
Research of data collection methods for a houseplant management mobile application

Master Thesis
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Abstract:

The project focuses on analysis and comparison of different user data collection methods in small scale projects. Firstly, the bibliography sources are researched to determine which data collection methods are advised for requirements specification. Each of the methods are then researched, planned and performed. The example used within the project is an app that helps user manage and take care of their houseplants. Each of the data collection methods is concluded with a requirements elicitation. The project concludes with analysis and comparison of the methods based on predefined factors.

When uploading this document to Digital Exam each group member confirms that all have participated equally in the project work and that they collectively are responsible for the content of the project report. Furthermore each group member is liable for that there is no plagiarism in the report.

Contents

1	Introduction	2
1.1	Background and motivation	2
1.1.1	Example project	3
1.2	Which methods should be compared?	3
1.2.1	Academic research	4
1.2.2	Textbooks	4
1.2.3	Personal experience	5
1.2.4	Conclusion	6
1.3	How should the methods be compared?	6
1.4	Problem Formulation	8
1.5	Methodology	9
1.5.1	Process	9
1.5.2	Limitations	10
2	Research and planning	12
2.1	Survey	12
2.1.1	Devising a sampling plan	13
2.1.2	Designing a questionnaire	15
2.1.3	Test run	19
2.1.4	Choosing an online survey software	20
2.1.5	Conclusion	21
2.2	Interviews	21
2.2.1	Types of interviews	21
2.2.2	Interviewing aspects and methods	23
2.2.3	Choosing participants	25
2.2.4	Interview guide	25
2.2.5	Conclusion	27
2.3	Focus group	27
2.3.1	Group Size	27
2.3.2	Group composition	28
2.3.3	Discussion guide	29

2.3.4	Conclusion	32
3	Data collection	33
3.1	Survey	33
3.1.1	Distribution	33
3.1.2	Data collection	34
3.1.3	Results	34
3.1.4	Requirements elicitation	35
3.2	Interviews	36
3.2.1	Recruitment and logistics	36
3.2.2	Interview 1	37
3.2.3	Interview 2	39
3.2.4	Interview 3	40
3.2.5	Requirements elicitation	41
3.3	Focus group	42
3.3.1	Recruitment and logistics	42
3.3.2	Discussion	43
3.3.3	Requirements elicitation	44
3.4	Conclusion	46
4	Analysis	47
4.1	Personal impressions	47
4.2	Cost	48
4.3	Data quality	49
4.4	Other aspects	52
4.4.1	Requirements verification	52
4.4.2	Personal interactions	53
4.4.3	Sample size	53
4.5	Discussion	53
5	Conclusion	55
	Bibliography	57
A	University statistics	59
B	Interview Transcripts	60
B.1	Interview 1	60
B.2	Interview 2	63
B.3	Interview 3	66
C	Focus group transcript	69

Chapter 1

Introduction

This chapter focuses on introducing the reader to the project idea and process. It includes the motivation, problem formulation as well as the planning of the process together with important decisions that had to be made before the start the project.

1.1 Background and motivation

For the duration of my studies at university, and the numerous amount of projects and group work, I experienced the process of choosing a data collection method being rather random than thoughtful. Usually, the methods were chosen out of convenience or based on previous experience with them. This has often caused doubts on whether the chosen method was, in fact, right for that type of the project, or whether a different method could have provided more information and lead to a better results.

There was usually no time and none of the group members had enough knowledge to properly investigate each of the possibilities and choose the right method. Now, when working on a personal project which is a development of a mobile application that helps users with houseplant management, I stopped the process and asked myself which method should I choose. I found that the choice isn't so straight forward and that this situation gives me the opportunity to explore and analyse the choice by comparing different methods, and by using my personal idea as an example project.

This resolved in the decision on dedicating the master thesis on the analysis and comparison of data collection methods on an example mobile application. The goal of the project became to create a recommendation of which data collection method to use when designing small scale projects such as university group project or start up projects that operate on limited time scopes or budgets as well as human resources.

1.1.1 Example project

The idea that is used throughout the report as an example project is a personal project that have been in development for several months. It all started by my great interest in the houseplant care and management and the realisation that when having multiple plants of different species it can get challenging to provide the best care for each individual plant without having some kind of diary or a log. This discovery led me to create a solution of that problem in my head that soon after became an formed idea that I was keen on developing.

The main focus of this mobile application is to provide a place that users can treat as a diary and a place where they can store all of the thoughts or development progress of their plants. Additionally, as I myself have issues with remembering when to water each plant, I decided it could add value to have a watering calendar that can send me reminders when individual plants need to get watered. Similarly, since the fertilisation of plants takes place less often ranging from 6 to 12 months, I found it difficult to remember when was the last time each of the plants was fertilised or replanted, and how much of a help would it be to have a reminder sent each time I had to do it. On top of that, when looking back at my own plan journey, I realised that when I wasn't as experienced, it was hard for me to identify plants in order to research their preferences and ideal conditions. This created another idea of a functionality that could be added to my app which is plant identification. This way, less experienced users could easily identify the plant and receive information and tips on how to take care of them.

The final project idea that slowly formed in my head was to create a complete mobile application that would help users to identify their plants, receive information about them, let them create a log or a diary of their plants journey as well as provide a calendar that can send them reminders to water or fertilise their plants. Since all this was based on my personal experience I decided that additional user input would be extremely valuable to see if users think that such functionalities can, in fact, be useful, and it would be beneficial to explore if there are any other functionalities that different users might find helpful in such application.

1.2 Which methods should be compared?

Taking into consideration the time scope as well as human resources that are dedicated to this thesis, only limited number of data collection methods can be chosen to be analysed and compared. Since the thesis focuses on small-scale projects, such as the example project, and originates from the university experience, the decision on which methods to compare is based on few different sources. The first source is a study run by a group researchers that analyses number of projects described in scientific papers and provides statistics on which methods are used

most often in mobile application development. [2] The next source is to research the textbooks that have been included in the curriculum of the studies. Since the theories provided in the textbook have been recommended to students for years, as well as have been a starting point for many of my group projects, it comes naturally to treat them as a official recommendations on which methods to use.

1.2.1 Academic research

As mentioned, in an article titled 'A Systematic Study on Software Requirements Elicitation Techniques and its Challenges in Mobile Application Development' a group of researchers discusses different aspects of requirements elicitation methods in mobile development by analysing documentation from different projects described by scientific papers. [2]

In their research, the authors firstly conducted searches in most popular scientific databases with predefined filters and gather 4507 scientific papers by reviewing all the search results. They then proceeded to redefine the selection of papers by reading the titles and abstracts and gathered total of 18 research papers that were focusing on mobile application development. After reading each of the papers, they found that 22 types of data gathering methods were used throughout the studies. The authors completed a summary of how many times each data gathering method was used withing the 18 studies. According to their findings, interviews and direct discussions are the most commonly used method withing the scientific papers focused on mobile development being used in 13 out of 18 research papers. Additionally, methods like prototyping, questionnaires and use case scenarios are also commonly used but not as widely, compared to interviews, scoring only between six to eight counts. [2]

The authors' findings provide a valuable insight of which data collection methods are most commonly used within scientific studies. Taking into consideration the fact, the the papers used in the research are not know and not presented in this thesis, it is still a valuable insight into the type of methods that are used by other scientific writers and can prove to be beneficial when choosing methods to analyse and compare for these thesis.

1.2.2 Textbooks

As the thesis is highly based on university experience, the choice of the methods it also be influenced by that. This means that the textbooks that have been included in the curriculum are treated as a reliable source of information and advice.

Starting off with the 'Interaction Design: Beyond Human-Computer Interaction', a textbook written by Helen Sharp, Jennifer Preece, and Yvonne Rogers which provides a detailed, interaction design oriented source of knowledge on how to create designs by interacting with users. This textbook has been used throughout

many of the group projects I was a part of when designing different mobile applications and therefore is used here as an source. In the chapter 'Data Gathering' the authors discuss and list three different methods of gathering data for the purpose of requirements elicitation. The first of the three methods are interviews, which the authors describe by citing Kahn and Cannell [6] as 'conversations with a purpose' [11]. The authors divide interviews into four types - open ended interviews (also called unstructured), structured interviews, semi-structured interviews that combine the features of both structured and unstructured types, as well as group interviews also known as focus groups. [11].

The second data gathering method are questionnaires that authors refer to as a "well-established technique for collecting demographic data and users' opinions" [11]. Authors argue that a 'well designed questionnaires are good for getting answers to specific questions from a large group of people' [11].

The last method used for data gathering mentioned by the authors is observations, which is a method that 'helps designers understand the users context, tasks, and goals'[11]. The authors divide observations into three types - direct observations in the field, direct observations in controlled environments and indirect observations.

Another textbook titled 'Wireframing essentials : an introduction to user experience design'[3] was written by Matthew Hamm and focuses on the process of designing user experience for mobile applications and websites. It describes different methods of designing software and conducts two example projects - 'Mobile Device Application' and 'E-commerce Website' where different data collection methods are used and presented on real-life examples. Throughout the example projects the author uses multiple data collection methods including methods that do not require user input such as stakeholder interviews, competitive analysis and personas.

One of the user oriented methods that the author of the book describes are focus groups that, according to him, can 'be used by software designers to gauge interest in proposed features, or just to seek out what ideas current or potential users have'[3]. Similar to that, user surveys are mentioned as a less interactive 'variation on the focus group concept'[3] that can 'be much easier and cost effective to enact'[3].

1.2.3 Personal experience

In addition to the information collected from different academical sources, it can be a valuable point to investigate my own experience when writing group projects at the university. During the five years, I've been a part of total of 10 group projects (excluding the master thesis). Each of the project have been a great learning process but looking back at them, makes me wander whether the group would be able to

get better results if the method chosen was more thought through. The information of the trends within said projects can provide a deeper understanding of my perspective as well as show what choices did the different groups I've been a part of made. The summary of the projects together with the methods that were used can be found in Appendix A.

Out of the 10 group projects, only five included any user oriented data gathering methods. During the process, three of those projects, performed interviews. Some of them had as little as a single interview while others recruited up to five participants and performed interviews with each. As for the other data collection methods both survey and focus group have been used only one time each. As seen, any of the groups that I've been a part of have used other data collection methods that require user input.

1.2.4 Conclusion

To conclude, it can be seen that there are specific trends that are followed within each part of the research. Firstly, the statistics of academic databases show that interviews are being used in a significant amount of papers. Next, the textbook review outlines what which methods do authors, that are read by students, recommend. Finally, the statistics from different group projects I've been a part of prove that there are a limited number of methods that students tend to choose. It can be summarised that the most frequently appearing in this section methods are surveys and interviews which include individual interviews as well as focus groups (sometimes considered two separate methods). Based on that, this project will focus on comparison of those three methods by using the houseplant management app as an example project.

1.3 How should the methods be compared?

In order to compare the three data collection methods and discuss which one is the most suitable while designing a mobile application, factors for comparison have to be set. These will be used to analyse whether using any of the data collection methods proves to be beneficial for small scale projects such as school projects or start-ups.

1. Cost

The first factor to consider is the cost of conducting such data collection method. This is important as companies within the industry often operate at a tight budget and will consider the cost as one of the main deciding factors when planning the process. Cost is tightly related to the time spent and this is how it will be measured in this project. Assuming that one unit of cost

is equal to one hour of work, the total hours of work put into conducting the method will be compared. The total hours of work includes research and analysis, creating the method as well as conducting it. It is important to include each and every hour spend on activities such as preparations, setting up meetings, talking to users, sending reminders, collecting the data and analysing the data. By gathering the information of total time spend on conducting a method, a cost can be calculated and methods can be compared based on how 'expensive' they are. Of course, this cost calculation assumes that people will volunteer as participants for the data collection methods and their time and effort is not not monetary rewarded.

2. Data quality

The next comparison factor is the data quality gathered from each data collection method. It is tightly related to the cost factor as the data quality have a great impact on the time spent to analyse it. However, it is also important to consider it separately as to how good of a contribution can the data have to the project. This can be compared based on the number and quality of requirements. Once extracted, the requirements will be counted and the number of those will be compared. Slightly harder factor to compare is the quality of them however, it can be verified by analysing how much valuable detail is included in the requirements and how many specific functions or designs are listed. This cannot, by no mean, be an entirely qualitative analysis but will be taken under consideration when concluding the project.

3. **Other aspects** The last factor for comparison will be different, sometimes limiting, aspects of each method. For a lot companies it might be a deciding factor when looking for different data collection methods. The aspects might not be entirely related to the cost but can be inconvenient for the process or simply lack the functionality that the project needs.

- **Requirements verification** The first aspect to consider is whether the verification of requirements is possible. In many data collection methods it is not possible to verify the requirements with users who provided them due to the anonymity of the data collection. In some cases, it might prove beneficial to contact the participants with a follow-up questions if in any doubts about the answers. [9]
- **Personal interactions** The next aspect that can be considered it the personal interaction. In the methods that are lacking it, it might be harder to collect the data needed since some of the interactions cannot be noted. It might also be possible that the participants that perform the data collection methods without a personal interaction are less honest. [8]
- **Sample size** Another aspect to many data collection methods is the sam-

ple size. When operating on a budget, the methods that take longer to perform might have limited sample size which might lead to inaccurate data and results. In those cases, the sample should be collected carefully in order to maximize the diversity but that might still not be enough to ensure that the results aren't limited. On the other hand, in many project such as the example project, the sample size might not have such a big impact since there is no statistical data required.

1.4 Problem Formulation

Combining my personal project idea and the difficulty in the decision of which data collection method to choose, helped me to define the goal of this master thesis, which is to compare the data collection methods by performing each of them on the example project and provide an answer to the question I have asked myself multiple times - which data collection method is most suitable for small-scale projects and will lead to creating a valuable user requirements specification.

Therefore, the problem formulation set for this thesis together with its sub questions is as follows:

Which of the chosen data collection methods is the most suitable for small-scale mobile application projects?

In order to answer the problem formulation, following sub-questions have to be answered:

- Which of the chosen methods is the most cost effective?
- Which of the methods provides the best data quality?
- What other aspects should be considered when choosing a data collection method?

Each of these questions, examines an area that could be an important factor when choosing a data collection method. As mentioned previously, small scale projects or start-up companies work on limited budget and therefore need to be cost effective. On the other hand, the cost effectiveness needs to correspond to the expected data quality that each of the methods provides therefore both aspects are important to investigate in order to answer the problem formulation. Additionally, as mentioned previously, there are many different aspects that can influence whether a method is right for the project and therefore should also be investigated. Concluding, answering each of the sub-questions will provide a base for answering the problem formulation and guide me through the process.

1.5 Methodology

This section focuses on the methodologies chosen for the process of the thesis together with outline of limiting factors that influenced the project. This section is important to establish how the process of the project will be conducted and which steps have to be taken to answer the problem formulation.

1.5.1 Process

Based on the problem formulation, the project focuses on comparison of three different data collection methods using the houseplant management application as an example project. As established in the previous sections, these methods are surveys, interviews and focus groups. This section focuses on the identification of the process of the comparison of said methods.

The first step in the process is to thoroughly research each of the data collection methods. This must be followed by a decision making process concerning different possible aspects of such method. Each of the data gathering methods is designed and planned before performing it and therefore decision about the details of it should be discussed beforehand. It is important to plan each method in a way that will provide the most and the best data possible for the houseplant management app requirements elicitation. In order to be able to compare the cost of each method, the time spend on researching and planning it should be counted and noted.

Once all three data gathering methods are formed and planned, they can be carried out and the results documented. For each one of the methods, the process of conducting it as well as its results should be documented in a structured manner that includes all the details as well as the authors observations. The time spent of conducting each method should be noted for the purpose of comparison.

The data gathered from each of the methods, is later on transformed into requirements providing a user requirements elicitation. This provides a great overview on the quality of information that can be gathered while performing each of the data collection methods and allows for the comparison.

At the end, the comparison can be performed by analysing all the aspects of each method and the conclusion on which of the methods is most beneficial in such projects can be drawn. In order to properly analyse the verdict, the analysis use factors of comparison that were created in previous section.

To conclude, the planned process of the project was summarised in a graphical representation that can be seen on Figure 1.1.

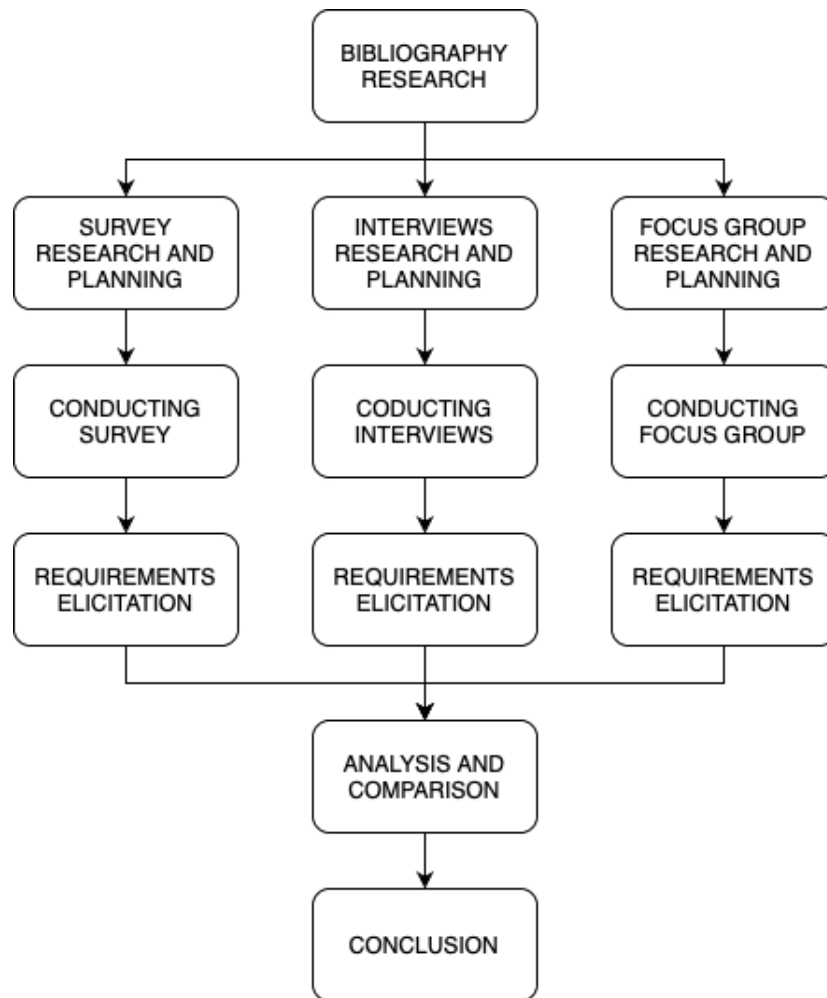


Figure 1.1: Graphical representation of the projects' process.

1.5.2 Limitations

This section describes the limitations that were encountered during the process of the project.

First and foremost the project was done within a specified time scope that may have limited the number of data collection methods that can be analysed. If the time scope allowed, it might have been beneficial to pick more than three methods to perform and analyse. Additionally, more time could have allowed for more detailed analysis including more factors for comparison.

The second major limitation of the project is the COVID-19 pandemic that has made it impossible to plan, schedule and perform data collection methods in person. The government restrictions at the time of writing this thesis were changing constantly and therefore it was difficult to know whether it would be allowed to

conduct in-person meetings. This led to a decision that all of the methods have to be performed remotely in order to reassure compliance with the restrictions as well as the fact that all the methods should be as alike as possible to allow for comparison. This is, of course, a huge factor and an inconvenience to the process and the results of the thesis could have been different if in-person meetings could have been conducted.

The next limitation is that there is only one person working on the project. A lot of data collection methods suggest having more than one person conducting it. However, this was impossible due to the only one author of the thesis and therefore there is no possibility to conduct the data collection methods by more than one person.

Chapter 2

Research and planning

This section describes and details the three methods of data collection. Here, the important decisions about each of the methods are made together with detailed research on different aspects. This section is important, as it allows to thoroughly plan the process of conducting each of the methods. Each of the sections in this chapter is dedicated to one of the methods.

2.1 Survey

Survey is a data collection method which process starts at the decision of who the respondents should be and ends at the interpretation of the data. Its main part is the questionnaire that includes the question that users will answer. Questionnaires are a data collection tool that can be conducted in order to collect both qualitative and quantitative primary data from individuals in a written, verbal or online manner. Both surveys and questionnaires can be used throughout the entire development process and complement other methods of data collection. It is generally considered to be a quick and easy solution to collect data from many individuals, but as mentioned by Chauncey Wilson - 'the design of questionnaires and surveys is a complex process that involves many, sometimes conflicting, considerations' [12].

The main strengths of conducting a questionnaire is that they can be conducted in a number of ways (email, online survey tools, phone or face to face interviews) and present an opportunity to reach a greater audience. Additionally, as mentioned previously, the data collected in questionnaires can be standardised and compared and broadly available online tools allow for easy collection and analysis of the data. However, when creating online surveys, it is hard to always have a clear knowledge of the sample and the return rates can be different than expected. Additionally, questionnaires are not as flexible as other data collection methods since there is no room for follow-up questions and open-ended questions are not as valuable due

to the scale of surveys. [12]

Based on the scale of the project as well as time and circumstantial limitations, the survey is to be conducted online using a free and ready to use software. Based on that, it was decided to start formulating the survey by defining the sample, then focus on designing the questionnaire and finally choosing survey software in said order. This section covers all the research as well as decisions made to create and conduct the survey.

2.1.1 Devising a sampling plan

Identifying potential respondents is a crucial part when including a survey in the research process. The size or diversity of the sample alone can decide whether the results are accurate and how the research will progress. There are number of methods describing on how to choose a sample such as a probability or non-probability sampling.

Probability sampling is considered ideal since it is always representing the population it is drawn from. This means that it is very accurate and therefore generalisations can be made on the whole population based on the sample. This however is very hard to achieve since it's hard to have enough knowledge about the population and achieve 100% response rate, therefore most researches are based on non-probability sampling. This method doesn't ensure equal diversity across the sample but is easier to use and has many variations. For example, the sample can be gathered systematic, meaning that every *n*th case will be chosen. Another way of choosing the sample is based on quota, which means set criteria are used to select a sample and ensure diversity. [10]

Due to the scale of the project, it is not essential to perform detailed and extensive sampling but it's important to gather a sample that can allow for collecting data that is needed. However, to ensure that, a certain lever of diversity is needed. In order to gather a diverse sample, respondents can be different ages, genders, have different backgrounds and be interested and educated about the houseplant care at different levels.

Considering all those factors, it was decided to use the quota method of sampling and the ideal sample size is 30 as this should be big enough to gather the data needed as well as small enough to be able to conduct by one person. In order to apply the quota method and verify whether the sample is diversified, participants that answer the questionnaire will be asked a filtering question at the beginning of the survey.

The first very basic quota that can applied to the sample is the age and sex. This can prove to be beneficial as the differences in age can have quite large impact on the opinions and general attitude towards technologies such as mobile

applications. However in this case, where the survey is largely focused on the functionalities itself and not the technologies involved, the diversified by age sample might not be as necessary. Additionally, the gender of the respondents might not have such a huge impact and taking into consideration the desired size of the sample the gender will not be considered as a quota. [10]

Another quota that can be applied to the sample is the expertise level of houseplant care. Some users that have more knowledge of the topic can have more specific requirements for such an app while the respondents that are more enthusiast than experts can be more interested in the basic features. Here, it is important to consider who should be included in the sample. Since the app is for houseplant care and people who own plants are the targeted users, it should be considered how many plants should the respondents own to be included in the sample. Most likely, users with no plants will have little interest in such application and therefore provide less valuable answers and therefore users that don't have any plants won't be included in the sample. To conclude, the next survey question should be regarding respondents expertise and ask them which group oh houseplant care knowledge would they consider themselves to be in - beginners, intermediates or experts. [10]

Beginner means that the respondents have zero to some knowledge about how the plants their own should be taken care of but usually fail at keeping their plants alive in the longer run. Intermediate group is respondents that have moderate knowledge about the plants their own and can keep them alive and thriving in a longer run. Experts are the group of people that have great amount of knowledge about their plants care, can take great care of them and advise others on the topic. Additionally, assuming that both intermediate and expertise level respondents own significant amount of plants, the beginner level should be specified as to beginners that do own at least one houseplant. In order to ensure that respondents understand the levels correctly, each of the answers should include little explanation of what each level means. Furthermore, in order to diversify the sample it would be ideal to have 10 respondents from each level group. [10]

To conclude, in order to apply the quota method of sampling, the survey should start with a question formulated as below:

1. What is you level of expertise regarding houseplant care knowledge?
 - Beginner - I own at least one plant and have zero to some knowledge about how the plants I own should be taken care of but usually fail at keeping them alive in the longer run.
 - Intermediate - I have moderate knowledge about how the plants I own should be taken care of and can keep them alive and thriving in a longer run.

- Expert - I have great amount of knowledge about how the plants I own should be taken care of, I can propagate, keep my plants thriving and advise others on the topic.

Having the filtering questions and detailed knowledge about the desired sample, the questionnaire can be now designed.

2.1.2 Designing a questionnaire

First and foremost designing a questionnaire should be focused on extracting answers that will help answer the problem that the project is trying to solve, however the questions do not always have to exactly match that problem. It is important to write questions in a way that is understandable to respondents. This will depend on who the targeted audience of the questionnaire is. In this project, the audience is houseplant owners who are not required to have any technical knowledge or academical background. Therefore the language used in the questionnaire should not include any technical terminology. [10]

Another aspect of writing the questionnaire is how to structure the questions to get as many requirements as possible. The primary categorisation of questions is into open and closed. While open questions have less risk of forcing authors opinions on respondents they are hard to compare. Closed questions offer more possibility of analysis but can limit the respondents and therefore not reflect reality. As per Jenny Rowley [10] recommendations, few simple rules regarding the questions should be followed. The first one suggests that the questions should be as short as possible therefore ensuring that the respondents will not get bored or tired and that the questions will not get too complicated for them. Next rule talks about making sure that the questions do not lead or have implicit assumptions to avoid bias. Another important suggestion is to formulate questions so there is never two questions within now. This can cause not only confusion, but also additional work when analysing the answers. In order to keep respondents engaged and get as much data from them as possible, it is advised to avoid using questions that can lead to only "yes/no" answers. On the other hand, the question should never be too vague or general as this can contribute to lower quality of the data. Another recommendation is to not use double negatives within the questions as that can confuse respondents. In addition to that, the questions should never be in any way invasive or ask about topic and area that respondents will not want to talk about. The last recommendation for writing questionnaire questions is to not to invite respondents to breach confidentiality. [10]

Following those rules can have a great impact on how the respondents perceive the questionnaire and the data that can be gathered from it. Based on that and all previous analysis and decisions, the questions, divided in three sections, can be formulated and are as listed below.

Section 1

This first section of the survey consist of the filtering question mentioned before that contribute to devising the sample as well as a question allowing for branching.

1. *Are you currently using any apps that help manage houseplant care?*

- Yes
- No

This first question is introduced at the very beginning to initiate the first branching. Respondents will be divided into two groups - those who use houseplant care apps and those who don't. This branching is needed in order to later ask more specific questions that will be adequate to the respondents usage of such apps. If the respondents answer 'Yes' they are then forwarded to Section 2, if they answer 'No' they are let to answer questions from Section 3.

Section 2

The second section of the survey is assigned to the respondents who are using houseplant care mobile applications.

1. *Which app are you using? (open question)*

This first question help to collect information about what apps the users are using. It can be a valuable data that can lead to further analysis of the most popular among users app and provide inspiration for the project.

2. *What functionalities does the app include? (multiple answer question)*

- Watering schedule
- Fertilising schedule
- Diary (saving plants progress)
- Plant recognition
- Plant information (history, origin, family)
- Tips and tricks
- Information about diseases
- Calendar with watering/fertilising schedule
- Other...

This question helps to understand what kind of functionality other apps include and therefore indicate the most popular functionalities among such apps. This question does not indicate whether such functionality is useful or needed but can help to see the participants tendencies when choosing such applications.

3. *Which functionalities do you find useful? (multiple answer question)*

- Watering schedule
- Fertilising schedule
- Diary (saving plants progress)
- Plant recognition
- Plant information (history, origin, family)
- Tips and tricks
- Information about diseases
- Calendar with watering/fertilising schedule
- Other...

This question is asked to gather information on what users like and appreciate in the app they use and therefore can give information on what such apps should include to fulfill users expectations. This question allows for multiple answers since getting more answers would be more valuable. It also has an option for the respondents to write any other functionality they find useful since the list of answers includes only the most common functionality found in such apps.

4. *Did you encounter any issues with the app? (open question)*

The next question for app users is to get information on any potential problems or issues with the app. If there is something that annoys them, they don't like or makes using the app not a great experience. This kind of information can be very valuable in defining what should be avoided or made better when developing such application. It can help to understand users perception on different functions or design choices.

5. *Are there any functionalities you would like to add to the app you are using now? (open question)*

This open question serves as a opportunity for respondents to express their personal opinions and ideas. It is important to give them the possibility to express any thought or feeling since the closed questions do not allow for that. The data gathered from answers to these questions can be used as an inspiration of what users might want to see in houseplant care app.

6. *How could the general functionality of the app be improved? (open question)*

This last question asks the respondents to provide feedback on any improvements that could be made in the app they are using. The data collected from this question can help to pinpoint important aspects of user experience that users pay attention to and notice if done badly.

Section 3

The third section of the survey is assigned to the respondents who are not using houseplant care mobile applications.

1. *Why are you not using an app? (multiple answer question)*

- I don't need it
- I don't like any existing solutions
- I'm not consistent in using such systems
- I'm looking for one
- I don't know about any
- It's too time consuming
- It's too difficult
- It costs too much
- Other...

This is the first question asked the respondents who do not use any houseplant care apps. It aims to gather data on why some users might feel discouraged to use such apps. This information can be useful in specifying what should be avoided in order to appeal to more users.

2. *Do you have any issues/problems while taking care of your plants? (open question)*

This open question gives respondents the opportunity to voice any issues, problems or troubles they might have with their regular day-to-day plant care routine. This information can be valuable when researching how the app can help users who do not currently use any apps for houseplant care.

3. *Which aspects of plant management would you like to see in an app?*

- Watering
- Fertilising
- Diary (progress)
- Plant recognition

- Plant information (history, origin, family)
- Tips and tricks
- Diseases
- Other...

This question is directed to the respondents in order to collect their opinions on what functionality, in their perception, a houseplant care app should include. This can be valuable to determine trends and preferences of the sample.

4. *How important are the following features/designs for a houseplant app? (ranking question)*

- Main page with info about all your plants
- Easy to use plant recognition
- Daily tips and tricks about plants in general (not linked to any specific plant types)
- Calendar for each plant showing watering/fertilising days
- Calendar for all plants together showing water days
- Possibility to purchase plants from local plant shops through the app

This ranking question is a large data source for general feature preferences among the respondents. Users have option to define each point as 'Very important', 'Important', 'Less important' or 'Not important'. It can provide information on what kind of features or design details users care the most and what they perceive as useful and inviting. Due to the nature of surveys, this question is limited to the answers provided by the author and therefore constraining to great extent.

5. *Do you have any ideas of what can be 'cool' to have in such app? (open question)*

This question is included in the survey in order to give respondents the opportunity to voice their own ideas that might have not be included in any previous questions. It is valuable to include such a question since the respondents might have a different point of view on the app and not be limited by their perception of what is technically possible. Therefore, the data from this question can be used to gather inspiration for new features.

2.1.3 Test run

In order to verify whether the survey can, in fact, be understood by the respondents as intended, it was decided to perform a test run, also known as pilot study,

before sending the survey to respondents. To do that, a personal contact of the author who had no previous information about the project was asked to fill out the questionnaire. By doing this, it can be verified whether the questions are understandable for the respondent and the answers are as expected. It is important to verify that the survey is capable of gathering the data that is needed and that the respondents have a clear idea of what the questions are about. The participant of the test run cannot later be asked to participate in the questionnaire, as they might have more insight to the survey. After answering the questionnaire, the test run respondent was asked to provide feedback on the impressions, eventual problems or misunderstandings. [11]

To perform the test run, a colleague of the author was asked to fill in the survey and provide comments on how each of the questions was understood. To summarise, the tester described the survey as easy to understand and navigate. She had no issues in understanding the questions and answers. All the comments provided by the testers indicate that the survey is able to gather the data as expected.

2.1.4 Choosing an online survey software

According to Wilson's guide [12] choosing a software where the survey will be conducted has to be done in a thoughtful manner. In his book, he lists different features that such software can have and that have to be taken under consideration. First of them is whether the software allows for the type of questions and response categories that are needed. The questions designed for this survey are mostly closed question with one or multiple answers but also open questions and ranking questions and therefore each of those types is needed in order to perform the survey. The second feature is whether the software has an appropriate navigation which debates whether users are able to navigate through and answer questions easily. Another requirement is whether the software is accessible, meaning it should work well on all types of screen (i.e. mobile and computer). Additionally, it is important for the survey that the software allows branching as a result of filter question in order to accommodate the filtering questions introduced before. The next recommendations are to choose a password protected software so the data collected is considered securely stored and allow for progress indication to show the respondents how much they have done and how much is still left to do. In addition, Willson's guide suggests to provide an ability to change earlier questions but does not advise using it with filtering questions. The last recommendation is to use a software that allows for exporting the data in suitable data formats such as Excel, SPSS or another analysis program. [12]

Taking into consideration all of the Willson's recommendations as well as limitations present in the process such as pricing, availability and difficulty of use,

it was decided to use Google Forms as a online survey software. Google Forms allows for accommodation all above mentioned aspects, is free to use and author has previous experience with it.

2.1.5 Conclusion

In conclusion, it can be argued that the survey has been planned and designed in great detail. The research have brought many important aspects that have been included in the questionnaire as well as the logistics of performing the data collection. The planning and designing process of the survey took a total of 30 hours work and it provides all the information and logistics needed to start performing the data collection. Additionally, creating the survey on Google Forms took additional two hours, making the total 32 hours of work.

2.2 Interviews

Interview is a research method that can be used within many different stages of product development and is conducted by having a conversations with participants. It can be used when developing scenarios and use cases, selecting participants for research, performing site visits or gathering information about users, tasks and workflows. [13]

The first categorisation based on the type of the interview includes three different variations: structured interviews, semi-structured interviews, and unstructured interviews. [11] In addition, it is important to specify whether the interviews will be conducted in person or remotely to adjust the questions and method accordingly. [13] This section will not describe group interviews, also known as focus groups.

2.2.1 Types of interviews

As previously mentioned, there are three main types of interviews. This section focuses on each category and discusses which of them is most suitable for the project.

Structured interviews

The first type of interview is a structured interview that is essentially a questionnaire performed by the interviewer who is limited to the pre-designed script and a set of questions. It can be performed in person or remotely (over the phone, video call or chat) and has a specified type of format that both sides are asked to follow. Both open and closed questions can be used and each participant is generally asked the same questions in the same order. The questions are often standardized

to ensure that the answers can be analysed by grouping or comparison. Additionally, this type of interviews requires little to no training therefore lowering the cost since anyone can perform it. Similar to the questionnaires, it can be difficult to verify whether the questions asked are well understood and the answers gathered reliable. Due to the script and controlled process, structured interviews can be performed face to face, over the phone or video call. [13]

Semi-structured interviews

Another type of conducting an interview is to use predefined questions as well as allow for exploration by following a document called an interview guide or interviews schedule. This document is set to contain an opening including introduction and the topic of the interview, list of topics and questions, suggested probes and prompts and closing comments. The interviewer is not required to follow predefined order or number of questions which can be closed or opened ended therefore providing both quantitative and qualitative data. Those types of interviews are used in order to further identify already known facts and issues by allowing participants to discuss and explore it as well as to solidify the understanding of users goals. Using semi-structured interviews can be beneficial when looking for new ideas or issues that have not been discovered before. Additionally, it allows participants to clarify their answers and provide the opportunity for the interviewer to ask follow up question when in doubt of the answers. On the other hand, each interview might have slightly different questions and therefore provide different data that can cause difficulties when trying to generalize the answers. It is also more time consuming to analyse the mix of qualitative and quantitative data. [13]

Unstructured interviews

This type of interviews is the most similar to a simple conversation. It has a predefined topic and agenda but no specified formats or questions. The general goal of using this type of interviews is to gather rich data by not restricting the participants. The interviewers have to be well trained and prepared to be able to help interviewees follow the agenda or adjust it when a new perspective arises. Unstructured interviews follow an 'interview guide' that consist of the list of topics to cover, opening questions and checklists. This type of interview can be used to explore broad themes or topics, rather than specific questions. It can be valuable when gathering information on users impressions on the topic or sensitive and emotional topics. Conducting an unstructured interview can be beneficial when trying to understand general perception of the users or the product acceptance. Due to the unstructured format, the interviewers have to be well trained and experienced to be able to perform such interviews. The analysis of the data collected

during those interviews can be very time consuming due to its volume as well as possibly impossible to generalize. [13]

Conclusion

To conclude, each one of the interview types has its benefits and downsides in relation to this project. Since the general specifications for the product are predefined, such as it being a mobile application, it is important to conduct interviews that can allow for asking detailed and specific questions about features or design choices. Additionally, it is also relevant to consider the expertise of the interviewer as well as participants. The interviews are meant to provide specific information about feature as well as participants preferences, feeling and general perspective towards the product.

Due to the experience required for the interviewer to have in order to conduct unstructured interviews as well as the data type that can be gathered from them it is not valuable to perform those in this project. On the other hand, the similarity of structured interviews to a questionnaire can lead to having very similar questions and very little personal input from participants and therefore structure interviews will also not be used. Since the semi-structured interviews provide a good balance of specific questions and ability for participants to express their thoughts it can be argued for that this type of interview will be most valuable for the data gathering in this project. It allows for the interviewer to ask ad-hoc question whenever relevant and therefore get more specific answers on user thoughts, experiences and ideas.

2.2.2 Interviewing aspects and methods

Due to the circumstances occurring while writing this project, it is impossible to conduct in person interviews due to safety reasons. This means, that the interviews have to be performed in a remote manner and therefore it is valuable to gather recommendations and best practices on how to conduct such interviews and still be able to gather as much data as during interviews in-person. To better understand and successfully conduct remote interviews it can prove valuable to review different aspects of this method.

The first challenge to consider when conducting interviews over video chat is the privacy. Since the interviews are transmitted over internet, there is a possibility of a leak of sensitive data. Due to that it is important to use software that uses secure connections for transmitting the data. Even though the subject of this project and the interviews do not focus on collecting sensitive data, it is important to make sure that the participants feel comfortable and that the basic privacy and GDPR principles are met.[5]

In order to perform the interview, an online meeting should be scheduled. The study by Judge, Tejinder K. and Neustaedter, Carman found that participants were

more likely to reschedule an online interview than a one conducted in person even though it required less time due to no commuting needs. They found that if a reminders about upcoming interview were sent a day before to participants, they were less likely to reschedule it. [5]

Due to the high involvement of technology in the interview process, technical challenges might arise. While this is less likely to happen when interviewing younger participants, older individuals might face difficulties in using chosen software. This should always be taken into account when scheduling the interview and allow for additional 10 to 15 minutes in case such issues occur. Another recommendation is to ask the participant beforehand which software they feel most familiar with and use it to perform the interview. Technical challenges may cause participants to be less focused on the questions as they can constantly worry about the connection quality. If any technical difficulties arise, it is important to be prepared on how to fix them and make sure that participants don't lose the focus.[5]

Because of the limited visibility of both the interviewer and participant, it can be difficult to see and understand their body language. It is hard to see whether the participant is doing anything else during the interview - for example browsing web or checking email. Additionally, if the interviewer is taking notes during the process, they might seem disconnected or simply not interested in what the participant is saying. In order to avoid these situations, it is beneficial to simply record the whole process. Recording of the interview includes both video and sound and therefore the interviewer can always have a detailed second look on how the participant was acting. Additionally, when asking participant to perform tasks or draw something, it can be a good idea to use a screen sharing function. It is important to notice here, that some participants might not feel comfortable being recorded and that the permission to do so must always be granted. [13][5]

The last aspect to consider is the environment that interviewer and participants are in. While the interviewer has little to no impact on what environment the participant will be in, it is important that the interviewer prepares their environment accordingly. To not interrupt the process, the interviewer should always make sure that no one will come into the room or listen to the interview. This can cause a privacy violation and the participant might feel insecure about the process. It is also a good idea to take any pets out of the room to not cause a distraction. Additionally, the interviewers environment should be clean and well lighted so the participant can see the person clearly. [5]

In order to ensure the success of the data collection the aspects of recording and transcription of the process have to be considered. Since the interviews will be performed by the author only and, additionally, remotely it can prove beneficial to record them. Having the recording will help gathering the data after the interviews instead of writing notes during the discussions which can prove to be distracting for both interviewer and the participant.[5] For the purposes of the project and its doc-

umentation, the interviews can be later transcribed to allow for easier navigation through the data collection. [1]

2.2.3 Choosing participants

In order to conduct the interviews, a group of participants had to be chosen. Since It was decided to perform the interviews remotely and there is no need for physical presence, the participants from different countries and cities can be chosen. Due to the subject of the project, all the participants must own houseplants and be, to some level, interested in taking care of them. Since there will be only one interviewer with limited experience, it can be argued that it might be beneficial to recruit participants that are familiar with the interviewer and therefore will feel more comfortable when performing a recorded video call. [1]

In order to be able to complete the interview process in the time scope of the project, as well as have enough data to be able to analyse it, the number of interviews that seems the best fit is three. This means three participants have to be chosen and three interviews have to be performed.

2.2.4 Interview guide

As previously mentioned, semi-structured interviews are composed from both open and close ended questions and allow for additional follow up or exploration. The interviews are performed based on an interview guide. This section focuses on creating the guide following bibliography recommendations.

The first recommendation is to specify the goal of the interview - what is it that the interviewer is trying to achieve. In this project the goal of the interviews is to gather data from users on what functionalities and designs they would like to see in a houseplant care management application. The ideal output is a detailed requirements specification including features, designs, functionalities and expectations. [13]

Second recommendation on how to write a semi-structured interview guide is to create a list of general question to ask the participants. This type of interviews doesn't require to follow the questions list strictly, therefore only general and most important questions need to be included in the guide. During each interview, additional follow-up questions or new questions arising from the conversation flow can be added. It is important that the questions asked can be easily understood by the participants. Therefore they should not include detailed technological or academical terms that the participants might have issue understanding. The questions should also never be too long, complex or include a double questions - instead, short to the point singular questions should be asked that can always be followed-up with ad-hoc questions if needed. It is also important to remember that the participants do not see the questions in text, so if asked to rank multiple items,

they might get lost or confused. The questions list should be revised to look for any sensitive questions as those, if asked at the beginning, might influence later responses. [13]

Based on all above mentioned aspects and recommendation, a list of questions has been assembled:

1. *Do you use any houseplant manager apps?*
This question gives a general knowledge of the participant. Asking follow-up questions such as 'Why yes?' or 'Why not?' allows to understand participants point of view towards such app.
2. *How do you manage taking care of your plants?*
This question helps the interviewer to understand the routines of the participant. If the answer to the question includes some system (paper diary, calendar) a follow up question can be asked to discuss why the participant chose such a system.
3. *What main issues/problems do you have with managing your plants?*
This question allows for gathering data on what most common problems the participants have and therefore how the app can help to solve them. It also forces the participant to find all the possible negative sides of the houseplant care.
4. *What functionalities do you think that a houseplant care manager app should have?*
This question explores the participants opinions about the functionalities they would like to see in such an app. Follow up questions, such as 'Why?' can be asked to better understand the needs and priorities of the participant. Having it right after a question exploring negative sides of houseplant care management might influence the answer since the participant has already acknowledged the problems and can now propose solutions to solve it.
5. *What designs do you think would make the app good?*
This question lets the participant explain any opinions they have on mobile application designs. By asking it, the data about preferences and wishes is gathered that can later be transformed into requirements.
6. *What do you think would make the app 'cool'?*
This last question serves as an opportunity for the participant to express any ideas or innovations they might have. It can be highly valuable to gather participant opinion to explore different, maybe new to the interviewer, ideas. Follow up questions, such as 'Why do you think this will be cool?' or 'Would that feature make you use the app more?' can be asked to reveal the motivations behind the ideas.

Those few questions are a base for the interviews and the order of them can change at any time depending on the conversation flow. On top of that, additional questions can be asked as well as follow-up questions. It is important to keep the conversation focused on the topic and only asked questions that help to gather relevant data.

2.2.5 Conclusion

To conclude this chapter, it can be said that the planning and decision making process of performing interviews is finished and has been successful. After thoroughly researching different types of interviews as well as many aspects that concern performing such data collection method, the interviews can now be performed. The process described in this chapter took 20 hours of work and provides all the necessary information to start the data collection process.

2.3 Focus group

Focus group is a data gathering method conducted by interviewing multiple participants simultaneously and, according to David Morgan, 'create lines of communication' [7]. Unique characteristic of this data gathering method is the involvement of multiple participants that leads to an interactive discussion between them and the moderator. Moderator (also called facilitator) guides the group conversation by asking questions or asking to perform exercises. Focus groups are performed to initiate a discussion and brainstorm on a given topic. They are an inexpensive research method, compared to the individual interviews, and can produce large amount of data in a short period of time. The sessions can prove beneficial in terms of providing new ideas as well as discussing problems with current solutions. Focus groups help to create discussions between participants that, when feeling comfortable, can present and argue their individual point of view with other participants. Another difference between focus groups and individual interviews are that focus groups can create a more natural, every day social interactions like situations. Moderator guides participants at all times by asking questions and ensuring that the discussion maintains its focus on the topic. [4] This section focuses on all the aspects that need to be considered and discussed before conducting a focus group.

2.3.1 Group Size

Range of literature sources define the size of focus group differently. Some state that the group can contain as little as three participants [11] while other recommend that that the group should not be smaller than five people [4]. Both big and

small focus groups come with their advantages and disadvantages. In example, having a small focus group doesn't ensure diversity withing the participants but can be easier to manage and allow individuals to express their opinions more frequently and affect the other participant at higher rate. On the other hand, bigger focus groups can raise diversity in opinions and points of view, but might be difficult to manage and allow each individual to express themselves to full extend. The size of the focus group heavily depends on the topic and focus of it.

Taking into consideration the size and scale of this project, it can prove difficult to conduct and manage a bigger focus group while having only one person conducting it. Additionally, the main focus of this project is to produce requirements rather than discuss many different opinion on the application or collecting statistical data. A focus on this projects' focus group is to create a friendly environment where the participants can brainstorm and discuss the ideas with each other. After consideration of all those aspects it can be seen that there is no large advantage in conducting a large focus group and therefore a focus group of three to four participants will be conducted. [4]

2.3.2 Group composition

In comparison to the traditional individual interviews, the characteristics of the participants play a large role in the success of the research. The composition of the group highly influences the group dynamics during the discussions and therefore also its results. An unproductive discussion can be caused by a poor group composition resulting in participants feeling uncomfortable and therefore not as engaged and eager to discuss issues. It is therefore very important to carefully plan the group composition considering different aspects so the participants feel comfortable and contribute creating a productive discussion. [4]

The first aspect of group composition to consider is the homogeneity between the participant. This is important, since the participants tend to share their opinions with individuals that they feel are similar to them. Therefore it is important bring together a group of people who have something in common to make them feel more comfortable and, in conclusion, produce more data. To achieve homogeneity withing the group it can be beneficial to look into potential participants cultural background or their lever of experience and expertise. In some situations it can make sense to create groups oriented by gender or age group, eventually both of them creating groups of 'young woman', 'young man', 'older woman' and 'older man'. This can create enough homogeneity depending on the topic of the focus group and create a group eager to discuss the subject. Another way of creating homogeneity can be by grouping participants who have the same intense experiences (for example - individuals who experienced car accidents, who have severe illnesses). [4]

Another aspect of group composition it to consider the level of acquaintance between participants. It is common to perform focus group on both complete strangers as well as people who are familiar with each other but the consequences of both should be considered. Recruiting strangers is usually a more preferred way due to the level of anonymity between them. Individuals might be more comfortable to talk to strangers knowing they remain their anonymity. Additionally, participants might be forced to provide more detail and background to their views and opinions therefore revealing more data, while a group of familiar people might already know that information. On the other hand, it is harder to recruit a group of strangers and it takes more time to develop relationship with them and make them comfortable in the environment. Groups of people who are already familiar with each other tend to be have higher attendance rate due to the knowledge that other people they know are attending. Those groups tend to take shorter time to create rapport and have a discussion. On the other hand, the anonymity of individuals in such groups is compromised, and in some cases might affect the discussion when particular individuals don't feel comfortable voicing their opinions in front of people they are familiar with. [4]

In conclusion the group composition is a very important aspect of focus group and needs to be planned accordingly. For the purpose of this project, in order to ensure homogeneity it can be beneficial to create focus group of participants in the same group age. Since the discussion will focus around technology related solutions, young people might prove to have more experience in the mobile application usage and design. Due to the topic of the project it is also very relevant that all the participants own houseplants and can therefore have opinions about the houseplant care management. Additionally, due to the non-sensitive topic of the project, dividing participants by gender is not as relevant. The level of acquaintance within the group should not have a bigger impact at the discussion due to the non-sensitive or personal nature of the project. Considering the time and resource scope of this project it can prove beneficial to recruit participants that know each other.

2.3.3 Discussion guide

In order to guide the discussion, the moderator should have an discussion guide that includes topics, in some cases question, that should be covered. The guide doesn't need to be strictly followed, it serves as a reminder or a checklist for the moderator to bring specific topics to the discussion to gather certain data. It is important to prepare such guide to make sure that the participants don't go too much off the topic. Additionally, in case that the discussion is not engaging the participants enough, the moderator should be prepared to bring a questions that the participants can answer and discuss.[4]

The structure of an discussion guide can have different, depending on the study and the moderators. For example, it can be a simple list of topics to cover, or a more developed version with specific questions and probes that can be included in the discussion. With a more specific guide, it is easier for moderator to include questions rather than creating them during the discussion. It can also be beneficial when moderator is not highly experienced.[4]

When designing a discussion guide it is important to keep a logical structure to ensure that the questions order makes sense for both moderator and participants. The most standard structure of the guide is to follow a hourglass design. Its characteristics are that broader questions are asked at the beginning to let participants feel comfortable and settled in the discussion and are followed by more specific topics that are critical to the research to, at the end, perform a broader discussion. [4]

Due to the circumstances, the focus group will be conducted remotely and therefore the aspects of conducting it apply in the same way as when conducting interviews.

Considering all aforementioned aspects, the discussion guide can be formulated as follows:

- **Introduction**

At the very beginning of the discussion, a moderator provides an introduction for the participants. It is important to explain them why were they asked to participate in this focus group and what the data collected from it will be used for. Additionally, the moderator introduces each of the participants briefly, mentioning their name and welcoming them to the focus group. The participants will also be informed about being recorded and answer any privacy related question. It is important to start the discussion by clearing any doubts that participants might have in order to allow for establishing a relationship with them.

- **Subject 1 - Houseplants**

The first subject of the focus group serves as a simple introduction as well as helps to set to mood of the discussion. Since all of the participants have houseplants, it is a good starting point of the discussion to find out how much do they know about their houseplants and how do they manage to take care of them. Additionally, it follows the hourglass design structure of focus groups by bringing a broad, easy topic at the beginning. It can also give the opportunity to establish a trusty relationship with and between participants by showing them the similarities between them. Questions that can be asked during the discussion:

- How many plants do you have?

- Which plant is your favourite?
- When did you start collecting houseplants?
- How many plants did die before you learned how to care for them?
- Where do you buy your plants?

- **Subject 2** - Houseplant apps

The second subject of the discussion starts to concentrate more on the goal of the discussion. Here, the houseplant care apps can be discussed with participants. By discussing it, the data about opinions, feelings and individual points of view towards such apps can be gathered. This conversation subject should not focus on any specific apps but rather discuss the usability of such apps as a whole. Questions that can be asked during the discussion:

- Do you use any houseplant care apps?
- Do you know any houseplant care apps? If yes, which?
- Do your friends/family use apps like this?
- What do you think about using houseplant care apps?
- Do you think such apps can be helpful? Would they help you?

- **Subject 3** - Houseplant apps functionalities

This subject focuses on specific functionalities that houseplant apps could have. Here, the participants should first be allowed to bring any functionalities they can think of to the discussion. Once those are discussed, the moderator can suggest other functionalities that haven't been mentioned by the participants to explore their attitudes towards them. The data gathered from this subject discussion can be very valuable when creating the requirements specification of the functionalities of the app. Questions that can be asked during the discussion:

- What functionalities do you think are important in houseplant apps?
- What functionalities would you use?
- What functionalities would be 'cool' in such apps?
- What do you think about those functionalities (if not discussed before):
 - * Watering
 - * Fertilising
 - * Diary (progress)
 - * Plant recognition
 - * Plant information (history, origin, family)
 - * Tips and tricks

- * Diseases

- **Subject 4 - Houseplant app designs**

The next subject of the discussion is focusing on design choices in the app. It is important for the requirements specification to explore users design preferences. This part of the discussion can help to understand how users imagine such app to look like. Firstly, users can be asked about their opinions and ideas in general and later on, similar to previous questions, the moderator can ask about specific ideas that haven't been mentioned before. It also follows the hourglass design structure by not being too specific and allow for exploration of opinions among users about general app designs. Questions that can be asked during the discussion:

- How do you think the app should look like?
- Do you have any specific styles/design in mind that would make the app better? Maybe from another apps (not necessary houseplant oriented) that you like?
- What do you think is important to remember when designing the app?
- What do you think about those design features (if not discussed before):
 - * Main page with info about all your plants
 - * Easy to use plant recognition
 - * Daily tips and tricks about plants in general
 - * Calendar for each plant showing watering/fertilising days
 - * Calendar for all plants together showing water days
 - * Possibility to purchase plants from local plant shops through the app

- **Conclusion**

At the end of the discussion, the moderator will finalise the discussion by thanking all the participants for their contribution. Additionally, any questions that participants might have will be answered. All participants will be reminded of the usage of the data gathered during the focus group.

2.3.4 Conclusion

In conclusion, it can be said that this section covers the process of designing and preparation for the focus group in extensive detail. The data collection method has been researched together with all its aspects and important decisions have been made. The process took 23 hours of work and provides a starting point for conducting the focus group.

Chapter 3

Data collection

This chapter describes the process and results of conducting each of the data collection method. Furthermore, the requirements specification for each of the methods is composed and presented.

3.1 Survey

This section focuses and describes the process of the data collection using a survey together with the presentation of the collected data. It outlines explains the process step by step together with the time it took to perform.

3.1.1 Distribution

The first step taken when performing a survey is distribution. In order to ensure that enough data is collected, it was important to reach as many respondents as possible. To do this, the survey with a small explanation of its purpose was spread through authors' network. Firstly, the link to the survey was posted on multiple Facebook groups including student help groups as well as plant oriented networks. The latter, were especially important as the audience of such groups is precisely the respondents type that is needed to collect relevant data. In addition to that, individual acquaintances of the author were contacted and asked to fill in the survey. All this was done to ensure that enough data is collected and the mix of methods and environments that the survey was shared to can increase the chances of the sample being diverse and therefore correlating with the plan and decisions made in previous sections of the project.

The distribution of the survey, including writing social media posts and sending direct messages took two hours in total.

3.1.2 Data collection

The next stage of performing a survey is the actual data collection. Since, as mentioned before, the method provides little to no control and influence over the responsiveness of the respondents, the process of data collection can be described as a 'waiting game'. All potential respondents were already prompt to fill in the survey but their participation was not guaranteed. This means that there was no work performed in this stage of the process.

The respondents that were contacted personally, could have been reminded to fill the survey, but due to its anonymity it wasn't possible to verify whether they have performed it. However, the gentle reminders and encouragement was sent and took one hour of work to distribute.

In order to allow for as many responses as possible and keeping in mind the time scope of the project the survey was opened for the respondents for two weeks. After that, the survey was closed, social media posts were deleted and the analysis of the data collected could start.

3.1.3 Results

As previously mentioned, the survey was up and open for responding for two weeks. After that time, it was closed and the total amount of responses was 24. This is less than the 30 desired but only by 6 responses and therefore can be considered successful. The difficult part of conducting this data collection method was little to no influence on whether anyone will fill out the survey and the long time span that it took to collect the answers. The results of the answers can be seen in Appendix D attached to the project.

Among the 24 respondents, 12 (50%) of them claim to be beginners, 10 (41,7%) of them are on the intermediate level and 2 (8,3%) of them said they are experts in houseplant knowledge. The diversity of the sample in this area is an aspect that could not be controlled and therefore could be potentially very hard to achieve. Based on the number presented above it can be said that the sample is fairly diversified for the needs of this project.

Based on the results, there was only one person out of 24 who uses houseplant management mobile application. This implies that no statistical data can be collected from it. The original plan was to gather enough answers from respondents who are using the app to be able to see the difference in the requirements and analyse the both points of view. Due to the only being a single who uses the app who responded to the survey, there was no reason to differentiate the users. However, since the additional focus of the survey was to collect ideas and proposals of features, that one answer can still be considered when creating the requirements elicitation.

When asked about the functionalities that users would like to see in the house-

plant management mobile application, the answer with highest score was a watering schedule with 78,3% of respondents voting for it. Following it were tips and tricks about the plants as well as calendar with watering/fertilising schedule. This is a helpful information that provides feedback on whether such functions are wanted in the app. One of the downsides of conducting the survey is that all these functions were in the original project idea and the respondents votes only help to validate my ideas and bring no new functionality to the app.

However, towards the end of the survey, an open question was provided asking the respondents whether they can think of any functionalities that would be 'cool' to have in the app. This provided the possibility for the participants to voice any of their own ideas that might be unique and not included in the original scope of the project. Among the answers, several new functionalities were mentioned such as an achievement system or disease detection. These are a valuable feedback that can be transformed into requirements.

Concluding, the survey process was difficult to handle due to the lack of control over the data collection but there is a significant amount of data that can be translated into requirements elicitation. The analysis of the results of the survey together with the requirements elicitation took one hour of work. It was a pleasant and uncomplicated process since the answers could be seen clearly.

3.1.4 Requirements elicitation

This section lists the requirements elicitation accumulated from the gathered data from the survey. Additionally, the number of users that voted or listed an idea of a functionality from the requirement is included in the 'Total count' column.

No.	Requirement	Total Count
1.	The app should include watering schedule.	19
2.	The app should include a diary to save and track a plant's progress.	5
3.	The app should include a watering and fertilisation schedule in a form of a calendar.	15
4.	The app should include information on plant diseases.	11
5.	The app should include fertilising schedule.	11
6.	The app should include plant recognition.	14
7.	The app should include input automation.	1
8.	The app should include information on plant adjacency and positioning.	1
9.	The app should include information about the plant (history, origin, family).	9

10.	The app should include tips and tricks section.	14
11.	The app should include a simple and streamlined user interface and experience.	3
12.	The app should be able to detect if the plant is healthy and thriving through camera.	1
13.	The app should include smart watch integration.	1
14.	The app should suggest similar plants to users collection.	1
15.	The app should connect with plant encyclopedia for plant recognition.	1
16.	The app should include a social media aspect to share collection and progress between users.	1
17.	The app should include an achievement system.	1
18.	The app should be able to recognise plant disease or problems from user description.	1

3.2 Interviews

This section describes in detail the process of performing data collection using interviews. It explains each stage of the process that have been done to conduct each of the interviews together with the time it took to do so.

3.2.1 Recruitment and logistics

Before conducting the interviews, the participants have to be chosen and the date and time of the interview have to be agreed on. As mentioned in the previous chapters of the report, it is important to agree on the date and time as well as to send reminders in order to avoid cancellations.

Firstly, to recruit participants, a social media post was shared within authors network. As pointed before, the participants familiarity with the interviewer can help to establish rapport and allow for friendly, relaxed conversation where both parties feel comfortable. Additionally, it was decided to contact three interviews and therefore three participants are needed.

Out of the group of people who expressed their interest in participating in the interviews, a group of people was selected that was suitable for the interviews. This was done by simply asking each of the interested participants whether they have any houseplants. It is a simple condition that can be easily applied and in case the person doesn't have any houseplants, there is very little to no reason of interviewing them. The group of people who was willing to participate in the interviews and had houseplants was then individually contacted and asked about availability in the upcoming two weeks to conduct the interviews.

Next, the interviews had to be scheduled. Each of the participants was asked to provide the date that suits them best as well as a video call platform preferences if any. This was done to ensure smooth technical setup from the participants side. Once the date and time was settled, calendar invites were sent to each containing a link to the video call on the platform of choice. The day before the interview, a reminder email or text message was sent to the participants to make sure they are aware of the upcoming appointment and are still able to attend.

The process of recruitment and logistics for all three interviews took a total of 3 hours.

3.2.2 Interview 1

The first person that was interviewed was Joachim. He is a 24 year old student from Copenhagen, living in a dorm. He reached out to me after the social media post and scheduled an interview. He chose Zoom as his software of preference. The transcript of the interview can be found in Appendix B section 1 and in this chapter only the highlights of it will be detailed and discussed. Additionally, personal impressions and thought will be described.

The interview started with small introduction followed by discussion about Joachims' usage and knowledge about plant related mobile apps. He admitted that he never really heard about any apps like that but could consider using such app if it had relevant for him functionalities.

The first functionality that Jaochim would like to have in the app is the watering and fertilisation schedule in a form of a calendar. Those two functionalities are very basic and were already within the scope of the original idea of the project. However, a feedback that users find this useful helps to confirm that functionalities like that are in fact wanted. He later mentioned that the app should also send reminders such as pop-ups. Since the interview type was a semi-structured, it allowed me to probe Joachim and therefore help him develop this idea in his mind. This helped greatly as he then said that if possible, he would like the app to use his location and only send the reminders when he is at home since he is most likely to forget about it if he is at work or school. This aspect of the reminders was never considered before by me but can be very important when considering the user experience. It can easily become a very valuable aspect of the app as it can make it more 'smart' and more functional.

Additionally when asked about details of the watering calendar, Joachim mentioned that he would like if the watering calendar could be exported to his phones calendar. This is another example of a feature that was never considered and can improve the functionality of the app. Having the option to have the calendar outside of the app can increase its availability for the users.

Another functionality that Joachim mentioned was the overall information about

the plants including where in his apartment each plant should be placed. The functionality that Joachim could find useful is a FAQ section for each plant. He said that if there was a list of most common issues people have with a plant and reliable answers to them, he wouldn't have to look for such information online. This functionality was mentioned in the original idea of the project, however it introduces an additional detail to it. This idea was, again, generated by probing Joachim and asking multiple questions about the small details of the functionality.

When asked about his system of taking care of his plants and revealed that he usually asks his friends for advice when it comes to recognising his plants and then searches the internet for any watering or fertilisation tips. He said that it would be great to include a plant recognition function in the app. This is, again, a confirmation that a functionality that was included in the original project scope can prove useful to users and they, in fact, want to have it in the app. Additionally, when asked about how he is imagining such functionality, Joachim said that he would like it to show the 'best match' as well as few other very similar plants so he can choose which one resembles his plant the most. This is another fairly small detail, but can help in the design process.

The next interview step was a discussion about different designs and design choices. Joachim said that he would like the app to be simple in design with as little text as possible and including graphical representations of the information. This introduces a very vague requirement as a 'simple' design can be understood in many ways. However, it is a preference and if more users prefer similar design it can be a valuable input for the design process.

When asked about any additional functionalities that the app could have, Joachim mentioned a socialisation factor. He said that, in his opinion, if he could see what plants his friend have and share the progress of them, he would be more encouraged to keep up with using the app and taking care of his plants. This is another example of an idea that was never considered but can be a great functionality. In order to get as many requirements, Joachim was probed multiple times and asked to explain certain details.

In conclusion, the interview was a pleasant process, the conversation was meaningful and my immediate impression of it was that it was very useful to the design. The semi-structured type of interview allowed to probe the participant and ask to explain details that might have otherwise not been mentioned in the conversation. It was very helpful to be able to drift off the main questions of the interview into more specific topics whenever I could see that Joachim has more to add or is able to produce more data. The process of setting up the video call and the discussion itself wasn't difficult and took around one hour. The transcript was a repetitive and slightly boring process that took two hours in total. After the transcript was made, the text was analysed and the requirements were extracted from the data which took one hour in total. The total amount of work put into the interview was

four hours which is slightly more than I imagined.

3.2.3 Interview 2

The second participant for the interview is Mila. She is a lawyer currently living in Copenhagen. She reached out on social media with the availability for an interview and after scheduling it, she chose Zoom as her platform of preference. The transcript of the interview can be found in Appendix B section 2 and in this chapter only the highlights of it will be detailed and discussed.

After a short introduction Mila admitted that she used several plant related mobile applications before but is currently not using any due her bad experience with them. This gave a great opportunity to discuss with her which aspects of these apps were disliked by her and how could they be improved. Based on that, it was important to keep it in mind during the whole interview and ask Mila to compare her ideas to her experience with other apps.

Mila admitted that the apps she was using were sending her too many irrelevant notifications which is a valid concern when comes to allowing apps to send notifications. When probed about the solution to that, Mila said that if she has to water three plants in one day, she would rather get one notification than three separate ones. She said that the app could provide a setting where the user chooses which notifications they want to receive. This is a detail that wasn't considered before but since it did discourage Mila to use the other apps, it is worth analysing and considering for the design. It can be very useful when trying to design the app and provide a good user experience instead of discouraging and annoying users.

When asked about her main issues with houseplants, Mila admitted, that she is never sure about how much water the plant needs. When asked, she said that the ideal solution for her would be if the app provided a calculator that based on the plant type and its size would calculate how much water she should give it. This is a very detailed functionality that was not considered in the original idea of the app. However, it could prove beneficial to many users and therefore is a valid point and should be included in the requirements elicitation.

Another feature Mila would like the app to have is the watering and fertilisation calendar. She would like the app to provide a calendar with automatically loaded days for watering but she would also like to be able to edit them. This will allow her a certain level of flexibility - she could set all the plants to be watered on the same day or be able to move the watering day. Thanks to probing and asking additional questions, this, relatively small, detail was extracted. It can add value to the user experience and let users have bigger impact on their watering schedules.

Additionally, Mila mentioned that she would like the app to include information about the lighting preferences of each plant as well as plant recognition. Similarly to Joachim, she would like to get a set of answers from it rather than one

single match. Additionally, when asked about design of the app, Mila said that she would prefer a simple, minimalistic design. All these features were already covered in the original idea of the app as well as confirmed in the previous interview. However, it is valuable to have multiple users admitting to that kind of preferences as it might make prioritising easier.

The last feature that Mila could find interesting is a possibility to share the information with friends. If her friend likes her plant, she would like to be share the information page of the plant with them. When probed, she said it would be a great advantage if the information page would also include pictures of the plant. This is another example of an idea that could potentially be developed.

In conclusion, the interview was a friendly discussion with Mila being engaged in the conversation. She needed several probes to explain the details of specific features as well as additional questions to come up with some ideas. A lot of the data collected during this interview is a repetition from the previous one. However, this helps me to see which functionalities can be more needed or important than others. In other words, it helps to define the 'basic' functionalities that need to be developed in order to provide the essential usage of the app. The process of setting up and conducting the interview took one hour. The transcript was, again, a long process and took two hours to complete. The analysis of the data and requirements elicitation took one hour. The total of four hours of work were spent on this interview.

3.2.4 Interview 3

The third participant is Nina, a finance and accounting student from Poland. After reaching out on social media, an interview with her was scheduled and she chose Zoom as her platform of preference. The transcript of the interview can be found in Appendix B section 3 and in this chapter only the highlights of it will be detailed and discussed.

The interview with Nina was relatively short compared to the others. She didn't have any specific wishes or ideas concerning the app. When asked about the functionalities she thinks that the app should have, she said that the watering and fertilisation schedule with notifications would be valuable to her. Besides that she mentioned 'tips and tricks' for each plant would be a nice addition. When prompted about the plant recognition she said that the app could have it but it's not necessary for her. She said that she pays the most attention to the design of the app that's the most important part of it for her.

In conclusion, the interview wasn't very productive in terms of the data gathered. It was helpful to get feedback on the features that were originally in the app idea but no new features were discovered during the interview. It was a nice, pleasant process but in terms of the usefulness of it, I would say that the interview

wasn't very profitable.

The process of conducting the interview took half an hour, the transcript took one hour and the analysis and requirements elicitation took half an hour.

The process of setting up and conducting the interview took one hour. The transcript was, again, a long process and took two hours to complete. The analysis of the data and requirements elicitation took one hour. The total of four hours of work were spent on this interview.

3.2.5 Requirements elicitation

This section lists and details all the requirements gathered from all three interviews. Next to each requirement, interview numbers are written that specify the origin of each requirement. This proves a possibility to see how many requirements were repeated throughout interviews and how many were original to only one. As seen, there are multiple requirements that each of the participants mentioned. This doesn't necessarily mean that the interview was not worth doing or a question was not worth asking. It gives a good overview of the functionalities that all the users think should be included in the app.

No.	Requirement	Origin
1.	The app should include watering and fertilisation schedule in a form of calendar.	1, 2, 3
2.	The app should send pop-up notifications to water and fertilise the plants.	1, 2, 3
3.	The app should use users location and only send notification when user is at home.	1
4.	The app should have a setting where users can choose type of notification they want to receive.	2
5.	The app should only send one notification a day for watering and fertilisation.	2
6.	The app should allow to export the watering and fertilisation calendar into the phones calendar.	1
7.	The app should include information about lightning preferences for each plant.	1, 2
8.	The app should include information about watering preferences for each plant.	1, 2
9.	The app should include information about fertilisation preferences for each plant.	1, 2
10.	The app should include a picture of each plant.	2, 3

11.	The app should include a watering calculator that based on the type and size of the plant can tell user how much water the plant needs.	2
12.	The app should allow manual editing of the watering and fertilisation calendar by users.	2
13.	The app should include FAQ section for each plant that includes answer to most common questions about problem and issues with the specific type of plant.	1
14.	The app should include plant recognition and provide a best match along with three other possibilities.	1, 2
15.	The app design should be minimalistic and include graphical representation of as much text as possible.	1, 2, 3
16.	The app should have a social section.	1
17.	The app should be able to connect to Facebook, Instagram and use phones contacts.	1
18.	The app should show users friends or contacts that are also using the app.	1
19.	The app should show what plants users friends and contacts have.	1
20.	The app should allow users to share the information page of each plant.	2
21.	The app should include tips and tricks section for each plant.	3
22.	The app should include social media sign up.	3
23.	The app should function with the same account across all supported devices	3

3.3 Focus group

This section focuses on the process of conducting the focus group according to the plan made in previous chapters. Here, the process together with the data collected is described as well as the total amount of work time it took.

3.3.1 Recruitment and logistics

This part of the process was very similar to the recruitment process when doing interviews. It started by publishing a post on social media directed to authors network asking for participants willing to take part in a focus group containing 3 people total. This information was mentioned to ensure that the participants feel comfortable to take part in such discussion. The group of people that reached out was then contacted and asked to provide a range of dates that will suit them with-

ing the following two weeks. The participants chosen were Karolina - a pharmacy student from Malta, Edyta - lawyer from Poland and Andre - a developer from Copenhagen.

The logistics of arranging and scheduling the discussion were more complicated due to the number of people that were supposed to participate. Scheduling the discussion took some time in order to make sure it fits everyone and was rescheduled several times due to sudden unavailability of some of the participants. Similarly to the interviews, all the participants were reminded about the appointment the day before.

Summarising, the scheduling of the focus group was very difficult and stressful. Additionally, there is always a risk that one of the participants will not show up or have connection issues and therefore the session would have to be canceled and rescheduled which in turn could spiral into other participants dropping out of the focus group. All this, puts a big pressure on successful scheduling of the session and requires good organisation.

Additionally, each participant was asked for a preference of a online video call platform. Two of the participants said that they preferred Zoom while one participant suggested Teams. To best accommodate all the wishes, Zoom was chosen as it was a method preferred by the majority of the participants.

In total, the process of recruitment and scheduling the focus group took the total number of four hours due to the difficulty finding date and time in everyone's schedules, rescheduling and sending reminders.

3.3.2 Discussion

Once all participants joined the video call and a sound check of each of them was performed, a short introduction was presented. I introduced each one of the participants to the rest of the group. To start the discussion, participants were asked to talk about their plant interests, problems or just simple facts from their life. This gave a opportunity to see each of the participants point of view and get to know each other better. It could be seen from the very begging that the video call was making each of the participants, as well as me, a bit uncomfortable. It was difficult to have a natural flow of the conversation because of the delays. Participants sometimes accidentally disturbed each other as they were not aware the other person would say something more. It was evident that Karolina was a dominating participant in the group and very eager to talk and explain her opinions and ideas. This could, to some extend, make the other participants insecure and not so open about their ideas. They were mostly quiet and usually only answered and joined the conversation when prompted by me. All there aspects cause a unnatural, sometimes awkward situation and keeping a discussion flow was difficult. All these factors have also been caused by me not being an educated in the area

and experienced interviewer. Nevertheless, a lot of ideas were presented during the discussion and therefore many requirements could be extracted. The transcript of the focus group can be found in Appendix C.

When asked about their experience with houseplant management mobile applications, some of the participant admitted to have used apps like that before and had a bad experience. They admitted that the apps were often complicated to use and didn't provide much value to them. Among the ideas of how they could be improved all participants agreed that the app should have a watering and fertilisation schedule that send them notifications across different devices.

Additionally, the participant have agreed that the app should provide a plant recognition that automatically adds the plants to the app and creates a watering and fertilising schedule for them. This is an important detail about the flow of the app. To further discuss is and get more details, participants were prompted about it. They came up with number of wishes and ideas of what the app should provide in a detailed manner. This includes the ability to add plants manually, switch between weekly and monthly view of the calendar or be able to edit the interface colour of the app. All these ideas are a very fine detail or additional functionality that can improve user experience.

All the participants have also been interested in having a reward system in the app that would reward them for achieving the watering and fertilising goals. In addition to that, the users would like to have a social section in the app to create a kind of community and be able to connect with their friends as well as fellow users of the app. These functions are new ideas that were not included in the original scope of the project and can help to encourage users to use the app more.

Additionally, an idea of a 'feed' in the app was brought up by one of the participants. They all agreed that a combination of inspirational and informative content would be a great addition to the app in a form of a interface. This is a example of an idea that was formed by collaboration of participants and grew gradually with the discussion.

In conclusion, I would say that the discussion was successful. Even though the scheduling process was very stressful and difficult, a lot of data could be gathered from the discussion. The conversation wasn't as pleasant as during the interviews but was meaningful and all the participants were active. In total, the process of setting up and conducting the focus group took 1,5 hours. The transcription of the discussion took three hours due to it's length. The analysis and requirements elicitation took two hours totaling 6,5 hours for this method.

3.3.3 Requirements elicitation

This section lists the requirements gathered from the focus group. Next to each requirement, a origin of it is mentioned indicating from which of the participants

the requirement originated.

No.	Requirement	Origin
1.	The app should provide inspirational content about plants	P3
2.	The app should include plant recognition and provide a best match along with three other possibilities.	P3
3.	The app design should be minimalistic and include graphical representation of as much text as possible.	P3
4.	The app should send pop-up notifications to water the plants.	P1
5.	The app should send pop-up notifications to fertilise the plants.	P3
6.	The app should include information about lightning preferences for each plant.	P1
7.	The app should include information about watering preferences for each plant.	P1
8.	The app should include information about fertilisation preferences for each plant.	P3
9.	The app should include FAQ section for each plant that includes answer to most common questions about problem and issues with the specific type of plant.	P2
10.	The app should have a social section.	P3
11.	The app should be able to connect to Facebook, Instagram and use phones contacts.	P1
12.	The app should show users friends or contacts that are also using the app.	P3
13.	The app should show what plants users friends and contacts have.	P3
14.	The app should include information about soil preferences for each plant.	P3
15.	The app should include room placement advice for each plant.	P1
16.	The app should send notify the user across all of their devices.	P1
17.	The app should include information about positive adjacency of each plant to others.	P3
18.	The app should incentivise user engagement with virtual rewards system.	P3
19.	The app should include scheduled watering, fertilisation and soil change in form of a calendar.	P2
20.	The app should allow to switch between weekly and monthly overview in the calendar.	P1
21.	The app should allow to customise displayed schedules in the calendar.	P1

22.	The app should support manual addition of plants.	P1
23.	The app should present the user with a list of most popular plants for addition to users collection.	P3
24.	The app should contain a plant news feed.	P1
25.	The app should include a care difficulty scale for each plant.	P2
26.	The app should be aesthetically customisable by the user.	P1
27.	The app should utilise tags and icons to represent common information and content.	P3

3.4 Conclusion

In conclusion, this chapter gives a detailed description of the process of performing each of the data collection methods. After conducting each of the method, analysis of the data gathered were performed and the requirements were created. This chapter provides the information needed for the further analysis and comparison of the methods.

Chapter 4

Analysis

This chapter focuses on analysis of the data collection methods together with the comparison of them. It includes personal notes and impressions from each method as well as the comparison based on the factors set in the Introduction chapter of the thesis.

4.1 Personal impressions

To start of the analysis, I wanted to include the personal impressions I had during the process. It is an important factor when considering the choice for my personal project but also has a significant impact on the later analysis.

Firstly, I think that the process of conducting all of the methods was rewarding and provided a great learning experience but required a lot of hard work, patience and dedication. Each of the methods had its own challenges and a lot of them were due to personal reasons or preferences.

While performing the survey, my biggest personal issue was the lack of control over how the respondents are filling it. I found it at times frustrating that some of the answers were very short or that respondents skipped questions. The lack of personal contact with the respondents made it impossible to have any impact on the respondents, show them how important the research is for me or how much their answers matter. In addition to that, it was very difficult to create the survey not knowing what the answers will look like and whether I should put additional questions to help respondents go deeper into their ideas. Very similar to this, it was impossible for me to adjust the questions depending on the respondents knowledge, ideas, experience or point of view since the survey had to be generalised in a way to fit everyone.

One of the difficult parts of performing the interviews and focus group was the transcript. It took relatively long time and was a boring and very repetitive task. On the other hand, it proved very useful for requirements elicitation as I found it

much easier to follow what the participants said in a structured text form rather than a video.

During the interview process I also discovered that some participants were more difficult to talk to, establish rapport and encourage to give more insight on what they think than others. It clearly showed me that not all participants will be equally engaged in the conversation and that maybe there should be more interviews scheduled so even if some participants are not equally engaged, there are still others that can provide valuable data.

While conducting the focus group, I run into several difficulties. One of them was the scheduling of it that was very stressful to me personally and took a long time. Several cancellations were made and a whole process felt like it's out of my control and therefore was very stressful. In addition, I found it difficult to manage the video conversation with so many participants. This is mostly due to lack of experience on my part and generally very stressful process from the very beginning.

To conclude, the process of conducting all data collection methods was filled with unexpected obstacles some of them being caused by my personal expectations and priorities but also many rewarding moments. This section covered my personal thoughts on different aspects of the process and the further analysis will be based on the factors for comparison established at the beginning of the project.

4.2 Cost

The first factor that is being considered is the cost of conducting each method. As mentioned in the introduction chapter, this is done based on the time spent on each step of the process. The table below represents the summary of how many hours of work each of the step took for each method.

	Survey	Interviews	Focus Group
Research and planning	32	20	23
Distribution	2	N/A	N/A
Recruitment and logistics	N/A	3	4
Meetings & Discussions	N/A	2,5	1,5
Transcription	N/A	3	3
Analysis and requirements elicitation	1	2,5	2
Total	35	31	33,5

As seen on the table, the 'Research and planning' stage of the methods took the longest time. This is due to the the amount of research and decisions that had

to be made before performing the method. The survey took the longest time to plan, totaling 32 hours, due to the amount of detail. This is mostly caused by the factor that after deploying the survey there is no possibility to add or change anything therefore the research had to be thorough. Additionally, the survey contains the most amount of questions that had to be written together with the multiple answers that are provided to respondents. The second most time consuming was focus group preparation followed by the interviews. Those two were relatively easier to plan and research since there was much less questions to add and they could always be altered during the conversations depending on participants input.

The second stage for the survey method was distribution while for the focus group and interviews it was recruitment and logistics. The survey distribution was fairly simple and took two hours total since it there was no scheduling to work on. Similarly, the interviews were scheduled individually with each participant and the process was easy. As for the focus group, as mentioned before, the scheduling process was very difficult and complicated. It took a very long time and several schedule changes to finally succeed.

The meetings and discussion part of the process was only relevant for the interviews and survey. It took more time for the interviews as there were more meetings to attend and even though the discussion was longer during the focus group, the total amount of hours spent is bigger for the interviews.

As previously mentioned, transcribing the discussions was a lengthy and difficult process for me. It took three hours for both interviews and focus group due to the amount of text in the focus group as well as the complexity of the video recorded from the video call.

As for analysis of the data gathered, the amount spent on doing that was very similar for each method. Since the survey online platform provided a summary of the answers, it was easy to extract requirements from it. The transcripts from both interviews and focus group provided a simple and structured text that was easy to navigate through.

In conclusion, it can be seen that the survey process took total of 36 hours, the interviews took 31 hours and the focus group took 33,5 hours. This can be understood as the survey is the most expensive method to conduct as it takes long time to prepare and perform. The cheapest method, according to my calculations, is conducting interviews.

4.3 Data quality

This section focuses on the quality of the data gathered that was then transformed into requirements elicitation. In order to summarise that, the requirements gathered from each method should be compared.

One way of deciding what the data quality was for each method can be to

simply consider how difficult was it to transform the data into requirements. In the survey case, the summary provided by the online platform was very readable and the requirements could be gathered almost instantly. Interviews as well as the focus group required transcripts to be written before the requirements could. This means it was relatively more difficult to extract requirements from the data. Additionally, the transcripts are structured as a conversation and therefore it is difficult to find the information in it. In addition to that, there were three interview transcripts and only one focus transcript. Concluding, the data gathered from the survey was the easiest to analyse and extract requirements from.

Another way of the data quality can be to compare the number of requirements. The survey provided 18 requirements, interviews 23 and the focus group 27. To see which methods provided requirements for which functions a summary was made. The table below represents functionalities or features together with an 'X' next to them indicating whether they were included in the requirements elicitation for given method. Additionally, the 'Project idea' column is listed to outline the features that were included in my idea of the project.

Feature	Project idea	Survey	Interview	Focus Group
Watering schedule	X	X	X	X
Diary to save and track a plant's progress	X	X		
Watering and fertilisation schedule in a form of a calendar	X	X	X	X
Information on plant diseases	X	X		
Fertilising schedule	X	X	X	X
Plant recognition	X	X	X	X
Information on plant adjacency		X		X
Information on lightning and plant positioning		X	X	X
Information about the plant (history, origin, family)	X	X		
Tips and tricks section	X	X	X	
Simple and streamlined user interface and experience		X	X	X
Detection if the plant is healthy and thriving through camera		X		
Smart watch integration		X	X	X
Suggestion of similar plants to users collection		X		X
Connect with plant encyclopaedia for plant recognition		X		
Social media aspect to share collection and progress between users		X	X	X

Achievement system		X		
Recognition of plant disease or problems from user description.		X		
Pop-up notifications to water and fertilise the plants			X	X
Notifications only when user is at home			X	
Setting where users can choose type of notification they want to receive			X	
One notification a day for watering and fertilisation			X	
Export the watering and fertilisation calendar into the phones calendar			X	
Information about watering preferences for each plant			X	X
Information about fertilisation preferences for each plant			X	X
Picture of each plant			X	
Watering calculator			X	
Manual editing of the watering and~fertilisation calendar by users			X	
FAQ section for each plant			X	X
Plant recognition that provides a best-match along with three other possibilities			X	X
Graphical representation of as much text as possible			X	X
Connection to Facebook, Instagram and~use phones contacts			X	X
Users friends or contacts that are also using the app			X	X
Plants that users friends and contacts have			X	X
Sharing the information page of each plant			X	
The same account across all supported devices			X	
Soil preferences foreach plant				X
Notify the user across all of their devices				X
Virtual rewards system				X
Switch between weekly and monthlyoverview in the calendar				X
Customisation of displayed schedules in the calendar				X

Manual addition of plants				X
Care difficulty scale for each plant				X
Background and theme customisation				X
The app should provide inspirational content about plants				X

The table is a useful illustration of the type of requirements that were gathered from each method. It can be seen that most of the functionality provided by the survey respondents is also covered by both interviews and focus group participants. There are only five functionalities that the survey provided that were not included in other data gathering methods from which three of them were included in the original project idea. This means that the survey introduced only two new functionalities or ideas. This can be an indication that the data collected from the survey is not as useful and original.

The interviews and focus group both introduced nine functionalities that were not included in other methods and none of them were included in the original project idea. This means that nine functionalities or features were extracted only from the data gathered from interviews and focus group. This is a relatively high number and can indicate that interviews and focus were both very useful for the process and provided requirements that would have not been thought of otherwise. This means the focus group and interviews data quality is equally good. It's worth mentioning that on top of the nine features gathered from each method, they also provided nine common functionalities that were not included in the original project nor extracted from the data gathered from survey. All of those aspects indicate that both focus group and interviews are methods that can provide good data quality.

4.4 Other aspects

The last factor for comparison are different aspects of each method that can have an influence on the results of them.

4.4.1 Requirements verification

The first aspect to consider is the possibility of requirements verification. After conducting each method, I can see that when the process of development moves forward I might need additional information about the ideas some of the users had. It was impossible to prompt respondents in a survey to gather more detail about their ideas if they had any. In addition I cannot see who wrote what in there and therefore the ideas included in it might be misunderstood by me. In the case of the survey or focus group, I was able to gather as much information as possible about certain ideas or preferences and if I will need more, I can try to contact

the participant asking for additional input. This can be an important factor in the design process in case of any uncertainties and interviews as well as focus group support that while the survey doesn't allow for follow-up.

4.4.2 Personal interactions

Another aspect to consider is the amount of personal interaction while conducting the method. In my experience, during the interviews or focus group it was easy to see whether the participant needed prompting, asking additional question or they just simply didn't have anything to add. Based on participants body language, I could notice whether they are nervous, confident or excited and therefore ask question accordingly. It can also be beneficial when the interviewer can have an impact on the participant, for example, ensure them that the idea is good and they should think more about it to provide additional information. In my opinion, it was easier to gather the data while having a personal interaction with the participant like in the interviews or the focus group.

4.4.3 Sample size

The last factor to consider here is the sample size. As previously mentioned, the sample size can have a big impact on the number of requirements as well as the ideas that are generated. From previous analysis it can be seen that even though the survey sample was 24 and the interviews sample was 3 the number on requirements gathered by each was similar. This raises a question whether having more interviews would lead to more requirements or they would simply only start repeating no matter how big the sample is. In some projects, it can be necessary to collect statistical data and the sample size is therefore significant. In my project, the needs were mostly to gather users opinions, preferences and ideas of the functionality and therefore the sample size didn't play a big role in it. That said, it is an important factor to consider that can vary depending of the needs and the goal of the project.

4.5 Discussion

In order to provide a verdict and answer the problem formulation it is important to discuss the results of the analysis. All the aspects that were covered during the analysis should be taken under consideration when deciding on the final verdict.

Firstly, considering the cost of each method together with the data quality, the survey doesn't seem like a valuable option. It was the most expensive method and produced the smallest number of original requirements. Additionally, as mentioned it was difficult to create and perform, and introduced many restrictions

during the process. On the other hand it was the easiest method to analyse. When looking for a method for data gathering for the project where statistical data is not needed, I wouldn't advise conducting survey as a main method. It can be a method that helps validate that the original project ideas are in fact needed, but it doesn't provide much creative and original data from the respondents.

The focus group and interviews were similar when considering cost and produced similar amount of original requirements. They both allow for follow up and personal interaction with the users. The similarities in these categories indicate that both of those methods are useful and valuable when gathering data for requirements elicitation in small scale projects. However, in my opinion, interviews were much less stressful and easier to schedule as well as slightly cheaper. I found the process of scheduling, performing and analysing the interviews to be more pleasant and easier. The interviews allowed me for individual conversation with participants where my whole focus could be centered at them while the group discussion when conducting the focus group was difficult to manage since there were three participants. Out of these two methods, I think the interviews were more convenient but also allow for easy expansions. At a small cost, additional one or two interviews can be performed to expand the amount of data gathered and provide more requirements.

To conclude, I think that for my project conducting interviews would be the best method of data collection. It can be an indication that such method can also be valuable for other small-scale projects as it provides an opportunity to collect data that, when transformed into requirements, can be a great feedback to the design process. As discovered during this thesis, a decision about which data collection method to choose can be based on many different aspects including personal preferences and therefore I cannot say that interviews will be the best for each project. However, based on the findings, I can confidentially say that interviews provide a good data quality, are not expensive compared to other methods, the process of conducting them is not difficult even for inexperienced person and they can greatly help in finding new requirements and user preferences as well as help validating already existing ideas for the project. As mentioned, each project comes with different expectations and needs but I think that by reviewing my findings and the analysis, I can now make the decision consciously for every future project I will be working on.

Chapter 5

Conclusion

Looking back at the thesis process it can be argued that the planned and aimed for research an analysis were successfully done and problem formulation was answered. However, I found a lot of aspects of the methods to be very flexible and even a slight change to the process could have produced different results. It is difficult to say whether I would gather similar data from each method and analyse it the same way if, for example, there was no limitation on the personal contact and I could have conducted the focus group and interviews in-person. It is also difficult to say whether different participants and respondents would contribute differently and therefore provide different data and, in the end, different requirements elicitation would be made. Additionally, in real life situations, even in small companies, it is possible that more people would be designated to such task. Maybe personnel with more experience or simply more people would have a significantly different approach to the data gathered as well as to the participants during data collection. All these aspects are very variable depending on situation and, to some degree, luck.

When starting the project, I had close to zero expectations of what each method would bring and how many additional ideas of features and requirements I would gather. Each of the methods, no matter how many new requirements they brought, was a addition to my personal idea and therefore, in my opinion, worth it. By performing all three methods, I gathered many ideas that I can plan, develop and include in my product. The amount of work that I now have put into user involvement in the project has paid off with a number or unique ideas and requirements that can be used.

Coming back to the problem formulation that was established at the beginning of the project, it can be said that by performing each of the data collection methods, information about the cost, data quality and other aspects was provided and led to a discussion that outlined the findings. The interviews, proved to be not only most cost efficient method, but also allowed for collecting good quality data and

were less difficult and stressful for me than other methods.

Unfortunately, I cannot say that interviews are the most suitable data collection method for small-scale mobile application projects since each project has its own needs of the results as well as different people conducting them. I can say that interviews are the most suitable data collection method for the houseplant management application project since it is impossible for me to generalise the results of my findings and give a specific verdict. The results can, however, help to find a verdict for individual projects based on their needs and expectations and I will definitely be using the knowledge that I gathered during this thesis to choose a data collection method for any future project that I will be working on.

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Appendix A

University statistics

SEMESTER	PROJECT TITLE	DATA GATHERING METHOD #1
ITCOM 1 (P0)	SMap	Market analysis
ITCOM 1 (P1)	Call Quits	Focus group
ITCOM 2 (P2)	Lumos	Scenarios
ITCOM 3 (P3)	Sparkling Pill	Interviews
ITCOM 4 (P4)	Connectivity in Smart Homes	Scenarios
ITCOM 5 (P5)	SafePass	Scenarios
ITCOM 6 (P6)	Shoppify	Scenarios
ICTE 1 (P7)	Emotion Recognition System	Survey
ICTE 2 (P8)	iHealth	Interviews
ICTE 3 (P9)	An Independent Ranking Engine for the MISIP Framework	Interviews

● Methods with no user involvement ● Focus groups ● Interviews
● Surveys

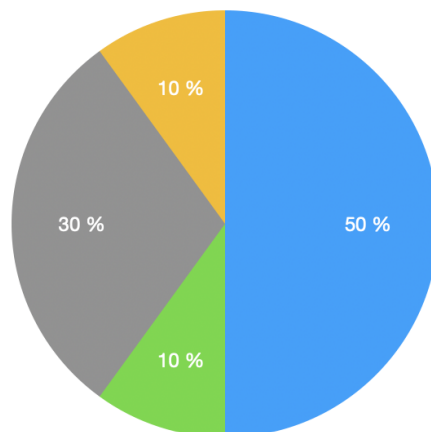


Figure A.1: Statistic from previous group projects.

Appendix B

Interview Transcripts

This appendix includes the transcripts of each interviews. The 'I' stands for interviewer while 'P' for participant.

B.1 Interview 1

I: Hello Joachim, I'm working on a project that focuses on creating a mobile application for taking care of houseplants. As mentioned on my post that you commented on, it's just a simple interview, I'm gonna ask you some question to talk about different stuff and as I understood you do own some houseplants so we can just talk about it and take it from here. The first question I have is - do you use any houseplant management mobile applications that help you with it?

P: Hello. No, and to be honest I never heard about apps like this.

I: Okay, and that's just the reason why you don't use it

P: Yes, I actually don't know how could they help me with my houseplants.

I: Yeah, okay. So you never really heard of any. But do you think it's something that you could maybe start using?

P: Yeah, I guess I could consider it. Especially for the beginner, who I am, it's pretty hard to manage all of the things with houseplants. Especially when it comes to watering or where should I put them in the apartment. Do they need more sun? Do they need less sun? I have no idea about it so if there would be an app which would collect all of this information that I could use then I would probably consider downloading it.

I: Yeah, okay. Now, coming back to you and your houseplants - do you have any system for managing them? Like do you just try to remember when was the last time you watered them? Where do you find the information about when to water them? Stuff like this. How do you in general manage your houseplants?

P: I mostly ask friends because at first I got my plants as housewarming gifts and right now I have four plants and mostly I don't even know what kind of plant is it

so I need to send a picture to my friends so they can tell me which plant is it and once I know I need to Google it and I just go through different websites and I tried to find something.

I: Yeah okay, that's fair enough. And about watering or, for example fertilisation, do you feel like you are doing it regularly or mostly you just do it whenever you remember, like 'oh yeah, i have to water my plants'?

P: Well, I'm trying to do it regularly, but you know how it is, you just don't remember about it. And sometimes you just have a look at the plant and the soil is totally dry and you're like 'oops I forgot this week'.

I: Yeah, fair enough. And then, I know we talked about it and mentioned it briefly but what would you define as your personal biggest and main issues or problems concerning your plants management. So what causes the most issues or is hard and difficult for you?

P: I would say that the hardest thing would be... It's hard to tell, I would say its a mix of things but it's mostly about where I should place the plants in the apartment. I move them from one place to another and very often online people give tips which are the very opposites. So it's hard to find a good source of information for it. I would say that this is the biggest issue.

I: Okay, let's now talk a little bit about the app itself. So, in your opinion, what functionalities do you think an app that helps users like you manage and take care of their houseplants should have? What are the most important ones and what would be extra?

P: I would say that it would be a reminder for watering and fertilisation. That's the thing that for sure will help me especially when you have few different plats that need different care. So you just get a reminder on your mobile. That would be helpful for sure.

I: And how do you image that? What kind of reminders would you like? Notifications?

P: I think that I would like pop-ups.

Great. Any other functionalities?

P: Maybe some tips. This would be also helpful. Maybe the most popular questions about the plant collected and answers to these questions.

I: And you are thinking specific to this plant type?

P: Yeah, exactly. Yes. Like you know, questions with the most common problems that people have and if I could find trustful answers in the app then it would be great.

I: Yeah, sure. And then you mentioned before that whenever you get a plant you don't really know what plant it is and you send pictures to your friend to recognise it. Is that something that you thing would be nice to have in the app maybe?

P: Hmm, you mean plant recognition?

I: Yeah.

P: Well if it's possible then yeah for sure it would be helpful.

I: Okay so how do you imagine that looking? That you just take a picture of the plant and then it gives you an answer or should it give you for example five different possible answers that the plant is the closest to so you can choose from them which one exactly do you think it is?

P: I think something in between, it should show me the main suggestions that it thinks it is and then 'It also could be...' and show three additional ones for example.

I: Yeah okay. And would you like to know anything else about the plant? Like its origin or..

P: Hmm, this I'm not interested in.

I: Nah you don't care about. That's fair enough. Another question concerning the app. You know that designing the apps is a process, not an easy thing and there are apps that are worse and apps that are better even though they have the same functionality. The question I have is what type of design choices or designs in general do you think would make the app good and nice to use for you, that you would like to use it.

P: Hmm... I would say it should be clear in bright colours probably and not overloaded with information, text. I would rather see some really short texts and visualisations of what I should do. I guess it's more simple and easier and faster than to read a very long post about what should I do with the plant.

I: Yeah, and then if we go back again to the watering schedule functionality. How do you imagine that looking, would you like a calendar with texts or maybe each day view that says you have to do this and this or today you have nothing to do. What do you think would make you like and use the app?

P: Yeah, I think a calendar would be a good idea. A calendar that is maybe synchronised with my calendar on the iPhone.

I: Okay.

P: And when there is a day that I need to do something with the plant then I would just like to receive the pop-up that 'here it is, now you need to do it'.

I: Okay, and would you rather receive the pop-up from the app itself - like an app notification, or do you think it would be nice if you could just export it to your calendar on your phone and just have events in your phone?

P: I actually think the pop-up from the app would be better. And also it would be nice.. I don't know if its possible, probably... But it would be nice if these pop-ups show only when I'm home, if I allowed the app to locate me, use my location, because when the pop-up appears when I'm at work, well, I'm probably gonna forget about it.

I: Yeah, that's true. That's a great idea, I haven't thought about it. And for the last question - overall, is there anything that you would think would make the app 'cool', unique or stand out, something that excites you to use it?

P: Hmm... I would say that nowadays it's mostly about socialisation, challenges so maybe that I could connect this app with Facebook, Instagram, whatever and I could somehow see which friends of mine have the same plants and we can maybe exchange tips in the app.. But we could see what we have and it somehow makes you want to keep with the hobby because you see that other people do it and it also makes you stay with the app and use the app still because you can see your friends and you can compare. I think that would be good.

I: That sounds great. So which one would you choose - you have the app and you can login with your Facebook and it shows you all your Facebook friends that are using the app. Or would you rather have the option of phone contacts so it shows you that those people are using the app? Or Instagram? Or maybe a mix of all so you can just choose which people from which platform would you like to see?

P: I think that the mix of all would be the best. For me personally I would probably connect it with Facebook but I know that many people don't use it anymore so the contacts would also be good.

I: That sounds great. Thank you very much for your help, it was great talking with you. Thanks for the input. Are you available for any follow-up questions? Can I contact you if needed?

P: Yes, we can make an appointment.

I: Perfect, thank you very much and have a great day!

P: Thank you, bye!

B.2 Interview 2

I: Hello Mila, I'm working on a project that focuses on creating a mobile application for taking care of houseplants. As mentioned on my post that you commented on, it's just a simple interview, I'm gonna ask you some question to talk about different stuff. As I understood you do own some houseplants, right?

P: Yes, I do. A lot.

I: Then we can just talk about it and take it from here. The first question I have is - do you use any houseplant management mobile applications that help you with your plants?

P: I used to use some but then I deleted all of them because I didn't like them.

I: Okay, that's great. Why didn't you like them? Is there any specific reason you didn't like it?

P: It's because they would send me too many notifications probably. They weren't that useful. It was just annoying.

I: Yeah, that's good. So now that you don't use any of those apps, how do you manage taking care of your plants? Do you have any system? Like write it down or...

P: Yeah, now I'm just keeping it in mind that I need to water them and I try to do

all of them in one time so that's it. This is my system.

I: Good. As long as it works, it's a good system. Then, what would you describe as the main problems that you have with managing your houseplants? What are the biggest issues?

P: It's that I never know for sure how much water my plants need so I can over water them, and some of them are dry. That's the biggest problem I have.

I: Yeah, so just pretty much the watering stuff?

P: Yes, that's it.

I: Okay so now when you think about it, and you have some experience using those apps, what functionalities should the houseplant management app have?

P: I think I would say watering would be most important for me because I never know for sure if it needs more or less water. And all those apps usually tell you, like, 'basic' stuff but they don't say any concrete stuff.

I: Okay, so you said you have a problem with how much to water them, would you like an option to put for example 'my plant is this size and the pot is this size' and it would tell you 'put 2 liters'?

P: Yeah, yeah. I would like to probably put what kind of plant I have so it would give me more detailed answer.

I: Okay, any other functionalities you thinking of?

P: I don't know maybe information about how do they like the sun?

I: Okay so for example, would it be helpful if it said which side facing window to put it next to? Or how close to the window?

P: Yes, exactly, yes.

I: Yeah, so information like that. Okay. That's great and then...

P: Also, plant identification is nice. Usually those app have it but I wouldn't say they all are that precise.

I: Okay so would you say that you take a picture and it gives you one answer like 'this is your plant' or would you rather have that you take a picture and it give you 'this is probably thins plant but it can also be this, this, this and this.

P: Yes, yes, I would like some options because I'm not sure if the app gets it right with the first picture I give it to.

I: Okay and is there anything else you would like to know about the plant? Like names, origin, and 'backstories'?

P: I don't think so, I usually find it boring in the app, if I needed information I could as well just Google it.

I: Yeah, because you already have the plant name right?

P: Yeah.

I: Okay, and then before you said that in the plants you use there were too many notifications so what do you think how much notifications should you actually receive? What would be enough and what would be too much?

P: I would say that I would like to get the necessary notifications to tell me when

to water it, that's the only thing you actually need. I find that I need only that kind of notifications because the rest I don't even look at.

I: Yeah, and then of course it depends on the plant how often you water it.

P: Yeah so I would like to get only that 'today is the day' that I have to water it.

I: Okay, and what if you have to water three plants the same day, would you rather have 3 notifications with 'water this plant today' or just one with 'you have three plants to water today'?

P: Hmm.. I think it would be better with just one, if I need more info I would just open the app and see.

I: Okay, now I wanna talk to you a bit about the overall design of the app. So what do you think the app should look like, what certain design choices should it have that will make it nice to use for you?

P: I would say very simple. I prefer simple designs so you actually want to spend some time in the app so it doesn't annoy you with all the colours or extra information. I don't want it, I would like only the necessary stuff be there and the design to be also simple.

I: Okay, so the necessary stuff, what would you say that is? The watering and sun exposure?

P: Yes, yes.

I: And fertilisation maybe?

P: Yes, that would be nice also.

I: And those are the main things?

P: Yeah, yeah. And also plant identification. Also I would like to be able to share some of the information so I can send it to my friends or someone else.

I: Okay, and for the watering would you like a calendar?

P: Yes, that would be nice. Yes. A calendar would be nice and also there I could choose dates and everything.

I: So you would like to be able to choose the days that you want to water the plants?

P: Yeah, the day I start and also when I already know I'm gonna water it in two weeks so I could put it myself as well.

I: Yeah.

P: Or the app can also recommend me when to water it.

I: Yeah, sounds great. And you also said you would like to share it with your friends, can you tell me a little bit more about that?

P: I think it would be nice if I could share it, so maybe like one of my friends like the plant I have, I could send a link to it so they know what it is?

I: Okay, so just a link with a set of information about specific plant?

P: Yeah, maybe super basic information...

I: Yeah, okay.

P: And pictures! I think the pictures are the most important

I: Yeah, okay. So you would like to have maybe more than one picture to each plant?

P: Yeah that would be cool, yeah.

I: Okay, any other designs or anything?

P: I don't know, I think that's enough for me. I wouldn't say I need anything else.

I: Just keep it simple.

P: Yeah, camera, calendar...

I: Yeah, okay. And then the last question i have is - is there anything, like any functionality, that you think would make this app 'cool', so it would make you excited about using it?

P: Hmm.. Let me think. I don't know, I think if all of that was in one app, it would already be super cool and nice. There is no app that includes all of that. And also there is no free app like that, they all paid. So it would be nice if you could use it for free.

I: Okay, that's great. Thank you very much for your time and for the interview.

P: Thank you too, it was very nice.

I: Thank you, bye!

B.3 Interview 3

I: Hello Nina, I'm working on a project that focuses on creating a mobile application for taking care of houseplants. As mentioned in the social media post that you commented on, it's just a simple interview, I'm gonna ask you some question to talk about different stuff. As I understood you have some houseplants, right?

P: Yes.

I: Yes, then we can just talk about it and just take it from here. The first question I have is - do you use any houseplant management applications?

P: No, no.

I: Have you ever heard about any?

P: No.

I: No, okay. For the second question - how do you manage to take care of your plants? What's your, sort of, a 'system' for taking care of them?

P: I water my plants and sometimes read about my plants on the internet. I think that's all. No, I also fertilise them sometimes.

I: Okay, and you just do it as you remember? Or you have a specific way for doing that?

P: Yes, I water my plants every Sunday.

I: Okay, that's a good system. Do you have any issues or problems with managing your plants?

P: Sometimes I forget to water them or to take care about them because my cat destroyed one of my plants. That's all I think.

I: Now what do you think, if there was an app, that would help you plan the care of your plants, would you use it?

P: Yes, I think it would be very useful and good for me.

I: Would you use it?

P: Yes, I think so.

I: That's good. Now we can talk a little bit about that. So what functionalities do you think such an app should have?

P: Maybe the watering schedule or something like that, maybe notifications about watering, maybe some tips and tricks . That's all.

I: Okay, that's great. What about stuff like plant recognition, for example? So you can take a picture and see what plant it is.

P: I think it's a nice function but it's not necessary for me because I'm not that interested in plants.

I: So you don't care about that?

P: No.

I: Okay, so now we can maybe talk a bit about the watering schedule you mentioned. Imagine that you are opening the app, how do you imagine it looks?

P: Hmm... Maybe a calendar or something like this? With days when I have to water my plants or do anything else with my plants. Maybe also a 'tip of a day' or something similar. I think that would be really good.

I: Okay so what do you think that the general design of the app should be? How should it be designed, how should it look?

P: I like modern and clean designs, it would be nice with some colours as well. Maybe some pictures of graphics of plants? And easy to use, not too complicated. I think that's all.

I: Okay, and then when we come back to the notifications. So would you like to receive just simple pop-up notifications? That would say 'water your plant today'?

P: Yeah.

I: And then, you could have, let's say, 5 plants in the app, would you like to see every single notification separately?

P: No, I would prefer all plants in one notification.

I: Okay, that's great. So, actually, the last question that I have is - what do you think that would be 'cool' or exciting to use? Something that would make you excited to use this app.

P: For me the most important is design and how the app looks. Second if it's easy to use or maybe the option to use this app with my phone, computer and smart-watch.

I: Okay so you would like to have it on all three devices?

P: Yeah. And one account, not separate.

I: How would you like to create the account? Email and password? Or an option to login with some social media accounts?

P: Yes, I think login with social media is much easier than email and password. And I think the app should be free, because I don't like when I have to pay for apps.

I: Okay, fair enough. Is there anything else you would like to add?

P: No, I don't think so.

I: Okay, then thank you for your time. It was nice speaking to you. Thanks you.

P: Thank you, good luck!

I: Thanks you, bye!

Appendix C

Focus group transcript

This appendix includes the transcript of the focus group. The 'I' stands for the interviewer while 'P1', 'P2' and 'P3' for participants.

I: Hello everyone, welcome to the focus group. It's nice to see you. As I mentioned in my post, this is a simple group discussion that's gonna help me conduct my master thesis project. As some of you know, I'm working on a project that focuses on creating a mobile application for houseplant care management. I gathered you all here today so we can just talk about different stuff - apps, houseplants. The conversation is gonna be recorded for the transcript purposes. So yes. Some of you might know each other but I'm gonna introduce you all quickly. First we have Karolina, she is a pharmacy student from Malta. Next we have Edyta who is a lawyer from Poland. And then we have Andre who is a developer from Copenhagen. Now I think we can start with the question. So the first discussion subject that I would like to start with is just general about houseplants. As I know, all of you own some houseplants, but can you give me some more information? Like how many do you have? Which are your favourites? Just some fun facts.

P1: Okay, so actually when I arrived to Malta I bought one plant. It's low key dying right now just because I left it in my old apartment for like a month and no one took care of it. Now I'm trying to rescue it but it's not in a good position and it doesn't have that much light so it's still dying. But I'm trying. I have another one, that is here because it needs a lot of sun and that's the only light place in my room. And there is another one, it was a cactus, I actually had two cacti but one of them died because I over watered it. Another one is still alive because I'm not watering it.

I: That's nice, thank you. Anyone else wants to share?

P2: I have about 5 or 6 plants and they are in pretty good condition because it's really warm in my flat so they feel good in here. But when it comes to watering, I water them when I remember about it. But I'm maybe not taking good care of them, they are in good condition but I don't care about them so much, I don't know anything

about them. Every plant that is in my flat came as a gift from friends and family so I don't know much about them.

I: Yeah, fair enough.

P3: I think I have around 10 plants right now, I used to have more but a lot of them died because either I forgot to give them water or they weren't in exactly perfect condition light-wise and maybe also heat-wise. And yeah, I think I water them around twice a week but of course it depends whether I remember or not. So yeah, that's about it.

I: That's nice. Okay, so now that we covered the houseplants I wanna talk to you a little bit about houseplant apps. Does any of you know any houseplant apps that help with plant management?

P1: I know but I don't know how they called. But I know they exist.

I: Have you every used any?

P1: Yes, I had one, but it was really difficult. It was in english but the whole app was really complicated. I had to put every single plant and every single picture of the plant and then how much I want to water them. I had to pull all of that information by myself. I didn't know how often should I water those plants, I had to check it first, then put it in my app so that was too much...

I: Yeah fair enough. What about the rest of you guys? Do you know any apps?

P2: I know about one app, I downloaded it for my mother because she wanted something that can help her recognise the plant. It's really simple, you take a picture and then the app shows you something similar so you know what the plant is called.

I: Yeah, okay. But you don't use it yourself?

P2: No, I'm not using it.

I: Okay. Andre, do you have anything to add?

P3: Yes, I've seen a couple of apps and as Karolina mentioned, some of them were really complicated to get started with, because you have to do a lot of things to kinda, get started. It would be much nicer if you had a solution that kinda automated a lot of these things. Other than that, I think some of them are also quite expensive so if there was a cheaper solution, or eventually a free solution it would be much nicer. Also I think that design wise they don't look too great, could've been nicer.

I: Okay.

P1: It would be great if all the information would be already there, like I would not have to look for it by myself.

I: And would you use it then? Would you use that app?

P1: Yes, yes. I wanted to use it, I was just too lazy for that. So yes, I would use them then.

I: Okay. What about you Edyta? If the app had all the functionalities you would like it to have, would you then use something like that, would you consider it?

P2: Yeah, probably. Once my plant died because I put it near another plant and I didn't know they cannot live near each other. So maybe if I had that app, I would help me with that.

I: Okay, so what each one of you thinks that is the functionality that the needs, the most important functionality for such an app? What would it be for you personally?

P1: For me it would be notifications on my phone to remind me to water my plant or to water them, you know. So when I should water each plant.

I: Okay and you would like to get them just on your phone?

P1: Yes. On my smartwatch and my laptop as well.

I: Sure. Edyta, what do you think about that?

P2: Hmm... Simple interface, without any advertisements because they are really irritating.

I: Any other plant related functionality you are thinking of? Is there any specific information, for example, that you would like it to have?

P2: I think watering, because the plant is alive if you water it so you need to know how to water it.

I: Okay. Before you mentioned that your mum is using the plant recognition, is this something that you would like to have in the app?

P2: That app is pretty useful but the interface is pretty bad, because there is plenty of information and images and sometimes it cannot recognise the plant correctly.

P1: I want to say something. I think it would be really great if the app could recognise my plant, put it as my plant, tell me how often I should water it and where it should stand. I mean how much light does it need. Like the one I have on the floor that needs to be there because it needs a lot of light. Like just where in the room it should be, near the window, not near the window.

I: Yeah, that makes sense. Andre, do you have anything to add? What do you think? What functionalities are the most important for you?

P3: Yeah, I think what was mentioned sounds pretty good. I mean, if you could just take a picture of it and it automatically adds it and tells you all the necessary stuff you need to know to keep it alive. That would be great. So, light conditions, how often you should water, if you want to be notified when it should be watered also stuff like plant nutrition or when you should change the soil, which plants it functions better with. That definitely sounds good.

I: Yeah.

P1: Also it would be cool if every time I actually water my plant, I would get like a little coins, or your know, something on my app that would give me joy and I would want to use my app more. And also if I could share it with my friends so they can see that I'm not killing my plants and we could like share photos of our plants on the app.

P3: Yeah that sounds pretty cool.

I: Yeah, that's an important aspects. So like challenging right, you mean?

P1: Yes, yes.

P2: Having reword system, yeah.

P1: Yeah, reword system exactly.

I: Or the social aspect of it. It's not impossible to have it so you can share it with your friends. So what friends would you like to see there? Facebook, or Instagram? Or your phone contacts? Or just the app people, sort of?

P1: I feel like for the app people, it would be like a community. Like of course you friends, your contact numbers, your Facebook friends would be cool but it would also be an opportunity to meet new people that share the same interest as you.

I: Very true. Andre do you have anything to add?

P3: Nah, that sounds cool. I think that's a great functionality. So you get kinda rewarded for keeping your plants alive. So that's like a double bonus.

I: Yeah, sounds good. And now I wanna talk to you about, well, the overall design of the app. So maybe some specific design choices you would like to see? ... So the watering schedule, for example, how would you want it to look in the app? Would you maybe like a page with a calendar with a little signs on each days or...

P2: I think the calendar view would be good.

I: Okay, sounds good. And what information would you like to see in the calendar? When to water plants? When to fertilise plants?

P1: Yeah not so much information... I think it would be good if I could choose information that I want on my calendar because of cause there is a lot you can put, as you said, when to change the soil, when to give them something extra... It would be good to actually check which information do you want. Also to be able to change the calendar from monthly to weekly because sometimes it's easier for me to plan my week than a month.

I: That sounds great. What about the plant recognition? How do you imagine that? That you just gonna take a picture and it's just gonna add the closest match to your app or would you like to have options? That it can be this, this, this and this so you can choose yourself.

P1: Options, because I don't trust AI that much so it would be better if I can double check it if it's really the plant that I bought because there are some plants that are so similar. It would be good if I could not only take a picture but also like type the name. Because sometimes I do have specific plants that are not as easy to just take a picture and recognise them.

I: Yeah, any other opinions guys?

P3: Yeah. You should be able to just enter the name or just search through the list of popular plants. Because most houseplants that you buy, other people have them as well so it should be pretty easy to create a list of, let's say, top 50. So you can easily start the collection, so you don't have to take like 10 pictures but then just tap on 10 different plants that you have.

I: Yeah.

P1: Also that would be a cool thing, that I'm just thinking about now, like a feed of 'news of the plants'. That, I don't know, 'there is anew plant, check it out' and pictures...

I: Okay so like if you'd have on the main page sort of a random info, or tips, or articles or stuff like that?

P1: Yes, exactly. News feed.

I: Yeah, that sounds great. Any other functionalities?

P2: For me it would be something like, a test maybe, in the first use of the app . That you can say if you are lazy or maybe that you are excited about having plants so you could see which plant is easy to take care of and which one is difficult. Because some people are lazy to do the watering or take care of the plants. So maybe something like that...

I: Okay so it would tell you if the plant is actually doable for you as a person?

P2: Yeah.

I: That's a very good idea. And then for the overall design of the app. How would you like it to look? Any specific ideas or wishes? Is there anything that would make the app 'cool' and make you excited to use it? Is there anything like that?

P2: I think it could be green, because when you think about plants you think about green items. So I think that green should be the main colour.

P1: For me, I would like to choose the colour of the theme of my app but like not too many options because I'm getting bored. It would be cool if there was like at least 5 colours that I could choose from. That would be enough.

I: Sounds good.

P3: Yeah, maybe also to keep the overall design as simple as possible, use a lot of icons and tags and stuff like this so something that is very simple to understand across different plants as well. So you don't have a different design for different plants. So it kinda feels familiar each time you add a new plant or look at a different plant.

I: Okay, yeah. Sounds good. Anything else? Does anyone have any functionality or anything cool to add? Or just a preference maybe?

P3: Maybe a way to discover plants for your level so, as was mentioned, if you are lazy and you need a plant that is easy to keep and you can find other plants that would be in your level.

I: So a sort of a search? Or you could just scroll around and look at plants, whatever you like...

P1: Yes, something like Pintrest.

P3: Yes, yes.

P1: That you can just scroll and look for inspiration, that would be cool.

I: Yes, okay. And you can filter it by 'easy to keep'?

P1: Yes, yes.

I: Okay great. That's it from me if no one else has anything to add I think we can close it up here. Thank you all very much for participation it was very nice meeting you and seeing you.

P1: Thank you very much.

P2: Thanks you.

P3: Thank you, bye!

I: Bye!