Degree project

Mobile development
Linnaeus University App for Exchange students

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Date: 2014-01-16
Course Code: 2DV00E, 15 credits
Level: Bachelor
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Abstract
Every year approximately a thousand of exchange students arrive to Växjö looking for improving their university experience. The main problem is that this amount of people is very difficult to handle and organize. Sometimes, students don’t have enough support, missing important information, missing interesting events and so on.

In consequence, the students can develop a bad feeling about the university organization giving a bad feedback to the future potential incoming students. This is a bad aspect to Linnaeus University because it is losing future students.

In order to solve the problem, different surveys have been done to the international students, and even to the Växjö International Students (VIS) organization.

The findings from these surveys are very interesting, and it is possible to identify and group different problems in order to make the solution easier.

Furthermore, a good solution is found, improving the situation we were before. The solution found will fit in the hand of each student and will bring us in a better situation for the university and their students.

List of keywords
Software development, Mobile development, Apps, Smartphones, Tablets, Android, Java, Questionnaires, Interviews, Focus Group.
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1. Introduction
Currently there are hundreds of new students arriving at Linnaeus University every year. A big part of these students are foreign exchange students (there is an average of 400-600 students every semester). To handle the recurring process of receiving new exchange students the university administration and other (student) organizations have established well-organized processes, logistic, and experience to handle this demanding task and to provide a good service to the new students. However, despite these efforts, there are still some unsolved problems leaving room for improvement.

1.1 Problem
Exchange students have to solve a lot of difficulties in order to adapt themselves to a new country and university. Besides language barriers, there exist other difficulties like housing, knowing the available activities, meeting new people, knowing the campus, and so on.

Based on my own experience and from consulting Internet resources like the official Erasmus Forum (ErasmusU, n.d.) or the official Växjö fall Facebook group (Facebook, n.d.), where students from all countries explain their own experiences, the following three initial main problems could be identified.

1.1.1 Bureaucratic Process
Probably the most critical problem described is the bureaucratic process. There are a lot of rules and processes a new (exchange) student must follow to make a correct application. This process can be divided in two parts: before arrival and after arrival.

The bureaucratic process will start with creating the application. Once the student is accepted he has to complete, sign and send a large quantity of documents in order to make a correct exchange. This process is the most critical because, if the student forgot any document, he could lose his place in the host country. At the moment the student arrives to their destination, he will have to overcome the second part of the bureaucratic process. This part is less critical, but is more difficult because the student is in a different country.

The main problem is the students are not used to this amount of documents and sometimes they use to lose them or they use to forget important deadlines.

1.1.2 Housing
The accommodation is another important point that all Erasmus students must bear in mind when studying abroad. There exist a lot of different kinds of housing, but the most common are the student residences and the student houses. These buildings are specially oriented to students and also exist exclusively for exchange students. The main problem with housing is to find it when the student arrives to their new university.

1.1.3 Self-Organization
Organizing one-self and staying informed during the actual stay abroad can be a challenging problem as well. A typical (official) stay abroad can last from 3 months until one year. Hence, during this period, it is very important to be well organized and do not forget the real purpose of the Erasmus program, which includes everything from getting to know the new country, the most interesting places and the new culture, as well as (even more important) to study successfully, participate in classes and complete all expected university tasks. However, students have difficulties to adapt themselves in
their new lifestyle as exchange students. They forget project deadlines, register to exams and so on.

1.1.4 Problem Summary and Motivation

In conclusion, if the student overcomes the difficulties presented above, he will have a great experience and it is sure that he will recommend it to all his friends. It is very important to know other countries and other people in order to grow and improve our culture.

Otherwise, the consequences can be bad. These problems can create bad feelings from the students to the university.

The potential benefit is improving the exchange experience for the students. By improving the relationship among the student and the university, the possibilities of having academic results will rise. Furthermore, a good recommendations to their friends, will increase the possibilities of keep receiving exchange students.

1.2 Goals and Criteria

The primary goal of the thesis is to confirm the initially identified problems and to possibly identify additional ones. This goal is met if a thorough research method is defined and followed. This might include questionnaires, interviews, etc.

The secondary goal is to propose a solution for at least some of the identified problems. This might involve the development and improvement of software applications. This goal is met if an overview of possible solutions for at least three (3) problem areas is provided, as well as at least a functional prototype for at least one (1) problem area is implemented.

The final goal is to document the research, identified problems and solutions, as well as the required background for allowing others to continue solving the identified problems.

1.3 Overview

Section 2 describes the research process followed, questions asked and results found. Section 3 exemplifies the identified problems in order to allow the analysis of requirements and the specification of a software solution. Prior requirements analysis, Section 4 provides background on Software Engineering practices and technologies that might be interesting for developing a solution. Section 5 summarizes in particular the requirements elicitation and Section 6 discusses the problem solution including the design and implementation of a functional prototype. Section 7 a final discussion of the performed research, the implemented solution, and the expected improvements. Section 8 draws final conclusions and discusses future work.
2. Research

The problems described so far in the introduction are based on own experience and the informal review of an online forum. Yet, they indicate that there are real issues that could be improved upon to allow for a better overall experience for important group of exchange students.

To show that these problems exist for more than a limited group of people we want to perform a scientific research. A sound research process is a crucial part of this. It is necessary exactly identify what the problem is, and only then, it is possible to find a good solution.

In order to get qualitative and quantitative information, different questionnaires, interviews and focus groups are going to be employed. Appendix I provides these research tools that allowed us to investigate the core questions of the project in detail.

In the following, we will discuss the different research questions, summarize our findings, and point at possible solutions improving on the identified problems.

2.1 Questions to answer through research

The questions to answer will provide us important information in order to define more accurately the problem and in consequence, find a solution that fits with it. We can divide them in problem and solution questions.

2.1.1 Problem questions

We employed a number of questions allowing us to identify existing problems. I.e., the following questions will be answered through the first questionnaire “Exchange experience: Finding the main problems”. These questions are focussed on all international students.

- What are the main issues for international students at LNU?
- What kind of solution would you find more useful for these problems? (Paper guide, personal guide, app…)

On the other hand, the interviews presented to the VIS members will help us to answer the following deep questions.

- What is the level of importance of the VIS for the international students?
- What are the VIS main organization problems?
- Do the students have problems that VIS should solve?
- Find other interesting suggestions.
- Group these questions by VIS members.

2.1.2 Solution questions

We also employed a number of questions allowing us to identify possible solutions for the described problems. This means we want to harvest the ideas the individuals experiencing the problems and see what solutions could solve or at least reduce these problems.

The following questions will be answered through the questionnaire “Exchange experience: Finding the main solutions” and the Focus group “Exchange experience: Finding the best solution”.

- Is the relationship between new technologies and international students sufficiently close considering them helpful to solve these problems?
- It is possible to help the international students with new technologies? How?
- What are the most useful widgets for an international student?
• What percentage of international students will have access to the solution purposed? Is this enough?
• What will be the main connection restrictions to use the app? (Wi-Fi → place, 3G → speed, data quota…)
• Is a payment gateway going to be useful in order to speed up some process? (Booking VIS trips, getting memberships, buying entrance for special events…) 
• Will be useful to link this app with LNU website and My Moodle?
• Group these responses by age, nationality, faculty and students’ level.

Furthermore, the interviews presented to the VIS members will help us to answer the following deep questions focussed on the solution.
• Could be helpful an App to improve the VIS organization? How?
• Considering the international students’ needs, do you think that an App could help you to solve them? How?
• Find other interesting suggestions.
• Group these questions by VIS members.

2.2 Results evaluation
The next figures show graphically the different results offered by all the surveys. On the one hand, the questionnaire offers qualitative and quantitative results. On the other hand, the interviews to the VIS and the Focus group offer qualitative information. These results will be the key to decide the solution we should offer.

2.2.1 Questionnaire results
People answered: 118
Description of the target: The target of the questionnaires is international students at Linnaeus University. The main part of students (95%) is between 18 and 25 years old and they come from different countries from different continents (Spain, Germany, China, USA, Morocco…).

Problems
The following table (Table 2.1) shows the average of the results obtained through Questionnaire 1: “Exchange Experience: Finding the main problems” (Found in Appendix I, section I). Concretely, these results are about the ninth question: Check what have been the main issues you have found in campus life. The rating is between 1 and 5, where 1 means that there is no problem and 5 means there is a very important problem for the requested people according the provided problem areas.

<table>
<thead>
<tr>
<th>Problem Area</th>
<th>Too long lines Avg. (1-5)</th>
<th>Number of cards</th>
<th>Booking VIS events</th>
<th>Impossibility to find some classrooms</th>
<th>Communication to teachers out of lectures</th>
<th>Problems with meeting new people</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg.</td>
<td>4,02</td>
<td>3,85</td>
<td>3,59</td>
<td>2,43</td>
<td>1,83</td>
<td>1,38</td>
</tr>
</tbody>
</table>

**TABLE 2.1 Problem ratings**

Then, the Figure 2.1 shows more graphically the results, allowing us to see easily which the most relevant problems are.
Table 2.2 and Figure 2.2 show the difference between all the solutions proposed. As we can see, a Mobile App is, with difference, the most popular between the students. In order to understand better these results, it is recommendable to see the Appendix I, section I, question 10: “What tool could be interesting to have in order to improve your stay in campus.”
Solution
Bearing in mind the problems presented above and the solution preferred by the main part of the students, it would be necessary to evaluate the following aspects. The main aim of this research is to bring a solution that could be used by the main part of students considering the available resources.

- Devices owned by students. (Figure 2.3)
- Most popular Operative Systems. (Figure 2.4)
- Predisposition to pay by Internet. (Figure 2.5)
- Importance of LNU and MyMoodle for students. (Figure 2.6)
- Average of the different possible features. (Figure 2.7)

Devices owned by students

![Own Smartphone](Image)

**FIGURE 2.3 DEVICES OWNED BY STUDENTS**

Figure 2.3 shows us the presence of smartphones and tablets in our international students’ life. As we can see, almost everybody has smartphone and the tablet is also a frequent device among them, owned for almost 1 out of 2.

Most popular operating systems

![Used OS in Smartphone](Image)

**FIGURE 2.4 MOST POPULAR OS**
Figure 2.4 allows us to understand that Android OS is with difference, the most used operative system in mobile devices (Smartphones and Tablets). As we can see, 3 out of 4 devices owned by the respondents are powered by Android.

Importance of www.lnu.se and mymoodle.lnu.se for students

As we can see in Figure 2.5, students consider that lnu.se and myMoodle are important tools for their lectures. Hence, it could be very interesting to link the app with these two webpages. In order to understand better these results, it is recommendable to see the Appendix I, section 2, question 11:” Rate the importance of mymoodle.lnu.se for you “. And Appendix I, section 2, question 12: “Rate the importance of www.lnu.se for you.” The rating is between 1 and 5, where 1 means that there is no importance and 5 means that the website is very important for the student.

Students that have paid once by Internet

As we can see in Figure 2.6, 99% of students have paid once by Internet.
Figure 2.6 allows seeing that every exchange students have already paid at least once by internet. The concept of payment is not the most important aspect to know here. With the question proposed: “Have you ever paid by Internet?” (Found at Appendix I, section II, question 10) we want to understand predisposition that students have for paying by internet. Hence, now we can confirm that it could be useful to add features to the solution that include paying by internet.

Average ratings of different possible features

![Average ratings of possible features](image)

**FIGURE 2.7 AVG. RATINGS OF POSSIBLE FEATURES**

Figure 2.7 shows the most voted possible features the solution could have. As we can see, the features coloured in green are the most interesting for the requested people. The rating is between 1 and 5, where 1 means that there is no importance and 5 means that the feature is very important for the student. For more details, it is recommendable to see the Appendix I, section 2, question 14: “If you would imagine having an app on your smartphone for supporting your life as a student, what features would you like to have?”

2.2.2 Interview results

**People answered: 5**

**Description of the target:** The target of the interviews is a part of Växjo International Students (VIS) members. All the VIS members are evolved with international people and know perfectly what the main problems are. All of them are between 18 and 25 and they come from different countries (including Sweden too).

**Problems**

Looking at the responses offered by the VIS members, we can summarize the main problems in the following groups.

- Too much time and people is needed for signups (trips and important events)
- Sometimes there are sold outs.
- Difficult to make happy everybody.
- Lack of communication between members can cause misunderstood.
- Difficulty to listen all the students related to VIS.
Sometimes the VIS members are too busy (studying and working for VIS).

**Solutions**
From these responses we can also extract what solutions could be interesting.
- Some solution to give "instantaneous" information to people for trips, and other events.
- A system for giving feedback about VIS Leaders in each event.
- Create an App for send out information to all the international students.

### 2.2.3 Focus group
All students agree that they have a strong dependency of its smartphone. That means they feel uncomfortable when they forget it at home or when their battery ends. We have concluded that Smartphones make our lives easier, that is because we miss them when they are unavailable.

Talking about the downloaded apps, the most popular among the students are social networks like Facebook or Twitter, also Gmail and other Google tools. Apart of these, also we must highlight games and other organization tools like calendars, reminders or alarms.

The most common online resources are the two websites related with the university (www.lne.se and www.mymoodle.lnu.se). Both websites are very popular because they are indispensable for following courses, registering exams, seeing our timetable, and so on. Furthermore, other interesting tools for students are email, virtual calendars and academic tools. Finally, the different sites for buying trips like flights, booking hotels or even the most important VIS trips, directly boughts to the agency.

As we have seen in section 2.2, students use to complain about the number of cards and the large time they spent in lines. Furthermore, many students suggested that they felt really alone until around the third week after their arrival.

Looking for a possible solution all students think that a Smartphone app could be the best solution for the different found problems because all of them have access to it. The application has to be usable and intuitive, with a good user experience feeling. About the possible features, the app should have all the necessary characteristics for solving the biggest part of the problems or almost all. The purposed characteristics from the students are:
- Having all cards in the phone
- Possibility of buying events
- Basic information about students

For more information, look at Appendix II, section III: Focus group results.

### 2.3 Conclusion extraction
At this point, we are able to respond to the questions proposed above. Divided into problem and solution, these responses are based on the research methods as the questionnaire, interviews and focus group.

#### 2.3.1 Problem responses
1. *What are the main issues for international students at LNU?*
   - Number of cards
   - Interesting locations
   - Booking and paying VIS trips
   - Meeting new people.
2. What kind of solution would you find more useful for these problems? (Paper guide, personal guide, app…)

According to the results obtained from the three different surveys, the most adequate solution would be a Smartphone App. The qualitative and quantitative information extracted show that the target considers this solution as the most useful. In the next chapter we will find a better approach about the chosen solution.

3. What is the level of importance of the VIS for the international students?

The VIS is very important for the international students. Forming part of Erasmus Student Network (ESN) organization is the biggest organization for international students in Linnaeus University.

4. What are the VIS main organization problems?

The main problems obtained from the surveys are:

- Too much time and people is needed for signups.
- Sometimes there are sold outs.
- Lack of communication between members can cause misunderstandings.
- Sometimes the VIS members are too busy (studying and working for VIS).

5. Do the students have problems that VIS should solve?

There is not any concrete problem that the VIS should solve; they are not directly responsible about these issues. Nonetheless, VIS is a very important organization and very useful for the international students. Hence, if it is capable to solve some issues, it will be interesting that they try so.

6. Other interesting suggestions.

No information was given by the respondents.

2.3.2 Solution responses

1. Is the relationship between new technologies and international students sufficiently close considering them helpful to solve these problems?

Yes, the relationship between new technologies and the students is really close. Virtually all students (99%) have smartphone and Internet connection. Furthermore, they admit that they are almost every day depending on its Smartphone, computer or other electronic devices.

2. It is possible to help the international students with new technologies? How?

Yes it is. The new technologies are really flexible and powerful, that is because they can help to daily life of the students. A solution that fits and would be able to solve a big part of the problems could be a Smartphone App.
3. **What are the most useful widgets for an international student?**
   According with the questionnaire results, we can identify the most important features that an App should contain:
   - Student timetable.
   - My student cards.
   - Campus map & interesting places.
   - Booking VIS events.
   - Exams calendar.

4. **What percentage of international students will have access to the solution purposed? Is this enough?**
   Bearing in mind that the 99% of students have Smartphone and a 74% of these use Android, almost a 3 out of 4 (73,26%) of the students would be able to use the solution. By the moment, this rate is more than enough. Furthermore, if the solution has a good acceptance, it could be possible to develop it for iOS and Windows Phone, arriving almost at 100% of the students.

5. **What will be the main connection restrictions to use the app? (Wifi -> place, 3G -> speed, data quota...)**
   All students have Wi-Fi connection provided by the university; hence the data quota is not going to be a big issue. In case that a big amount of data would be necessary, it could be possible to recommend the student to connect the university network. Otherwise, all international students receive a Telia SIM Card with free Internet. This connection allows 500MB of download (high speed) each month and the rest is in low speed. In conclusion, there are no connection restrictions to use the app.

6. **Is a payment gateway going to be useful in order to speed up some process? (Booking VIS trips, getting memberships, buying entrance for special events...)**
   According to the students’ needs and according to the VIS members’ responses, a payment gateway would be really useful in order to improve the VIS organization and reduce the caused lines, sold outs…
   Furthermore, a 99% of the requested students have paid at least once by Internet. That means they feel comfortable with this way of payment, what guaranties that they will use it.

7. **Will be useful to link this app with LNU website and My Moodle?**
   Looking at the importance of the Lnu website (3,7/5) and My Moodle (3,3/5) for students, it will be very useful to link this app with both websites.

8. **Could be helpful an App to improve the VIS organization? How?**
   A Smartphone App would be very useful in order to improve the VIS organization. Having in count the members’ responses, it could be interesting to improve the VIS communication, reduce lines and reduce the members’ workload.
9. Considering the international students’ needs, do you think that an App could help you to solve them? How?
   As we have seen, the students have needs that can be solved perfectly by a Smartphone App. It is perfectly attainable to provide a timetable, group all the student cards in one, show the most interesting places, book and pay VIS trips or show exams calendar in each student smartphone.

10. Other interesting suggestions.
    No information was given by the respondents.
3. Problem Summary
The research described in the previous section allowed us to identify a number of actual problems. It is possible to group the issues in five big categories.

1. Number of cards
2. Interesting locations
3. Booking and paying VIS events
4. Meeting new people.
5. Too long lines

To understand each one of them in detail they will be fully explained in the following sections.

3.1 Number of cards
As we can see in the surveys of the previous section, an important part of the students are annoyed by the different cards they must wear in their wallets. In fact, every international student has to own at least 4 cards.

3.1.1 Linneestudenterna card
The Linneestudenterna card is the most important card in LNU. Shown in the Figure 3.1, you can find the basic data about each student, like full name, security number and so on. Its main function is to identify each student as a LNU student. Furthermore, it has secondary functions like permitting entrance at campus clubs (Sivans and Slotts-Stallarna), having discounts in public transport, food chains and other.

3.1.2 Växjö International Students (VIS) card
The VIS card identifies each student as International Exchange Erasmus Student Network (IESN) member. As we can see in the Figure 3.2, there is the main information like full name, security number, nationality and their host university. This card is also very important because it allows to the international students to enjoy different privileges like the VIS trips, and preference to other important events like welcome dinner, VIS sports Saturdays, etc.

![FIGURE 3.1 LINNEESTUDENTERNAS CARD](image)

![FIGURE 3.2 VIS CARD](image)
3.1.3 LNU card
The LNU card allows the students to enter at the university in hour out of lectures. As we can see in the Figure 3.3, it does not show any personal data from the student. However, only his owner can use it because to use the university installations is necessary to have a personal pin code.

![LNU Card](image1)

**FIGURE 3.3 LNU CARD**

3.1.4 LNU Library card
The LNU Library card is also a yellow card that allows booking books to students in order to use the best resources for their projects (shown in Figure 3.4). Depending on the demand of the book, there could be more or less time to return it.

![LNU Library Card](image2)

**FIGURE 3.4 LNU LIBRARY CARD**

3.1.5 Nation cards
Nation cards are another way of documentation in the campus. However, this card, only means that you are part of a big organization. Normally, the nations have similar events, and advantages. Furthermore, showing it at Sivan’s before entrance, there is an important discount to enter. Depending on the nation, the card can be replaced by a sticker. Figure 3.5 shows the Smålands nation card.

![Nation Card](image3)

**FIGURE 3.5 SMÅLANDS NATION CARD**
3.2 Interesting locations
The research results show that students have a big interest in knowing different useful places in their daily environment. The biggest part of the sites is in the campus, but there are also lot of interesting places in the city centre.

3.2.1 On campus
Once the students arrive to the campus they use to have some orientation problems. They need to know where they are and where they have to go. The first day it is very important to know about their dorm room or apartment. The following days, in order to join the important and welcome events, the students must know where the important buildings are (K-Building, IKEA-Room, M-building, and so on). Some days later, when the course starts, the students will need to know where their lectures will be. It is important to know that the classrooms are situated in different buildings and different floors. Hence, the students get lost easily. A part of these basic locations, the students would like to know other interesting places like the Library, Pressbyrån, Gym, VIS office, the campus pubs, and so on.

3.2.2 Out of campus
A part of the campus life, the students also want to know how big Växjö is and what opportunities it offers. To know this, they need to know where the closest bus stations are and also they will like to have some information about the different bus lines. Talking about other interesting places outside the campus, the students would like to know where they can buy groceries (ICA, Willy’s, Lidl) and other necessary shops (City gross, Mediamarkt…). Furthermore, some students have asked for System Bolaguet, the central train station or a big mall like Grand Samarkand.

3.3 Trips and important events
The Växjö International Students (VIS) association organizes every semester a large variety of events. Most events are destined to international students, however there are some events available to non-international people. We can classify this events in trips and university events.

3.3.1 VIS Trips
The VIS trips are one of the most important events for international students. For this reason they have presented several suggestions in order to improve the process of booking and paying. Currently, the main problem is that they have to go to VIS office located on the Tufvan Coffee building and book personally each trip. Due to this, lot of students have complained about the lines (usually more than one hour) for booking just one trip. Furthermore, some students have complained about the main trips have to be booked before October. This implies that they have to pay a big amount of money in one time.

3.3.2 Important events
All events like welcome dinner, buddy mingle, VIS parties and so on must be considered. Some students complain about they are not always informed, or they are too late informed, missing some of this events. As the previous problem, some events that they must pay generate several lines, for paying the ticket.
3.3.3 Payment methods
The unique way to pay the trips and important events is cash. This issue is also a problem for main students. Most of them would like to pay by credit card, Internet or even by bank transfer.

3.3.4 Sold outs
The number of places for the events and trips is very difficult to calculate. Hence, many times there are several sold outs. This issue should be treated because it is a big problem for the students, especially for those that they will be only one semester in Sweden.

3.4 Meeting new people
Bearing in mind that the principal aim of the Erasmus program is to internationalize students, it is very important that they have the maximum ways to create new circles and connections. Currently, there exist lots of ways to socialize them, like organized events (Welcome dinner, Buddy mingle, Sports Saturdays…), amusing trips (Gotland, Russia, Stockholm…) and others (campus life, lectures, pubs…).

However, many students suggested that they felt really alone until around the third week since their arrival. The main reason it is because when the students arrive, the course hasn’t started yet, and there are not too many activities to do.

3.5 Too long lines
Another important problem is the time that students have to wait in the line. Many students are surprised about that they have to wait too much time for doing some things that could be automatic, or at least faster.

3.5.1 Bureaucratic process
The first weeks on the campus, all students have a large bureaucratic process to solve. The problem arrives when the administration has to manage 500 students in one or two days. This fact generates lot of waiting times at the lines.

3.5.2 Pubs entrance
Another big problem related with lines is the entrance to the students’ pubs. Usually it takes between thirty minutes and one hour to enter in the pubs. That’s caused for the numerous people who want to enter at the same time. Furthermore, we have to bear in mind the fact than when the pubs are full, the line doesn’t move until people from inside leaves the disco.

3.5.3 Shopping at VIS Office
As we have seen before, the tickets for the different events are a big trouble for the VIS organizers and for the students. Usually, there are a lot of people who wants to participate in events. Furthermore, the tickets are sold only on Tuesdays between 11h and 14h. Hence, during this period, the VIS office is really crowded by the people who want to buy these tickets.
3.6 Main Consequences
There are a lot of consequences that can be derived from the problems presented above. Then we can see the following:

Firstly, having too much cards, a part of being annoying, it increases the possibility of losing some of them. Then, once the card is lost, the university must provide another card to the student and try to inactivate the lost one, generating an extra cost.

Secondly, when the students do not know the most interesting places, where the main buildings, or even some lectures are they can have problems. If the place is out of campus, they can get lost in the city and if the place is in on campus, they can lose their lecture or be in late.

Talking about the VIS events assistance, there are different possible consequences, depending on where the problem is:

- **Sold outs**: Students lose the opportunity of visiting the place again.
- **Paying by cash**: Some people has to pay an extra amount for taking money in cash wasting their losing money.
- **Lines**: People get angry and sometimes decide to not book the trip for not doing 1 hour of line. Furthermore, VIS members are affected by losing their personal time selling tickets.

3.7 Potential benefits
The potential benefits the solution can offer to the students are important. If the app could solve all of the presented problems the main consequences (described above) would be avoided, improving the exchange experience for the students.

By improving its experience, the students will have better relationship with Linnaeus University, increasing the possibilities of having good academic results. Furthermore, a good feedback to their host universities will increase the possibilities of keep receiving exchange students.
4. Software development
As we concluded in the previous section many of the described problems could be solved with the help of software based solutions. But prior discussion the solutions themselves, we want to provide some background regarding the development of software systems. This includes a general discussion of processes and technologies.

4.1.1 Processes of analysis and synthesis
Currently, there exist large and complicated problems, hence we must start investigating and understanding the nature of each problem. To achieve this, it is sometimes necessary to break the problem into small parts and try to deal with each smaller sub problems. This practice is called the analysis, and it is illustrated in Figure 4.1. Once the analysis is done, the synthesis process will start. This is the reverse process that helps us to solve the main problem by solving each of the small sub problems. The process of synthesis is shown in Figure 4.2.

(Pfleeger, 2006:3)

Having a look to the previous section, it is possible to identify the process of analysis when the problem is divided into five different categories.

P: Main problem
   P1: Number of cards
   P2: Interesting locations
   P3: Booking and paying VIS events
   P4: Meeting new people,
   P5: Too long lines.

Hence, the process of synthesis is found when creating the solution. In this case, the solution will have different sub-solutions (use cases) in order to solve the problem separately.

S: Main solution
   S1: Number of cards
   S2: Interesting locations
   S3: Booking and paying VIS events
   S4: Meeting new people,

   ...
4.1.2 Phased development: Incremental and iterative

The most used approach in software development is based in increments. (Qmetry, n.d.) Incremental development wants to develop an initial implementation, exposing this to user comments and giving different versions depending on the user feedback. Specification, development and validation are interleaved, obtaining a rapid feedback across activities. In Figure 4.3 there is a simple schema about this approach.

![FIGURE 4.3 INCREMENTAL DEVELOPMENT](Sommerville, 2009 : p. 33)

Talking about iterative development, it is most related with agile methodologies, so it is starting to be really popular. Iterative development offers more flexibility and allows to designers being more adaptive to changes. It is recommended in huge projects, where the requirements are not clearly defined.

![FIGURE 4.4 ITERATIVE DEVELOPMENT](Pfleeger, 2006: p. 55 - 57)

In Figure 4.4 the basic idea is shown. After the initial planning of the project, there will be a determined number of iterations composed by planning, requirements, analysis and design, implementation, testing and evaluation. These sub processes will allow completing the project iterating until the solution is finished. Finally, after the last iteration, the deployment arrives.

In fact, incremental and iterative are similar approaches. Each method can be more focused in one or in other. The main aim is allow software engineers have real feedback from customers in order to create the perfect solution. In order to understand better what the main difference between both is, Figure 4.5 gives an example of these approaches in other field like art.
Incremental approach

Iterative approach

FIGURE 4.5 INCREMENTAL VS. ITERATIVE APPROACHES  
(QCon, n.d.)

As we can see, both approaches have the same final result. However, the intermediate results are different. In incremental approach, each phase ends with some parts of the painting completely ended, while others are without starting. Nonetheless, in iterative approach the phases are more general. At the end of each one, a partial part of the whole solution is improved.

4.2 Methods to develop software

As all complicated matters, correct developing software implies a correct plan and a correct management. There exist two big groups to classify the different methods used by software engineers; plan driven methods and agile methods.

4.2.1 Plan driven methods

During the last years, software developers are used to apply the traditional sequential lifecycle model. That includes rigorous planning, design upfront and a constant care in order to ensure the proposed plan. Shown at Figure 4.6, it has served for many software development projects finish successfully.

(Nyfjord, 2008: p. 48)

FIGURE 4.6 PLAN DRIVEN DEVELOPMENT  
(Sommerville, 2009: p. 63)

Waterfall model

This is the first and most used models to develop software, it appeared at the 70’s derived from other business models. It is also known as the software lifecycle and it is the most popular example of plan driven methods; before beginning the development, it must be a large plan and schedule of all the process.

(Sommerville, 2009: p. 30-31)
Spiral model
In this model, the software development process is represented as a spiral. Hence, each loop in the spiral represents a phase in the development. This model is very used when the priority is to reduce risks during the development. The phases are the same than in waterfall mode, but the order is different. The Figure 4.8 illustrates the main idea of spiral model.

Prototyping model
Prototyping model, shown at Figure 4.9, allows the system to be constructed fast in order to understand and clarify the arriving problems. The main goal is reducing risks and uncertainly in development.
4.2.2 Agile Methods

"Agile development appeared with the premise that software development is too complex and unpredictable to be planned exactly upfront and in advance."

(Nyfjord, 2008: p. 48)

Agile development is based on the practices of iterative and incremental development, where the most important values are simplicity. Agile methodologies emphasize the face-to-face communication rather than written documentation, used in the plan driven methods. In order to manage unpredictability, the agile methodologies make quick feedback loops during the whole process.

A software process is going to be considered agile it must be iterative, incremental, simple and adaptive.

(Nyfjord, 2008: p. 48)

![Diagram of Agile Methodology](image1)

**FIGURE 4.10 AGILE METHODOLOGY**

(Sommerville, 2009: p. 63)

**Scrum**

The Scrum methodology is one of the most common agile methodologies. It is a very young methodology in computing, but is based in industrial process control theory. The most important premise for scrum is that some work processes cannot be always controlled or always defined. Shown in Figure 4.11, the lower circle represents an iteration that contains backlogs (requirements for the current iteration). It will be necessary to make as iterations as necessary until the project is not finished.

(Nyfjord, 2008: p. 50)

![Diagram of Scrum Methodology](image2)

**FIGURE 4.11 SCRUM METHODOLOGY**

(CPrime, n.d.)
**Extreme programming**

One of the most popular agile methodologies, as scrum, is Extreme Programming (XP). Represented in the Figure 4.12, XP is based in small iterations; two weeks approximately. The iteration will end when the customer presents its approval before releasing the functionality.

(Nyfjord, 2008: p. 50)

![Extreme Programming Methodology](image)

**FIGURE 4.12 EXTREME PROGRAMMING METHODOLOGY**

(Extreme Programming, n.d.)

**Adaptive software development (ASD)**

ASD is another common methodology based in the features are the crux of customer value. At the same time, risk is embraced in order to allow the developers handle the hardest problems first.

![Adaptive Software Development](image)

**FIGURE 4.13 ADAPTIVE SOFTWARE DEVELOPMENT**

(Pfleeger, 2006: p. 60)

4.3 **Summary of methods**

In conclusion, just the parts which fit the restrictions of the development are used. Having in count that there is only one developer and just one month left to program, the most appropriate methodology is an Agile (because it allows a fast start and it is dynamic) but using the waterfall model for each iteration (it offers stability and it assures results). Hence, the methodology used has been the agile waterfall model.
4.4 Technologies
Currently, there exist several technologies used to develop software. Programming depends on many factors like the target, the language used or the resources own by the developer. For example, if a big company needs a huge system for control all the business processes, it will require more powerful technologies and a big developing team. Nonetheless, if a small company wants to develop a website in order to be present in Internet, the resources and technologies will be cheaper.

4.4.1 Main technologies
In this paragraph, the most used languages and frameworks for programming this project will be shown. There exist hundreds of technologies giving different options for programming.

Objective-C
Objective-C is an Object Oriented programming language created as a superset of C in order to implement an object model. Currently, is used as the main language to develop in MAC OS X and iOS. The following source code shows the **Hello World** in Objective-C.

```
int main( int argc, const char *argv[] )
{
    NSLog( @"Hello World\n" );
    return 0;
}
```

In conclusion, the C family is a huge family that currently allows thousands of systems working as the programmers want. The next figure shows a Venn diagram in order to understand the main difference between extension and superset. In red, C++ as an extension of C, implements a big part of C. However, in blue, Objective-C, as a superset of C, implements all features of C and its extensions.
Java

Java language was originally developed by James Gosling and published in 1995 as a core component Java platform (from Sun Microsystems). Java syntax comes from C and C++, but it has more facilities than them. It is a programming language with general purpose and object oriented. The main objective of Java is having the least implementation dependences as it is possible.

The next source code shows the typical *Hello World* in Java.

```java
public class HelloWorld {
    public static void main(String[] args) {
        System.out.println("Hello, World");
    }
}
```

As we can see, the syntax is very similar. Nonetheless, in the next table we find some significant differences between C family and Java.

<table>
<thead>
<tr>
<th></th>
<th>C Family</th>
<th>Java</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compatibility</td>
<td>All C source code</td>
<td>Java and C family (Java Native Interface)</td>
</tr>
<tr>
<td>Compilation</td>
<td>WORA</td>
<td>WORA / WORE</td>
</tr>
<tr>
<td>Paradigm</td>
<td>Procedural, functional, object-oriented and generic programming</td>
<td>Object-oriented and generic programming</td>
</tr>
<tr>
<td>Execution</td>
<td>Native executable machine</td>
<td>Virtual machine</td>
</tr>
<tr>
<td>Data management</td>
<td>Supports pointers, references and values</td>
<td>Supports only values</td>
</tr>
<tr>
<td>Memory management</td>
<td>Allows the programmer to manage the memory.</td>
<td>Automatic garbage collector</td>
</tr>
<tr>
<td>Inheritance</td>
<td>Multiple inheritance</td>
<td>Only single inheritance</td>
</tr>
</tbody>
</table>

**TABLE 4.1 C FAMILY AND JAVA COMPARISON**

4.4.2 Language selection and motivation

For the developed solution I am going to take Java. I have chosen Java, basically because is the main language for programming Android devices. Furthermore, it is more useful to program with Object-oriented and single inheritance. Finally, another important good characteristic of Java is that is higher level than C Family. Hence, it is easier for the developer to program it.
4.4.3 Mobile technologies

In this section we are going to talk about the mobile technologies. This kind of technologies appeared just 16 years ago at the same time than Smartphone devices (at 1997 Ericsson created GS 88 “Penelope” concept).

(Cordes, n.d.)

It is important to say that a Smartphone is considered as a computer because the main devices have all the components for being a computer. The only difference is the size and the performance of these components. For this reason, software engineers are required to develop mobile applications. The Oxford dictionary has the following definition for the term smartphone:

“A mobile phone that is able to perform many of the functions of a computer, typically having a relatively large screen and an operating system capable of running general-purpose applications.”

(Oxford University, n.d.)

As we said before, the technology used is in big part defined by the devices used. Hence, depending on the Operative System of each device, the technologies used to develop the software will be different. In the next figure (Figure 4.15), we represent the world’s operating system share from the last year.

This data is been obtained from the International Data Corporation and it helps us to know what are the most important Smartphone Operating Systems on the world.

International Data Corporation (IDC Corporate USA, n.d.)

![OS world's share in 2012](image)

**FIGURE 4.15 SMARTPHONE OS WORLD'S SHARE IN 2012**

As we can see, Android OS leads the market (68% of share), followed by Apple’s OS (17% of the share). The resting 9% of the market is own by Windows Phone, Blackberry (RIM OS) and Symbian.

Having in count the previous results, the most important Operative Systems should be shown.
Android

“Android powers hundreds of millions of mobile devices in more than 190 countries around the world. It’s the largest installed base of any mobile platform and growing fast—every day another million users power up their Android devices for the first time and start looking for apps, games, and other digital content.” (Google Inc., n.d.)

FIGURE 4.16 ANDROID SCREENSHOTS

Android OS is an operative system developed by Google Inc. It is strictly destined to smartphone and tablet devices. This operative system is the most popular around the world due to its flexibility and adaptability to main devices. Android is currently running on the main device brands like Samsung, Motorola, HTC, Sony, Huawei, etc.

In the Figure 4.16 we can see a screenshot of the last working version, Android 4.2 Jellybean.

Developing in Android is possible to all users. It does not require any developer license; hence it is cheaper and more available to develop than other technologies. Furthermore, the language for developing is Java, but with some restrictions. It is important to bear in mind that a smartphone is not as powerful as a computer, so the possibilities are less than in a computer.

The framework required is also free and it is completely available in the official page (http://developer.android.com). In the Figure 4.17 we can see an example of “Hello World” programmed in Eclipse and tested on the AVD Emulator.

FIGURE 4.17 ANDROID DEVELOPMENT FRAMEWORK
iOS

"The world’s most advanced mobile OS. With an easy-to-use interface, amazing features, and security at its core, iOS 7 is the foundation of iPhone, iPad, and iPod touch. It’s designed to look beautiful and work beautifully, so even the simplest tasks are more engaging. And because iOS 7 is engineered to take full advantage of the advanced technologies built into Apple hardware, your devices are always years ahead“

(Apple Inc., n.d.)

FIGURE 4.18 iOS SCREENSHOTS

iOS is an operative system developed by Apple Inc. It is strictly destined to smartphone and tablet devices created by Apple (iPhone, iPad, iPad Mini...). This operative system is very popular around the world due to it is strictly necessary to run Apple devices. In the Figure 4.18 we can see three screenshots of the last working version, iOS 7.

Developing in iOS is not available to everybody. The framework is available for free but is necessary to have a developer licence if we want to make our app available in iStore. Furthermore, if we want to develop, it is strictly necessary to have a computer running in Mac OS (like iMac, MacBook,, and so on) because this framework does not work in other operating systems.

The development is made in Objective C, a superset of C language, specially used to develop for iOS. It is also Object Oriented as Java, but in a lower level. (Apple Inc., n.d.) In the next figure (Figure 4.19) an example of iOS development with xCode and an iPhone emulator is shown.

FIGURE 4.19 IOS DEVELOPMENT FRAMEWORK

28
Windows Phone

Meet the world's most personal smartphone

Your Windows Phone comes alive with the things you care about. People, places, songs, photos, and apps automatically update right on your Start screen. Plus, SkyDrive is built in, so you can take your stuff with you wherever you go. The result? A screen that's as unique as you are.

FIGURE 4.20 WINDOWS PHONE SCREENSHOTS

Windows Phone is an operative system developed by Microsoft Corporation. Currently it has agreements with device manufacturers like Nokia, HTC, Huawei and Samsung. These companies produce devices working in Windows Phone.

By the moment, Windows Phone has not as popularity as Android or iOS, but it is very important to bear it in mind because it is created by Microsoft, one of the biggest software companies in the world. In fact, Windows Phone has one characteristic that others do not have. Currently, Microsoft is creating a system that will allow having the same interface in Mobiles, Personal Computers, Tablets, Video Consoles (Xbox) and even TVs (Metro Interface). Hence, in a few years, Windows Metro Interface will allow to create apps working at Smartphones, Tablets, PCs and even TV's.

Developing in Window Phone is not available to everybody. The framework is available for free but is necessary to have a developer licence from Microsoft if we want to make our app available in Windows Market. Furthermore, if you want to develop, it is strictly necessary to have a computer running in Windows because this framework does not work in other operating systems. In the Figure 4.21 an example of developing framework for Windows Phone is shown.

(Microsoft Corporation, n.d.)
To summarize, there are three big smartphone operating systems we must take into account. If we look at the frameworks, it could seem that they are very similar, but there are several differences. In the next table (Table 4.2) is a fast overview and comparison between both.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Android</th>
<th>iOS</th>
<th>Windows Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language</td>
<td>C, C++, Java</td>
<td>C, C++, Objective C</td>
<td>C, C++</td>
</tr>
<tr>
<td>Core</td>
<td>Linux</td>
<td>Linux</td>
<td>Microsoft Mobile</td>
</tr>
<tr>
<td>Source model</td>
<td>Open source</td>
<td>Closed source</td>
<td>Closed source</td>
</tr>
<tr>
<td>Language availability</td>
<td>46 languages</td>
<td>34 languages</td>
<td>25 languages</td>
</tr>
<tr>
<td>Development compatibility</td>
<td>All Operating Systems</td>
<td>Apple OS</td>
<td>Windows</td>
</tr>
<tr>
<td>Brand value</td>
<td>Interoperability</td>
<td>Exclusivity</td>
<td>Customizability</td>
</tr>
</tbody>
</table>

**TABLE 4.2 COMPARISON BETWEEN ANDROID, IOS AND WINDOWS PHONE**

Bearing in mind all of the research results and my knowledge, I decided to select Android OS as my priority to develop the application. Hence, the solution is going to work just in Android devices.

For a well performance of this application, the Smartphone or Tablet will need to achieve the following technological requirements.

- **Android Operating System**: The device must be based in Android technology, otherwise it will be impossible to execute.
- **Internet connection**: An Internet connection will be necessary to execute an important part of the functionalities like login, events booking, etc.
- **Global Positioning System**: A positioning via GPS will help our application to help the user to find some interesting places in their new country.
5. Overall structure of the solution
After evaluating the different surveys and research methods that the involved students have answered, it is time to start developing the most adequate solution to all problems exposed previously.

5.1 Introduction
In order to find the best solution, it is important to bear in mind all the conclusions extracted above. We can divide the different types of solution in three main possibilities:

1. Smartphone App
2. Personal guide
3. Paper guide

The chosen solution will be the first one. A Smartphone application is able to achieve most the purposed requirements. But, why is the first solution better than the other ones? In fact, the other two possibilities could be also useful for students. However, these solutions have more disadvantages than a Smartphone app.

Talking about a personal guide, the main problem is that it requires a big quantity of resources. The resources required are human (we would need almost one guide for each student) and of course, the economic resources (because every guide needs to be paid). Furthermore, there already exists the buddy program that can be quite similar to this idea. Every international student can get a buddy in order to be helped during the whole semester, but especially during the arrival days. A buddy is a Swedish student who is in charge of one or more international students and helps them voluntarily.

On the other hand, a paper guide would be cheaper than the other two solutions, but it also would be less useful and more expensive in a long term. It would be less useful because a sheet of paper is a static item and difficult to update, and it can’t be useful depending on some situations. Moreover, in a long term will be expensive to print a complete paper guide for each international student.

Finally, an app is dynamic, it can offer different characteristics that a sheet of paper can’t, like interactive map (provided by GPS), push notifications, instantaneous information, paying by Internet, and so on.

To summarize, the best solution is a Smartphone App, because of the usefulness, dynamism and availability (the most of students will have access to it).

5.2 Main description
The solution will have at least the following features.

5.2.1 User management
This category is necessary for keeping the user logged in, see the profile information and also log out. It is important to say that is not going to be possible to register and it is not going to be possible to edit the profiles. This app will have only reading permissions to the LNU’s database, hence, the registration and edition will be responsibility of the current system. Hence, we can distinguish three main features:

- Login
- Logout
- My profile
5.2.2 My timetable
This category is a very popular category between the students, not only international. The student timetable is very useful to know at the moment what is the following lecture, to know if it is mandatory, or know what is the classroom, etc. In this case, only one use case must be developed.
- View my timetable

By clicking to this option, the user will have a dynamic timetable, showing the current and upcoming lectures. The timetable will be visual offering different colours depending on the subject, and showing the most important data (classroom, name of the subject…).

5.2.3 My student cards
The option of having all the student cards in just one app is very wanted for the students at LNU. This feature will be able to show the different student cards through the Smartphone display, like if it was the real card. By this way, users do not need to wear five cards always in the wallet, increasing the commodity and reducing the risk of losing these cards. The main use cases must coincide with the different existing cards:
- View list of cards
- View Linnestudenterna card
- View VIS card
- View LNU card
- View Library card
- View Nation card

Add and delete options will not be available because there is not possible to add cards by each student due to hardware issues. It would be needed a scanner or any similar way to import images. The camera will not be enough. The responsibly of providing valid image of the card would be for the same organization who provides the physical card.

5.2.4 Interesting places
It is very important for students knowing where the most interesting places are, concretely when they are new at LNU. This option will give the opportunity of showing the map of the zone, see a list of the most interesting places (inside and outside the campus), showing these places in the map and finally it will allow to search for concrete rooms and sites. Hence, the use cases would be:
- View map
- Search direction or place
- View interesting places list
- View interesting place in the map

5.2.5 VIS events
The events organized from the VIS are one of the most important aspects for the exchange students. The main objective of this app is to group all organized events and allow the student to see the main information of each event, booking by Internet, or even make a pre-booking (for expensive trips). Furthermore, it will have the possibility of view in the list of past and incoming events. There are the use cases it should contain:
- View events list
- View event information
- Book event
- Pre-book event

5.2.6 My exams
Some international students are not used to register for each exam they have to go. Even if they know that they have to register, sometimes happens that they forget to do it. With this feature, each student will be able to see the exams (and re-examinations) list and will have the possibility to register directly in one click. Furthermore, a push notification some hours before the ending date will be useful to solve the problem explained above. It would be interesting to have the following use cases:
- View exams calendar
- Register exam (confirm assistance)
- Exam register deadline notification

5.2.7 Settings
As the main applications, it is necessary to configure basic settings in order to allow users configuring their preferred language, the sound of the notifications, and so on.
- Set language
- Activate / Inactivate sounds
- Activate / Inactivate vibration

5.3 Developing language
The app for exchange students will be compatible for Android devices. Hence, it will be developed in Java, because it is the primary Android development language.

5.4 Project planning
A good planning is always the key to success in engineering projects. Having in count the time and the human resources we dispose, the project will follow the plan presented below.

5.4.1 Estimated project duration
The estimated project duration is approximately 4 months. The project starts on September 2\textsuperscript{nd}, 2013 and the deadline is on January 16\textsuperscript{th}, 2014 (it corresponds to the autumn semester).

At the end of each stage a meeting with the director of the project will take place in order to analyse the project and confirm that the author is following a good process.

In conclusion, it will be approximately five meetings and the estimation of the dedicated hours per week is 35 hrs. /week. Hence, the project planning is attainable.

5.4.2 Project stages
Bearing in mind the agile methodologies, we can divide the iterations in analysis, implementation, test, integration and preparation for the next iteration. Hence, the project will have the following iterations bearing in mind different resources for each one.

Project definition
In the project definition is very important to choose what the problems we are going to solve are. In order to do it well, it is necessary to have in count the resources
(economical, material, time…) we have. For a good development of the project, the problem has to be correctly defined before starting the following stages.

**Documentation**
The final document of the project is one of the most important deliverables, as well as the implemented part. Document allows the author to explain what is not possible to explain with the source code. Furthermore, it allows the reader to understand what the problem is and have all information related to the project. The documentation part is going to be running at the same time than the other iterations. It is very important to keep the document updated in order to have a good quality product.

**I0 - Initial set up**
This iteration is oriented to prepare the environment and install the necessary frameworks to develop correctly the application. Once all frameworks are installed, it will be necessary to configure them in order to start the next iteration.

Resources needed:
- **Hardware:**
  - Hp EliteBook 8440p
  - Samsung Galaxy S III

- **Software:**
  - Microsoft Windows 8 Professional
  - Eclipse
  - Android SDK
  - Microsoft Project 2013
  - Microsoft Visio 2013

**I1 - Users Management**
In this iteration we are going to analyse, study and develop the use cases of login, logout and view the profile information. Meanwhile, it is important to keep the document updated to possible changes.

**I2 - VIS Events Management**
In this iteration we are going to analyse, study and develop the use cases of view events, view information, booking and pre-booking. Meanwhile, it is important to keep the document updated to possible changes.

**Final stage**
The final stage consists on closing the project development definitively. The report will be provided and finally I will proceed with the final presentation.

To close this project and give a good documentation, the next software will be needed
- Microsoft Office 2013
- Adobe Reader X

**5.4.3 Estimated time of different stages**
In the following table (5.1), an estimated indication of the whole project in hours is shown.
<table>
<thead>
<tr>
<th>Stage</th>
<th>Estimated dedication (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project definition</td>
<td>50</td>
</tr>
<tr>
<td>Documentation</td>
<td>200</td>
</tr>
<tr>
<td>Development</td>
<td>-</td>
</tr>
<tr>
<td>I0 – Initial set up</td>
<td>50</td>
</tr>
<tr>
<td>I1 – Users Management</td>
<td>100</td>
</tr>
<tr>
<td>I2 – VIS Events Management</td>
<td>100</td>
</tr>
<tr>
<td>Final stage</td>
<td>50</td>
</tr>
<tr>
<td>Total</td>
<td>550 hours</td>
</tr>
</tbody>
</table>

**TABLE 5.1 Estimated times of the project stages**
5.4.4  Gant chart

The figure 5.1 shows the planning of the project in a Gant diagram.
5.5 Structure of the solution
As we have seen before, there are many use cases we must develop in order to complete the whole solution. However, due to workload, I am going to develop two categories of use cases, User and VIS events management.

5.5.1 Use cases

**User management**

- **Login**: The user can login session introducing its LNU username and password.
  - **Actor**: User (student)
  - **Pre-conditions**: The user account exists at LNU’s database and the password is correct.
  - **Post-conditions**: The user will log in session.

- **Logout**: The user can logout the current session.
  - **Actor**: User (student)
  - **Pre-conditions**: The user is logged in.
  - **Post-conditions**: The user closes the current session.

- **View profile information**: The user can view his profile information like name, surnames, current courses, and so on.
  - **Actor**: User (student)
  - **Pre-conditions**: The user is logged in.
  - **Post-conditions**: The user can see his profile information.

**VIS Events Management**

- **View list of events**: The user can see the whole list of events.
  - **Actor**: User (student)
  - **Pre-conditions**: The event exists and it is available to students.
  - **Post-conditions**: The user can see the event information.

- **View event information**: The user can see the full information of the event. The most important information is available directly in the app interface. The user can see the place, a brief description, the date of start and end, the price. Furthermore, the rest will be provided by the official Facebook event page, the after movie in YouTube (in case it exists) and an image gallery about the most important activities.
  - **Actor**: User (student)
  - **Pre-conditions**: The event exists and it is available to students.
  - **Post-conditions**: The user can see the event information.
- **Pre-booking event**: After seeing the information, the user can pre-book the event, paying a percentage of the total price.
  - **Actor**: User (student)
  - **Pre-conditions**: The event exists and it is available to students.
  - **Post-conditions**: The user can see the event information and pre-book the event.

- **Booking event**: After seeing the information, the user can book the event, paying the total amount of the price.
  - **Actor**: User (student)
  - **Pre-conditions**: The event exists and it is available to students.
  - **Post-conditions**: The user can see the event information and pre-book the event.

In the Figure 5.2 Use cases diagram, we can see more graphically what the use cases are.

**FIGURE 5.2 USE CASES DIAGRAM**

### 5.5.2 Design model

The User Interface is one of the most important aspects of the application. The presentation layer is what will allow the user to interact with the app, in other words it is what the user will see and touch. Hence, I decided to use the yellow, black and white as main colours in order to create an attractive but formal app and well related with Linnéuniversitetet. The yellow colour helps the user to know that this app is destined to LNU services, and the black and white gives a formal approach to the app.

The figure 5.3 shows some screenshots of the app. As we can see, black, white and yellow are the main colours.
Logotype
The logotype is also important for the app. It is the first thing the user will see about the app, before opening it. As we can see in the figure 5.4, there is the university symbol and name with a yellow round in background. The main title is LNU Assistant. In order to make it short and concise, I have used LNU (in place of Lineeuniversitetet) and the word Assistant because is related to the aim of the app.

FIGURE 5.4 LOGO OF THE APP
**Screen compatibility**

Another important aspect of the design of the app is the full compatibility with large screens. As we have seen in the research process, tablets are also an important widget for students; hence the app must be compatible with them.

To achieve this, the app is developed through Master-Detail activities. As we can see in the figure 5.5, this kind of structures allows the activity being good looking with large screens (more than 7 inches).

![Screen compatibility](image)

**FIGURE 5.5 MASTER - DETAIL FLOW SCHEMA**

In Figure 5.6, the app fits the screen depending on the content. In this case we have non-deep link, the second activity will be shown in the same screen, filling the empty space of the screen. However, when we have deep links, a new activity will start in order to have the whole screen for the new activity.

![Screen compatibility](image)

**FIGURE 5.6 LARGE SCREEN MOCKUPS**
**Mock-ups**

- **Main menu**
  This is the launcher activity of the application. In the main activity we can find the header, an options list and footer. The figure 5.7 shows the important parts described here.

  - **Header**: Shows the symbol of the university and also allows the user to go to the login activity. Once the user is logged, also will show the studies of the user and it will allow him to logout (see Logout mockup).
  
  - **Options list**: The options list allows the user to choose from the different features described above. Each option will open another activity, setting the main menu activity in background.
  
  - **Footer**: The footer shows the main information of the app. There is the name of the author subject that is related to this app. Furthermore, the information icon will inflate an activity with more concrete information of the application.

- **Login**
  The Login activity is necessary to identify the user. Hence, all important information will be always available. The username will be the email direction of the student (example@lnu.se) and the password will be the same than in the student account. Furthermore, the **Keep me logged in** option, will allow the user to keep connected after closing the app. The following figure (5.8) shows graphically the activity through a screenshot.

---

**FIGURE 5.7 MAIN MENU MOCKUP**

**FIGURE 5.8 LOGIN MOCKUP**
- **Logout**
  The logout option is included in the main activity. With just clicking a power icon in the header the user can logout. Once logged out, the icon, the full name and the studies of the user showed in the header will disappear and we will return to the main page. Figure 5.9 shows the logout mockup.

![Logout Mockup](image1)

**FIGURE 5.9 LOGOUT MOCKUP**

- **View profile information**
  Shown in the Figure 5.10, the profile activity contains the basic information of the logged user. The presentation layer has a connection to the database and shows the most important content. In this case, there will be an image available, name, surnames, phone contact and a secondary email.

  The profile would be more complete in case that the database used was the real one from the university. In this case, it is just a simulation with the main fields. However, it could be possible to show the coursing subjects and other information related to the university.

![Profile Mockup](image2)

**FIGURE 5.10 VIEW PROFILE MOCKUP**
• **View VIS Events**
  This activity is the main activity for Events management, described above. As we can see in the figure 5.11, the list contains all the events and trips created by the VIS members. In the list only the event names are shown, but clicking to each event of the list we can see the most important related information.

![FIGURE 5.11 VIEW ALL EVENTS MOCKUP](image)

• **View Event’s information**
  The event information activity allows the user to know the most important aspects of the event. A part of the name, there is a description, the date of the event, the price and shortcuts to have more information. The shortcuts are three buttons, that allow the user arriving to the Facebook event page, to see the after movie (if exists) on YouTube or even show an Image Gallery with relevant pics.

  Furthermore, under these icons, there are two payment buttons. The one in the left side allows the user to pay a percentage of the price, while the other button, in the right side, will allow paying the whole amount of the price. See the figure 5.12 for more information.

![FIGURE 5.12 EVENT INFORMATION MOCKUP](image)
Event’s gallery
Each event has a gallery and allows the user to see some interesting pictures in order to increase his interest on the event. The gallery allows the user to slide each picture or seen all the pictures as a presentation by clicking the play button. In the next figure (5.13) we can appreciate the aspect of two pictures chosen randomly.

Event’s after movie
In the case of the event has an after movie, or an interesting video posted on YouTube, it will be available from the app. By clicking to the play button, the user will be able to reproduce the video. After that, when he finish, he will return to the event information activity being able to see more information or pay booking for the event. The next figure (5.7) shows how the after movie to Northern Lapland looks in YouTube in full screen mode.
- **Event Facebook page**
  
  Finally, the last information the user will be able to see is the official Facebook page. By clicking to the Facebook button on the app, the user will arrive to the official page. The he will have more information like who is going to the event and so on. In this case, the figure 5.15 shows the official Facebook page of the Trip to Northern Lapland.

![FIGURE 5.8 EVENT FACEBOOK PAGE MOCKUP](image)

- **Not implemented Activity**

  One of the biggest problems of this project has been the available time to implement the source code. After doing the main part of the document and the research process, the development occupied a small time of the whole semester. Hence, this activity allows the user (or the examiner in this case) to understand that the activity he is trying to open is not implemented yet. As we can see in the figure 5.16, the page shows a yellow builder working signal with the text “Under construction”.

![FIGURE 5.9 NOT IMPLEMENTED ACTIVITY MOCKUP](image)
- **User creation and list**
  This activity is not going to be available to the users of the app. It is a testing interface that will allow the examiner to verify that the database is well created and perfectly working. Shown in figure 5.17, the examiner will be able to create a user, and after that, try to login session. The main idea of this activity is to demonstrate that the app also would work with the data incoming from an external database (LNU’s database for example).

![Users Creation and List Mockup](image)

**FIGURE 5.10 USERS CREATION AND LIST MOCKUP**

### 5.6 Executable solution
The executable solution is going to solve a part of the problem. A proposal for further work to solve the other parts of the problem will be mentioned in section 6.

#### 5.6.1 Delivered file contents
The deliverable of the project is composed by different documents and files; we can distinguish the following ones.
- Documentation of the project
- Compiled file “LnuAssistant.apk”
- Source code.

#### 5.6.2 Instructions to execute the solution
Open from emulator (virtual device).
1. Open Eclipse
2. Open project…
3. Run project as Java Application

Open from real devices (Smartphones and Tablets)
1. Activate the unknown sources installer.
2. Copy and Install the .apk to the system.
3. Run the App LNU Assistant.

### 5.6.3 Navigational map of the prototype

In the following figure (5.18), there is a schema of the navigational map of the developed part of the solution. Each box in the schema represents a new activity executed in the device.

![Navigational Map Diagram]

**FIGURE 5.11 NAVIGATIONAL MAP**
6. Discussion

Returning to the problem, the difficulties that students have to achieve to adapt themselves in a new environment are numerous. As we have seen in the two first chapters (Introduction and Research) there are issues like housing, knowing available activities and so on. Hence, we have seen that the sub-problems shown at the introduction like bureaucracy and self-organization are a big trouble for students.

Talking about the objectives presented at section 1.2 (Goals and Criteria), the beginning of the document, the main purpose is to confirm that these initially problems are real and furthermore in necessary to try to find some new ones. Then, it is confirmed that this objective is full achieved because, besides confirming the problems presented at the introduction, other problems are found like number of lines, the number of cards or booking VIS events.

The secondary aim is to create a solution that helps to solve at least one of these problems. Furthermore, it should be related with software development. Hence, the goal is also achieved because at least three (3) problem areas are provided and the solution is a functional prototype for one (1) of these problem areas.

Finally, documenting the research, identify the problems and solutions, as well the necessary background for allow other solving the problem. Hence, the third aim is also achieved because all of the points are present at the document.
7. Conclusion

To summarize, different achievements have been achieved during this project. There are different points we can highlight.

Firstly, a well-structured process research has been performed. Different research methods have been employed (like questionnaires, interviews and focus groups) to create adequate surveys for our target.

Hence, it has been possible identifying and separating better the problems in different categories. As we have seen, five different categories are found as the most important problems at LNU (number of cards, interesting locations, booking and paying VIS trips, meeting new people and too long lines). For each of these sub-problems a sub-solution has been performed. Furthermore, a design for the most of the problems has been provided.

In addition, a prototype app has been created focussed just on a selected topic because for timing reasons it was not possible to made the full development.

The result obtained from this project is a functional App for Android devices. The solution allows the user to be connected to the app through the same credentials (username and password) than he uses to login to the university. Furthermore, the other implemented feature will allow the students to pay by Internet the important events organized from the VIS.
References

Bibliographic references


Online references


Appendix I: Finding users requirements
In the first Appendix there are the different surveys used in order to obtain the best results from our target. The main objective of these surveys is to know what the users requirements are. To achieve it, qualitative and quantitative information has been collected through questionnaires, interviews and a focus group.

I. Questionnaire 1:
“Exchange experience: Finding the main problems”.

We would like to ask you to help us by answering the following questions concerning about your exchange experience in Linnaeus University. This is not a test so there are no “right” or “wrong” answers and you don’t even have to write your name. We are interested in your personal opinion. Please, give your answers sincerely, as only this will guarantee the success of the investigation.

1. Knowing about you
In this section we want to know some personal information about you. This information is only for statistical purposes, your identity is completely safe. We would like to know your opinion about some different aspects of this university. In order to improve our services, please, be strict.

1. How old are you? *

- [ ] < 18
- [ ] 18 - 21
- [ ] 22 - 25
- [ ] 26 - 29
- [ ] > 30

2. What is your gender? *
- [ ] Male
- [ ] Female

3. What is your nationality? *
- [ ] Germany
- [ ] Netherlands
- [ ] France
- [ ] Spain
- [ ] Italy
- [ ] Other:______________

4. At which faculty are you studying? *

Linnaeus University
Sweden

Faculty of Technology
SE-391 82 Kalmar | SE-351 95 Växjö
Phone +46 (0)772-28 80 00
teknik@lnu.se
Lnu.se/faculty-of-technology?l=en
Faculty of Technology
Faculty of Economics and Business
Faculty of Arts and Humanities
Faculty of Social Sciences
Faculty of Health and Life Sciences
Board of Education

5. At what level are you studying? *
- Bachelor
- Master

6. Rate the level of organization during the first time you arrived in campus. *
1: Bad 2:Enough 3:As expected 4:Good 5:Perfect

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Poorly organized | | | | | Perfectly organized

7. Rate how much important information you had during the firsts days in campus. *
1: No info 2: A bit 3:Enough 4:Quite 5:Much

<p>| | | | | |</p>
<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

I miss almost all info. | | | | | I had ALL info.

8. Was the buddy program useful for you? *
- Yes, very useful
- No, not really useful
- I didn't used the buddy program

9. Check what have been the main issues you have found in campuslife. *

<table>
<thead>
<tr>
<th></th>
<th>I never had this problem</th>
<th>Sometimes it was a problem</th>
<th>It uses to be a problem</th>
<th>I have this problem almost every day</th>
<th>It is a problem for me every day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Too long lines</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Sivans line, booking events...)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of cards</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Student card, VIS card, Library, LNU...)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impossibility to find some classrooms</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Problems with</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>I never had this problem</td>
<td>Sometimes it was a problem</td>
<td>It uses to be a problem</td>
<td>I have this problem almost every day</td>
<td>It is a problem for me every day</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>--------------------------</td>
<td>-----------------------------</td>
<td>-------------------------</td>
<td>-------------------------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>meeting new people</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication to teachers out of lectures</td>
<td>〇</td>
<td>〇</td>
<td>〇</td>
<td>〇</td>
<td>〇</td>
</tr>
<tr>
<td>Booking VIS trips at Tufvan</td>
<td>〇</td>
<td>〇</td>
<td>〇</td>
<td>〇</td>
<td>〇</td>
</tr>
</tbody>
</table>

10. **What tool could be interesting to have in order to improve your stay in campus?** *
- [ ] Paper guide
- [ ] Personal guide
- [ ] Mobile app
- [ ] Other: __________________________


II. Questionnaire 2

_Exchange experience: Finding the main solutions_

We would like to ask you to help us by answering the following questions concerning your exchange experience in Linnaeus University. This is not a test so there are no “right” or “wrong” answers and you don’t even have to write your name. We are interested in your personal opinion. Please, give your answers sincerely, as only this will guarantee the success of the investigation.

We would like to know what kind of solution will be the best for solve the detected issues.

1. **Knowing about you**
In this section we want to know some personal information about you. This information is only for statistical purposes; your identity is completely safe. We would like to know your opinion about some different aspects of this university. In order to improve our services, please, be strict.

1. **How old are you?** *
   - [ ] < 18
   - [ ] 18 - 21
   - [ ] 22 - 25
   - [ ] 26 - 29
   - [ ] > 30

2. **What is your gender?** *
   - [ ] Male
   - [ ] Female

3. **What is your nationality?** *
   - [ ] Germany
   - [ ] Netherlands
   - [ ] France
   - [ ] Spain
   - [ ] Italy
   - [ ] Other: __________________

4. **At which faculty are you studying?** *
   - [ ] Faculty of Technology
   - [ ] Faculty of Economics and Business
   - [ ] Faculty of Arts and Humanities
   - [ ] Faculty of Social Sciences
   - [ ] Faculty of Health and Life Sciences
   - [ ] Board of Education

5. **At what level are you studying?** *
6. Do you have smartphone? *
- Android
- iOS (iPhone)
- Windows Phone
- I don't have Smartphone
- Other:______________

7. Do you have Internet connection in your Smartphone? *
- Wi-Fi
- 3G
- 4G
- I don't have connection
- Other:______________

8. Do you have Tablet? *
- Tablet Android
- iPad or iPad Mini
- Tablet Windows 8 / Windows RT
- I don't have Tablet
- Other:______________

9. Do you have Internet connection in your Tablet? *
- Wi-Fi
- 3G
- 4G
- I don't have connection
- Other:______________

10. Have you ever paid by Internet? *
    i.e. Booking trips, buying cinema tickets, eBay, LNU Library...
- Credit Card
- Bank transfer
- PayPal or PedEx
- I have never paid by Internet
- Other:______________
11. Rate the importance of mymoodle.lnu.se for you *
1: Less  2: A bit  3: Enough  4: Quite  5: Much

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Much</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

12. Rate the importance of www.lnu.se for you *
1: Less  2: A bit  3: Enough  4: Quite  5: Much

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Much</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

13. How do you remind your tasks, exams and so on? *
- [ ] Paper Notebook / Agenda
- [ ] Online virtual calendar
- [ ] Alarms / Reminders
- [ ] My own memory
- [ ] Other: ____________________________

14. If you would imagine having an app on your smartphone for supporting your life as a student, what features would you like to have? *

<table>
<thead>
<tr>
<th>Feature</th>
<th>Less</th>
<th>A bit</th>
<th>Enough</th>
<th>Quite</th>
<th>Much</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exams calendar</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My timetable</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Campus map and interesting places</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students chat</td>
<td></td>
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<tr>
<td>LNU Email</td>
<td></td>
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<tr>
<td>Tasks reminder</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject list and details</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>News from LNU</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Booking VIS trips in one click</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Having all cards in your phone</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

15. Observations
Do you have other interesting comments? Please, describe them here.
III. Interview

*Interview to Växjö International Students (VIS) members.*

1. Could you tell me your name and what is your position at VIS organization?

2. In which aspects do you think that VIS is more helpful for international students?

3. Are you aware of organization problems at the VIS? In affirmative case, please describe them.

4. Have you ever received complaints about some aspects of the organization? (i.e. giving too less information about an important event, not enough flexibility for VIS trips…) In affirmative case, please describe them.

5. Considering these problems described in the previous questions, do you think about some solution to solve them? (i.e. paper guide, personal guide, interactive app…) Please, explain your idea.

6. Other suggestions? Please comment it here.
IV. Focus group

Focus group: Finding the best solution

The presentation of the explored data from the focus group is gained by the audio record and the collected notes. The total quantity of the participants was ten participants of five different nationalities: Belgian, Dutch, German, Spanish, and French. After developing a first screener to recruit the group for our research the focus group was composed by the following structure:

Structure of Focus Group:
- Quantity: 10
- Age: 20-25
- Gender: 5 male, 5 female
- Occupation: Students (International)

The most relevant questions will be:
- Explain a bit what your smartphone dependence is, and what kind of apps are you used to download.
- Are you used to use online settings to improve your stay at LNU? Please, explain why and what kind of resources do you use.
- Tell one thing that is annoying for you related to the university’s organization focused on international students.
- Do you think that could be possible to improve these annoying aspects with a mobile application? Describe how the app could be.
Appendix II: Detail of results
In the second Appendix the results from the different surveys (found in Appendix I) are shown.

I. Questionnaire results
*Common part (questions from questions 1 to 5)*

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"Exchange experience: Finding the main problems".

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**Exchange experience: Finding the main solutions**

<p>|   | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19.1 | 19.2 | 19.3 | 19.4 | 19.5 | 19.6 | 19.7 | 19.8 | 19.9 | 19.10 | 20 |
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| Android | Wi-Fi | iPad or iPad Mini | Wi-Fi | | Credit Card;Bank transfer;PayPal or PedEx | 5 | 3 | Online virtual calendar;Alarms / Reminders | 2 | 4 | 4 | 1 | 2 | 2 | 1 | 1 | 4 | 5 | |
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| Windows Phone | 3G | I don't have Tablet | I don't have connection | Credit Card;Bank transfer;PayPal or PedEx | 3 | 4 | My own memory | 5 | 5 | 5 | 2 | 2 | 3 | 3 | 2 | 5 | 5 | |
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II. Interview results
The following results show the qualitative information about our research.

Response from respondent 1

1. Could you tell me your name and what is your position at VIS organization?
   My name is Erika Egonsson and I am the Booking and Facility coordinator of VIS.

2. In which aspects do you think that VIS is more helpful for international students?
   I would say we help the students when it comes to their social life in Sweden. We try
   our best to travel and party with the students. It is also a way for the exchange
   students to meet each other, through actives like sports Saturday which is also
   visited by many Swedish people. So in some ways we also help them to get in
   contact with Swedish people.

3. Are you aware of organization problems at the VIS? In affirmative case, please describe them.
   Oh yes… Haha, I am well aware of some of the problems. We are working on some
   of them, like the sign-ups. We really want to make less sign ups when you have to
   physically attend. Instead we have started using paypal (for like Gothenburg). But it
   takes time to learn all aspect and to change the mindset of the students.

4. Have you ever received complaints about some aspects of the organization? (i.e. giving too less information about an important event, not enough flexibility for VIS trips…) In affirmative case, please describe them.
   It happens but it really depends on the situation to be honest. But all of the things
   you mentioned above have been complained about. But overall, that really depends
   on the person who is responsible for the event or the situation. For Welcome Dinner
   I was main responsible, we had 450 attending and it is hard to keep everyone
   satisfied. People complained about food and that it was not enough tickets for
   everyone. This is something that VIS cannot control over since it is not VIS making
   the food or has decided the rules about how many people that can be present in the
   m-building. So there are many things that we cannot control over but of course,
   sometimes even I want to complain ;) Usually we don’t get complaint about our
   organization, it’s usually minor complaints like “why did you change the date?”
   “Why do we have to go so early?” you know what I mean?

5. Considering these problems described in the previous questions, do you think about some solution to solve them?(i.e. paper guide, personal guide, interactive app…) Please, explain your idea.
   It might be hard to believe but this semester we have improved a lot of things, but I
   still some things are missing. Like it would be nice to have some kind of way of
   texting people that are on trips/event about for an example where we should meet,
or like remind them that we have to meet in one hour. Something more convenient than a piece of paper. I hope I make sense.

6. **Other suggestions? Please comment it here.**
Response from respondent 2

1. Could you tell me your name and what is your position at VIS organization?
Kim Hansen, Secretary

2. In which aspects do you think that VIS is more helpful for international students?
Organizing events, trips, activities etc. VIS is helping to make exchange students’ stay in Växjö more fun and interesting. The VIS activities also help students to meet other students which is good since you can feel a bit lonely when you are totally new to a city or even a country.

3. Are you aware of organization problems at the VIS? In affirmative case, please describe them.
It is a problem when the board members give out different information since it creates confusion among the members. We are trying to always communicate within the board and make sure everyone has the right information so that we can give out the right information as well.

4. Have you ever received complaints about some aspects of the organization? (i.e. giving too less information about an important event, not enough flexibility for VIS trips…) In affirmative case, please describe them.
It is difficult to please everyone when the organization has around 500 members and their interests vary. A concrete example could be feedback from one of the trips where one student thought the leaders went to the trip just for their own pleasure and one thought it was negative when the leaders did not go out and party one of the nights. In this case it would have been impossible to make everyone happy.

5. Considering these problems described in the previous questions, do you think about some solution to solve them? (i.e. paper guide, personal guide, interactive app…) Please, explain your idea.
We are always working on setting policies and solving problems that arise and it is a continuous process. Things constantly change and since board members are students they come and go and then the work almost starts over again. It is also important to keep in mind that everyone in the board does the work alongside their fulltime studies and without pay so the time and resources are very limited.

6. Other suggestions? Please comment it here.
Response from respondent 3

1. Could you tell me your name and what is your position at VIS organization?
   Rikke Heimdal Holm, Webmaster

2. In which aspects do you think that VIS is more helpful for international students?
   Arrange trips, and events to bring the exchange students together.

3. Are you aware of organization problems at the VIS? In affirmative case, please describe them.
   Not so strong in getting Swedish students to participate together with the international students, internal problems at the moment.
   Actually listening to our members and what they need, instead of guessing and thinking we are doing what they want.

4. Have you ever received complaints about some aspects of the organization? (i.e. giving too less information about an important event, not enough flexibility for VIS trips…) In affirmative case, please describe them.
   We have had specific complaints about things that has happened, and I have heard some unofficial ones about the fact that we do not communicate enough without members, give them information about why we do things. We try to be flexible, like last semester when no one bought the Copenhagen trip we cancelled it, and this semester we went for another direction, trying to find the things and event our members want, however it is hard, since our memebers are changing every semester.

5. Considering these problems described in the previous questions, do you think about some solution to solve them? (i.e. paper guide, personal guide, interactive app…) Please, explain your idea.
   I like the fact we started making evaluations for our members after trips, so we can listen and improve them, but I think since we are a student organization representing them, we should have more participation, have a general evaluation about the VIS, and what they think could be improved.
   Getting Swedish students is a harder problem since first we need to find out if the Swedish students are even intrestet, and if so, what would they be willing to join with us.

6. Other suggestions? Please comment it here.
Response from respondent 4

1. Could you tell me your name and what is your position at VIS organization?
   My Name is Terese Fredriksson and my position in the board is Treasurer.

2. In which aspects do you think that VIS is more helpful for international students?
   I think VIS is helpful for the students from the beginning of the semester to the end. First when the students arrive they get picked up by the VIS crew and some people from the university, they also get information bags and phone cards, and have the chance to ask questions to students who already are studying at the university. Another good thing is that VIS has a lot of events and trips organized for the students so to make the students interact and meet other students. The events and the trips are different and are made so there would be something that will fit everybody. VIS is basically helping the students get the best experience here at the university and there stay in Sweden.
   I believe, that VIS is not only creating events and trips; they are creating invaluable memories for the students for the rest of their life, and to see that is one of the best parts.

3. Are you aware of organization problems at the VIS? In affirmative case, please describe them.
   It is a big organization and it is a lot to work that has to put into the organization, and all people who are working for the organization are all studying100%, so sometimes it can be very busy and also the people who work in the organization have different amount of time they are willing to put into the organization. I think that this can be a problem, or it is not a problem because people always manage it, but if they would have even more time they would be able to do a better job.
   VIS is also growing as organization with the committees, which is great, the board should give them more responsibility and freedom and the communication link between the committees and the board should be improved.

4. Have you ever received complaints about some aspects of the organization? (i.e. giving too less information about an important event, not enough flexibility for VIS trips…) In affirmative case, please describe them.
   Yes, we have evaluations after all trips for example where we get all the feedback and comments from the trips. This is really good so we can see what the students really think and what that could be improved things that can come up have been more information about a , one more day (in gotland). Other complainments can be there was no dessert at the welcome dinner. (The only thing I can come up with right now haha!)

5. Considering these problems described in the previous questions, do you think about some solution to solve them?(i.e. paper guide, personal guide, interactive app…) Please, explain your idea.
   We often have paper guides for the trips to solve the problem of lack of information. To create an app for the phones to send out information could also be a solution. If VIS will keep growing they might have be good to actually hire one or two people to work for the organization 100%.
6. Other suggestions? Please comment it here.

Response from respondent 5

1. Could you tell me your name and what is your position at VIS organization?
   My name is Alberto Sanchez and I am on the VIS Sports Committee.

2. In which aspects do you think that VIS is more helpful for international students?
   I believe that the VIS can help the average international student in many ways. In general, as soon as the new international students arrive, there are arrival hours & buses to help the students find the campus, the basic landmarks such as the library, student union etc. From then onwards the VIS is always available for any queries or problems which may arise in a new student’s life. More specifically to my case, the sports committee works together to provide an all-round active experience for those students who wish to practice sports of some kind. There are more committees and these work to cater around the international students needs and requirements.

3. Are you aware of organization problems at the VIS? In affirmative case, please describe them.
   I am not so deeply involved within the VIS to be a part of the organization of most of the activities and events which are not directly related to sports. However, I believe that there may be quite a few problems in the management of some trips and events. Where and how students sign up and the accounting and management of all this data has not always been perfect as it can be seen on the trips when there are too many people on a bus and have to be changed to another one, for example. But from I have seen, minor issues.

4. Have you ever received complaints about some aspects of the organization? (i.e. giving too less information about an important event, not enough flexibility for VIS trips…) In affirmative case, please describe them.
   Complaints are part of the daily job for the VIS. Like any entity with so many members, with so many opinions and from such as wide range of cultural backgrounds, there are bound to be people who do not agree with a certain way of carrying out an activity or who are not satisfied by a certain aspect of an event. However, these are generally dealt with effectively. In my case, if someone requests a sport which is not in the default sports done at sports Saturday, this feedback is taken into account with the sport co-ordinator and if considered viable, implemented into a future sports Saturday to see if people attend and enjoy it!

5. Considering these problems described in the previous questions, do you think about some solution to solve them?(i.e. paper guide, personal guide, interactive app…) Please, explain your idea.
   I believe that a website is in place, the effectiveness of the website is not always 100%, but as society is evolving and everyone has a new generation phone, an interactive app with all the events and activities posted in real time would not be a bad idea. However, the use of social media, in our case, Facebook, is currently the best medium to keep up to date with all the VIS events and activities as the people in charge use Facebook to post, describe, discuss and promote the majority of VIS matters. I believe that any further developments should be considered starting there.

6. Other suggestions? Please comment it here.
III. Focus group results

1. Explain a bit what your smartphone dependence is, and what kind of apps are you used to download.

All students agree that they have a strong dependency of its smartphone. That means they feel uncomfortable when they forget it at home or when their battery ends. In fact, Smartphones make easiest our lives, that’s because we miss them when they are unavailable.

Talking about the apps, the most popular between the students are social networks like Facebook or Twitter, also Gmail and other Google tools. Apart of these, also we must highlight games and other organization tools like calendars, reminders or alarms.

2. Are you used to use online settings to improve your stay at LNU? Please, explain why and what kind of resources do you use.

The most common online resources are the two websites related with the university.

- www.lne.se
- www.mymoodle.lnu.se

Both websites are very popular because they are indispensable for following courses, registering exams, seeing our timetable, and so on.

Furthermore, other interesting tools for students are email, virtual calendars and academic tools. Finally, the different sites for buying trips like flights, booking hotels or even the most important VIS trips, directly boughs to the agency.

3. Tell one thing that is annoying for you related to the university’s organization focused on international students.

As we have seen in the previous research methods, students use to complain about the number of cards and the large time they spent in lines. Furthermore, many students suggested that they felt really alone until around the third week since their arrival.

4. Do you think that could be possible to improve these annoying aspects with a mobile application? Describe how the app could be.

Yes, all students think that a Smartphone app could be the best solution for the different found problems because all of them have access to it.

The application has to be usable and intuitive, with a good user experience feeling. About the possible features, the app should have all the necessary characteristics for solving the biggest part of the problems or almost all. The purposed characteristics from the students are:

- Having all cards in the phone
- Possibility of buying events
- Basic information about students