issues on the website.
Heuristic method has a lot of advantages, but should not replace usability testing (ideally heuristic evaluation and usability testing should be performed together)

Cognitive walkthrough test allowed to assess how easy or difficult the website is to learn or explore efficiently, it also provided indications of the users' mental processes.
Thanks to it were found some issues mainly in the dashboard from DoctorsInPrague.com

The questionnaire post-task and the analysis of the answers pointed out the weak points and strengths of the website.

The group tasks were more interesting and rich of ideas compared to individual test. Thanks to group collaboration were possible to get feedback and opinion on different ideas and concepts.
Is not possible to compare which between individual or group task were solved faster, because tasks were different (group tasks were more longer and elaborated)
In proportion, it seemed to me that group tasks were solved faster thanks to the collaboration of the users, but in some cases happened that group testers were missing some obvious things (example one group didn't find how to add new services and prices, they were in the right page, scrolling up and down) but as they were speaking probably, they were distracted.

My conclusion is that individual evaluation heuristic and cognitive are enough to assess small websites or applications, while group evaluation should be used in case of medium-large size website, application or software.

This also taking into account the cost of a group evaluation, it required a lot of time and money to organize a test in the laboratory .

Remote testing wasn't so easy to organize, but the final result and feedbacks were similar to Laboratory test. For a small company not willing to spend a lot of money in a laboratory test, the best option should be a remote test, as it is much cheaper.
In average the remote tasks took between 10-20% more time to be completed.
Some reasons for this difference are that participants had different internet connections, or that they are in their real environment and could be distracted by many things (family, television, mobile phone,etc), while in the laboratory there are no distractions.

Both usability test helped to plan the future development of www.DoctorsInPrague.com

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8 List of Figures

9 List of Tables

10 Appendix

Due to high dimensions of recording files (about 2TB) , it wasn't possible to attach it in the appendix section. On request Im available to provide materials from usability test sessions.