

Alpinetec

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1. Introduction

There are 115 million skiers and snowboarders around the world. Every season someone lose their equipment because of theft, and countless of piste skiers use countless hours looking for their skis in deep snow after a fall. In our technology based world where you can almost measure everything, there are no good device that gives you statistics of your jump, tricks, and falls.

Alpinetec is currently developing a product called Alpinehawk, which is a little device you can attach to your skis or snowboard, and then synchronize it with your mobile phone through an app. The Alpinehawk will provide anti theft and localization abilities of alpine equipment. Our main focus in this project will be on the app.

The app will have core functionality like switching on/off the device, gathering the performance statistics, give a comprehensive feedback to users and compare statistics with other users. The device needs an app to control it and for future versions new concepts are needed to drive the product further. This project gives us the opportunity to work with something real, and be part of something that can be used.

Moreover, the project poses interesting challenges, gives creative freedom, room for research and chance to increase knowledge base in UX design and mobile app development processes. Solving a real world problem makes this project even more intriguing

Currently there are no device that gives skiers and snowboarders any feedback on their performance. There are one company named Alpine replay, that are developing a product called trace. They are working on something similar to us, but for snowboards, surfboards and skateboards. We want to focus entirely on snow sports. We want to give the users a better experience of the day in the slopes. By having an app that gives instant feedback on all your movement; speed, jumps, falls, tricks, turns, and the option of creating buddy groups and compete with your peers or other people in the same resort.

There are some design challenges we want to address. We want the app to be entertaining and useful. At the same time we have to consider the environment. In a ski resort the temperature is below zero and users are wearing a lot of gear.

We are addressing the following research questions in this report:

How to make our app entertaining and useful?

How can the content in our app make the users take out his phone to interact with other users in the middle of the slope or on top of a mountain?

How can we use voice or motion control to navigate our app?

2. Theory

2.1 Mobile Informatics (Dahlbom, 1998)

The article has many interesting and relevant views on the history and development of mobile IT use, even though the article was written in 1998. The article tries to develop a theory of mobile IT use and ask questions like; why has mobility increased? What are the major varieties of mobile IT use? How do we define mobile computing?

The use of information technology(IT) is expanding into all dimension of society. As a consequence, informatics with its general focus on IT use will develop into many different sub-disciplines. This article introduces a such discipline, mobile informatics, exploring services and concepts of mobile IT use.

Dahlbom and Ljungberg mentioned three varieties of mobility, wandering, travelling and visiting. Virtually all activities involve mobility of some kind. Office work is often described as stationary, although it often involves local mobility such as short trips to the coffee-machine or copiers. The article defines this type of mobility as wandering. Travelling on the other hand, is defined as moving from one place to another in a vehicle. The last type of mobility, visiting, is for example when a consultant spends a few days in a client organization. The consultant is mobile in sense of being away from the office. These forms of mobility can help us identify, describe and conceptualize the many varieties of mobile use of IT, which is very relevant to our project since we are making a mobile product that can be used in all three contexts.

An interesting observation by Dahlbom and Ljungberg is that mobile users try to reconfigure the mobile use context into a stationary one, by for example sitting down and placing the mobile computer on a flat surface. This is something we need to keep in consideration when are developing our product.

The articles also talk about informatics as the design-oriented study of information technology use and studying the use of IT with the ambition to come up with new ideas for such use. This is essential to all IT projects, and is something we will do in this project.

2.2 A longitudinal review of Mobile HCI research Methods. (Kjeldskov, J., 2012)

This paper revisits a research methods survey from 2003 and contrasts it with a survey from 2010. The motivation is to gain insight about how mobile HCI research has evolved over the last decade in terms of approaches and focus

This article provide us with knowledge about which research methods is considered state of the art in the field of mobile-HCI research. It gives us an understanding of what used to be the central research methods, and an insight on which research methods is most often used for different purposes in todays research.

Most notably the relative amount of survey research has almost tripled, field studies have more than doubled, and lab experiments have almost doubled. On the contrary the relative amount of applied research has decreased by nearly 1/3.

As the authors states, this indicates that as the field of mobile-HCI research matures, the more empirical research methods is used and considered to be valuable. The authors state that the emphasis in the field of mobile-HCI have shifted more towards research for understanding and evaluating. The focus have shifted from using mainly what they call engineer driven approaches such as applied research and lab experiments, to a more user centered design cycle where methods such as surveys and field studies are being more and more used.

Research in natural, artificial, and environment independent settings have very different fundamental strengths and weaknesses, and balancing them well allows the field as a whole to draw on the relative strong points of particular types of research settings while compensating for their limitations

According to the latest survey the article presents, applied research methods is still the most used method. The authors emphasises the value in combining the different kinds of research method in order to have a complete image of the subject which is being researched. In our projects we will try to use this knowledge as basis for choosing the which research methods to use.

2.3 On the Move with a Magic Thing: Role Playing in Concept Design of Mobile Services and Devices (Iacucci, G. 2000)

“Designing concepts for new mobile services and devices, poses several challenges to the design. We consider user participation as a way to address part of the challenges“.

This article addresses the development of devices that are meant for mobility.

With focus on three aspects: group activities and interaction, the mobility of participants in the interaction, and the context of each participant in term of artifacts, tools and environment .

They are looking at two different methods for achieving this. The first concept is a roleplaying approach, where one designer controls the game and the users play roles relevant to what sort of development are in process. The other concept are a situated and participative enactment of scenarios. Here the designer follows the user on a day in his life and records his events through his day according to the development one are working on.

Our device is mobile and fits well within this research. Our device based on using in the ski resort and its boundaries. It communicates with your phone which communicate with other users in the resort . The information the device sends to the user is based on his movement and his interaction in his environment.

For this project we have tried out the role playing approach where one of us was the game master and the three others played a group of young skiers and snowboarders that were in Hemsedal resort for a day. We printed out a map of the resort area and made stick men to represent the users. Then one of us controlled the game. The other three were playing students on a ski trip to Hemsedal. They said what they wanted to do and moved their figure accordingly. The game master then told them the result of what they were doing.

The other approach of following a user, would mean that we needed to go to a ski resort for a day. Ideally we could go to Tryvann with a test user and ski with him for a day. Give mockups of the functions of the app and get feedback on entertainment and use value. It would be useful, but not possible this time of the year.

2.4 Universal Design for Mobile Phones (Ornella Plos, 2006)

The paper is based on a case study of Universal design applied to mobile phone physical devices. It describes user centered design process that was applied in order to design mock-ups for visually-impaired, hearing-impaired and elderly people (target group). The authors analysed target group's needs on functionality and usability. For next step, they studied design trends. As a result came up with mockups and design specifications for mobile phone developers that would both fit people

with disabilities and general public. Overall, we find the proposed framework beneficial to use and universal design approach worth pursuing in some cases.

2.5 Negotiating Privacy Boundaries in Social Applications for Accessibility Mapping (Harald Holone., Jo Herstad, 2010)

This article is very relevant in today's society where social applications collect and share a lot of personal information. The article discusses privacy issues concerning the concept *OurWay*, which is a collaborative route planner for physically disabled people. It looks at its potential for accessibility mapping, the privacy issue that arises when technologies such as social applications on the web attempt to solve the task of collecting, disseminating and maintaining information. *OurWay* has some similarities to our project, as route planning is something that can be implemented. Our application will collect a lot of personal information about its users, such as positional data, if enabled. Example of this is the user's geographical coordinates and the geographical coordinates of the skis. Disclosure boundary, identity boundary and temporal boundary is all something we need to take into consideration. What information to reveal or share, and what to keep from others, is highly relevant in all social applications. We want to make it easy for the user to have control over what information gets shared and also what information is stored of them. It is important to build trust. We need to find a balance between disclosure of information and privacy.

3. Methodology

As the authors of *A longitudinal review of Mobile HCI research Methods* (Kjeldskov J., 2012) states, there has been a shift towards conducting more thorough research before starting to develop the product in modern mobile-HCI development. We decided to apply a framework described by Ornella Plos and Stephanie Buisin (2006), which uses a user centered design process, to do just this. We divided the research process in two steps. First, we researched which functionality is needed (functional dimension), second we conducted research for design trends (stylistic dimension).

3.1 Functional dimension

The goal of the first step was to narrow down the functionality of the app. When conducting the research for needed functionality, we decided to use triangulation when conducting research in order to get a better picture of the potential use cases for our app, as advised by Guion et al.; “*Data triangulation involves using different sources of information in order to increase the validity of a study*”(Guion, 2011). We decided to use participatory design and trying to involve the potential users in the design process. One could argue that we have conducted a case study on which features is most needed and wanted in an app such as ours.

We used the following methods when analysing user needs and finding use cases:

1. Research of existing products
 1. Strava, endomondo and LG health
2. Role playing
 1. 3 players and 1 game master.
3. Focus group with target group
 1. 4 girls and 1 guy; 1 experienced skier, 4 intermediate skiers/snowboarders.
4. Use cases on functionality

The research of existing products provided us with a basic set of ideas on which features to include. It is also very inspirational to see fully developed solutions which does much of the same thing that we would like to achieve. Many of our later ideas were similar to the ones used in other similar products and came as a result of this inspiration.

Our app is meant to be used not only at home or while sitting down, but also while on the move. It is meant to be used while skiing or snowboarding outdoors, potential in a cold and harsh

environment. The role playing method described in the article by Iacucci is very useful in our case. This is a method which enables us as researchers to envision potential challenges and new use cases in the setting in which the app is to be used.

As previously stated, we wanted to use a user centered design process, and have input from potential users. We decided to use a focus group as we find this to be very useful and effective when collecting ideas and finding potential challenges. *“The participation of several individuals in a focus group provides the possibility of a broad range of viewpoints and insights. Discussions can reveal the similarities and differences between opinions”* (Lazar, p.192).

3.2 Stylistic dimension

When working with the app we have tried to take into consideration the design principles of constraints, visibility, affordance, feedback and visibility. We have especially focused on the principles of constraints and visibility. Constraints refer to how one can limit the amount of possible interactions in order for the user to easier understand and find the most relevant functions (Sharp et.al, 2007, p.31-32). When explaining the meaning of the design principle of visibility Normann states *“The correct parts must be visible, and they must convey the correct message”*(Normann, p.4). In our case this could be to limit the amount of functionalities and options in the app, in order to make the most used and relevant functionality become clearer. These principles are especially important in our app, as they are to be used outdoor, possibly in cold weather where it is important to the user to be able to do the things he wishes fast. Bright sunlight could also prove to be a challenge, and therefore visibility is important.

We conducted research for design trends that might help us creating an app that is both pleasing aesthetically and that has a functional design. The goal of this step was to create a interface that is:

1. Nice to look at
2. Intuitive and effortless
3. Functional (visibility, constraints)

This step of the development consisted of the following phases:

1. Study of existing competing products
2. Study of apps with the best designs (some reliable sources)
3. Creating a trend board

4. Findings

4.1 Functional dimension

4.1.1 Research of existing products

We searched the internet and the different app libraries to see if there were existing products which do things similar to what we are trying to achieve. We found that there is an app in development which does some of the same things we are, though the focus is primary on surfing and snowboard.

Trace measures your speed, vertical, jumps, Calories, and more, on any mountain(snow.traceup.com). It is not fully developed yet. At the moment the device that the user should put on their snowboard is not done, so only an app version exist. The app uses the phone to calculate some statistics like speed, time, calories. At the moment there is no difference with this app and other existing apps that uses the phones accelerometer, gyroscope and gps to calculate statistics.

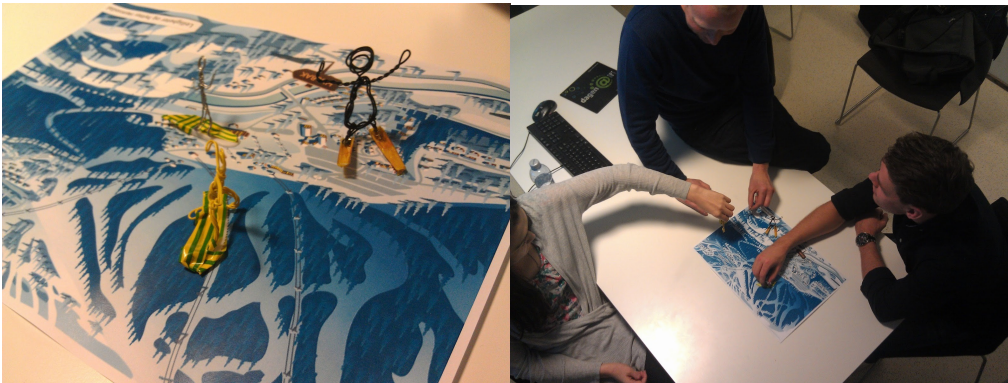
At the moment there is not much about this app that makes the user want to use it frequently in the slopes. It has one record button when the user starts his run, and a stop when done. This function is a bit weak, since the user must use time to put the phone back after pressing record. In this way you lose time if you want to do a speed run, and compare with others.

We also tested sports tracking apps such as strava, endomondo and LG health, both to get input on useful functionality as well as design. Lg health and Strava are very similar, in the sense of having many similar functions. It gives out statistics, you could set personal goals and challenges. The challenges is a bit different than what we are going to use. Here you can join a challenge for a specific time and on a specific route. Another function that we would like to include, is the statistic comparison on a given route. In our app this would be to compare statistic on a given slope. Whenever a user rides a slope his statistics will be added to that slope, and any user can compare his performance. We also would like to let the users create friend groups and options for following other users, and make it easy to throw challenges as you can in strava. We also took note of the design used in the apps and the way the apps present statistical data on your workouts.

4.1.2 Role playing session.

Based on the article “On the Move with a Magic Thing: Role Playing in Concept Design of Mobile Services and Devices“, we conducted a role playing game to see if we could find new use cases for

our product. This was a highly useful experience. We used this concept on our self. One of us were controlling the game (game master), and the three others were players in the game. The players were playing three students in Hemsedal resort. The game lasted for 1 hour and 15 min. Where the first 15 minutes were used for preparing the game, by printing out a map of Hemsedal resort, and creating stick figures. The players challenged the game master with situations where solutions to problems arised.Out of these problems the group tried to come up with implementations to the product that could solve the issues raised.



Several new use cases came out from the game:

A challenge system: The user can challenge any other user in the resort or of his friends in the app. These challenges will have fixed points in the resort, with highscore tables.

3d Animations of your jumps: A 3d character will show your jump, based on the data from the AlpineHawk.

Gamification: of your skill level. The user enters his experience level, then the app will calculate your skill level after your first run in a slope. Later the app will give you advices of how to improve, and you will gain level in your alpine skill level.

Crowd search of equipment: If the user manage to lose his equipment. He can send out a lost equipment signal to the app. Any user with the app on within bluetooth range of the lost equipment, will pick up the signals from the lost device, and a gps location will be sent to the user who sent the lost equipment call.

Automatic on/off: A button to turn on anti theft automatically. When this is on, the Alpine hawk will detect when the skis are left and the user moves away, then it will automatically turn on the anti theft function. This will solve the problem of taking out the phone in the cold environment, for the anti theft function.

Emergency feature: A one button call to the resort medic center.

Danger zone alert: When the user are entering avalanche areas with high danger level an alarm will be sent to the user.

Implement Siri into the app: A lot of skiers use hands free sets linked to their phone. By using a voice control, several of the functions can be evoked by voice.

This was a highly useful exercise. It took around 15 minutes to prepare the game and an hour to play. Based on the time we used compared to the output, we will say this gives good value back to the developers based on time used.

4.1.3 Focus Group.

We conducted a focus group with three girls and one guy. One being an experienced skier the rest was casual skiers. We told them the core functionality of the device; The anti theft function, and the finding of the skis in off piste. Then we got them to talk about possible statistic features.



In the beginning they came up with functions we already have discussed, but after some more discussion, some new areas of use was brought to the table. One of the girls suggested that the device could detect the slope condition. If you ski over ice, loose snow or bumps, it will send the information to the slope map of the resort you are in. This way users can avoid bad slopes as they get worsened during the day.

Another relevant suggestion was to get an overview of all the rides the user have skied through the season, with statistics attached to the different slopes.

The focus group was useful. It takes some time before the participants start to come up with useful ideas. At the same time we didn't want to tell them too much. They all gave us positive feedback on the product.

4.2 Stylistic dimension / Design Trends Research

Currently, the app market is overflowing with all kind of apps. In order to stand out, it is not enough to develop just a functional application, it is also important to make it attractive.

Throughout the years we see how design trends are changing. Currently, one of the hottest topics in UI design is flatness.

Skeuomorphic design or flat? or "Less is more".

Remember iOS keypad that had some level or 3d? It is not anymore. Why did it use to have this feel of depth? Because it is something people can relate to, it imitates physical objects we all are used to. It is a smoother transition from a physical keyboard to an on-screen keyboard. This feel of depth is skeuomorphic ornamentation.

Skeuomorphic design provides contextual clues that are needed to help users to make sense of new products, to guide them through it and teach them insensibly.

Why has the situation changed? Is it possible, that our smartphones getting flatter tags along UI design? Or it is just that skeuomorphic approach is considered to be overused and even tasteless by some experts?

It probably started as a desire to stand out due to inability to get user's attention with old skeuomorphic ways. Whatever reason it is, it is happening and being used by giants like Apple followed by army of small studios and freelancers. We find it interesting and challenging to try it out in our project.

4.2.1 Important design dimensions that need to be considered

Colors

Colors is important part of an app. It contributes to an app appearance as well as to usability. Properly chosen color schemes makes user experience better. The modern approach is to use simple color schemes with bright colors for call to action. It is part of flat design trend and makes the navigation process more intuitive.

Typography

Type can and should be part of the artistic intention. When well-placed, it contributes to composition and creates visual hierarchy.

Communication process and screen transitions

Transitions between screens are just as important as graphic design . Optimal motion design provides a feel of the application, brings graphic elements to life and enhance perception of the product. It contributes greatly to usability.

Recently gesture control trend has emerged. It brings magic and new level of user experience, once learnt. However, it has a crucial drawback: gesture control is not perfectly developed yet. Therefore instead of getting a smooth and intuitive experience, users get frustrated and annoyed. As part of our research, we tried gesture control ourselves with LG G3 smartphone's camera. It worked properly from third or fourth try. However, some sort of gesture control would probably make sense for Alpinetec app. The cold weather conditions and dynamic ski environment makes it sometimes inconvenient to tap the screen with bare fingers.

Another way to communicate with the app could be voice control which is currently has the same drawbacks as gesture control.

Thumb-focused interaction.

One of the recent interaction trends is thumb control which allows users to navigate the app with only one finger. We use our phones on the go, carrying at the same time cups of coffee, grocery, laptops. Ability to access basic functionality using one finger often is essential for the app to be considered a convenient one.

Icons

When creating an icon, designer has to draw two states of the icon - on and off. Both web-design and UI app design shows similar patterns. For the off state - only outline of the icon, for the on state - filled icon. The outline and filler usually has the same color.

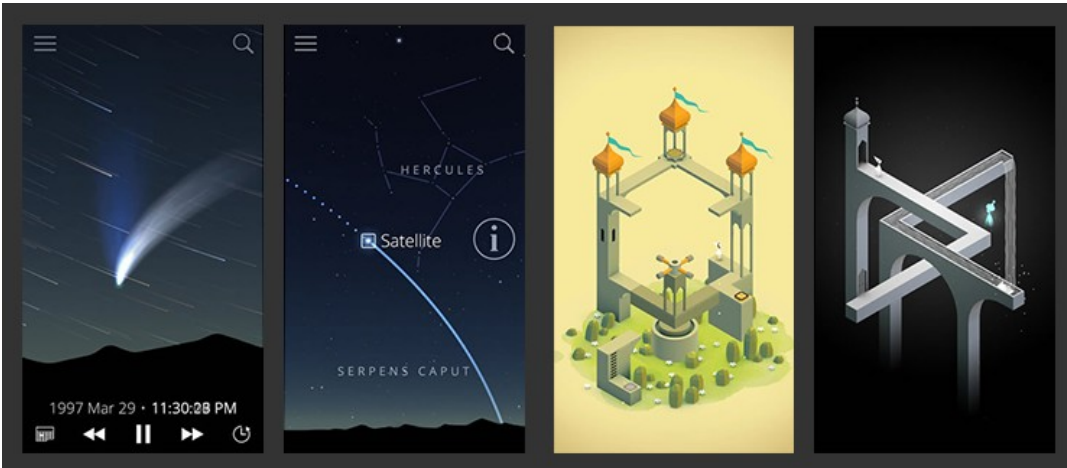
International approach. It is only logical to create icons that are easy interpreted in any language in our century of globalization.

Overall, it seems like design trend goes to simplicity, maximum accent on functionality and speed. The faster and in more efficient way the user is able to reach needed functionality, the better developed UI it has.

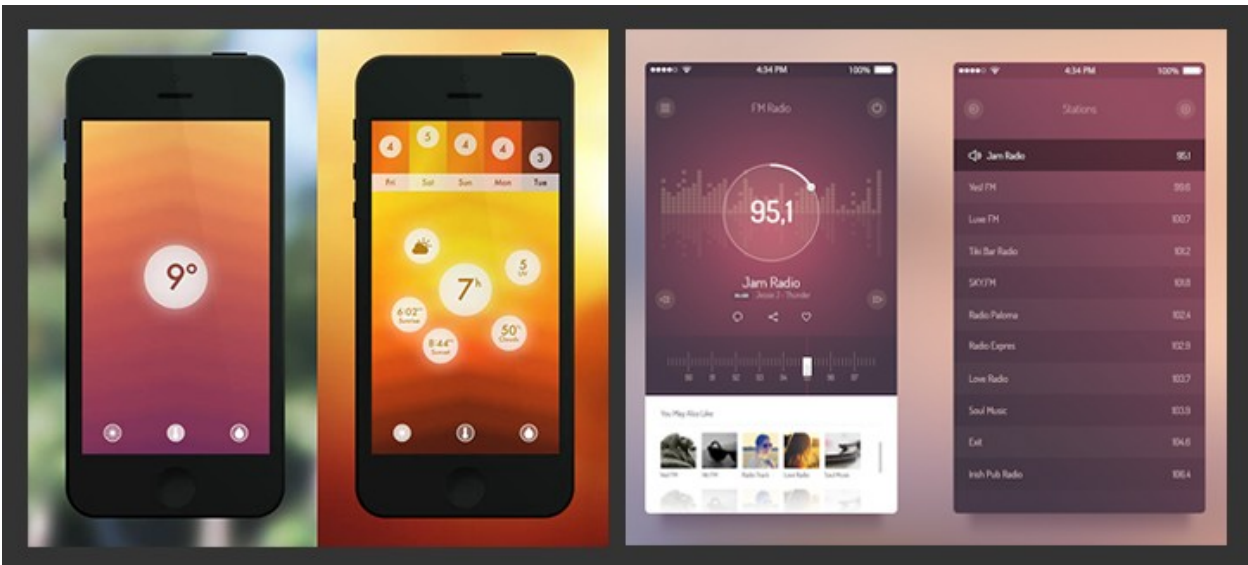
4.2.2 Best design apps

As part of our research on design trends, we looked into the best app designs on the market. There are many web resources that provides insights into app design and even give awards to the best ones. One of them is Apple Design Awards which awards apps that "combine design and technology in creative, compelling and powerful ways"

Example of the apps that got the Apple award in 2014:



While researching current trends, we encountered many beautiful and nicely developed apps. Here are some **examples of apps that fit to the latest design trends:**



Semantic trend board:

Based on conducted research we came up with a trend board:



5. Discussion

5.1 How to make our app entertaining and useful.

The basic functions of the app like the anti-theft and ski finding functions, has high usefulness for the users. From our focus group and role playing session we found good uses for creating an entertaining app. We also looked into existing apps and found nice functions that engage the user. We see that the challenging part and improvement of your skill as a game, both have high entertainment factors. The improvement of the users skill level, also makes the app useful for beginners.

By looking at successful apps like strava, we see that the ranking and challenge works fine in this app. An ongoing statistic of any given slope will add an interesting value to the app. This is based on cycling and running, but we see no reason why this will not work for snowsport.

The feedback of usefulness has been highly positive.

5.2 How can the content in our app make the users take out his phone to interact with other users in the middle of the slope or on top of a mountain.

A potential issue was identified in our focus group. It was said that the app would really have to be useful in order for them to stop and use it in the middle of a day in the slope. They mentioned the hassle of putting the gloves on and off, and the fact that they would get cold hands if the temperature is low. The challenge feature, might have an appealing factor that makes people use it even in cold weather. When Strava launched, people were so eager to contest with each other that there was several incidents of people hurting themselves just to win a challenge. The competitiveness of our challenge system will also drive users to use Alpinetec in the slope.

We think it's important that the app is intuitive and easy to navigate, so that the user can do the things they want in the app quickly before getting cold, or before their friends get impatient and want to go on skiing. As mentioned in the *design trends* section of this report we think “less is more” is the way to go concerning this issue. Since the app is meant to be used outside, possibly in conditions which are very bright (snow and sun), it is also important to have a well contrasted design. We will look especially into the design principles of constraints and visibility when designing the app.

5.3 How can we use voice or motion control to navigate our app.

It is possible to implement voice control into our app. It is not so common today, but search engines like Google and Bing use it as well as several map apps. There are some easy voice functions like asking for directions and places. We could implement voice activation to several of the controls, so that the user could use a handsfree to activate functions. There are some complications with that. Most skiers use helmets, so unless the helmet is made for headphones, but even without headphones it would be easier to just take out the phone and use it without taking of the gloves. The voice controlling systems like Siri, is getting better with each new operating system, and so will the implementation of voice control of apps.

At the moment it is difficult to test voice controlled functions of our app. If it makes any difference to the user, since we do not have a working voice controlled version of our app to test on users.

6. Alpinetec App

6.1 Functionality of Alpinetec App 1.0

Based on our previous research and a feedback from target segment, we decided to focus on this functionality:

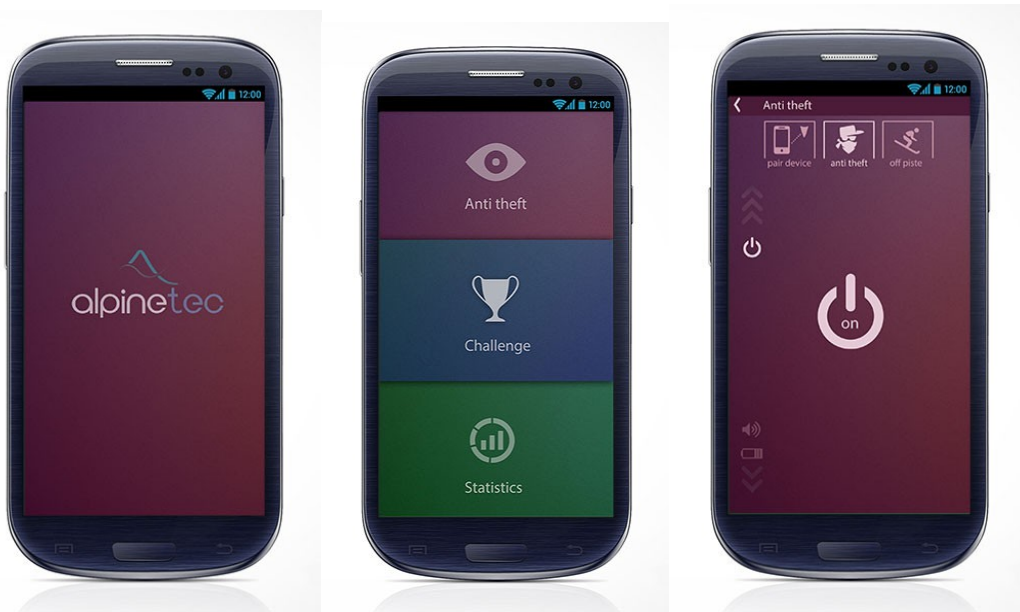
1. **Core functionality**
 1. Pair the device
 2. **Anti theft core function**
 1. **Button on/off**
 2. **Volume**
 3. Off piste mode
2. **Challenge**
 1. **Through a challenge**
 1. **Competition type (race or)**
 2. **Privacy (competition mode?)**
 2. Incoming challenges
 3. Challenge statistics
3. **Statistics**
 1. **Basic statistic (average speed and covered distance)**
 2. **Map**

Items that are marked as bold are those that we looked into more closely and have them represented in our mockup.

6.2 UI of Alpinetec App 1.0

We believe that design of our app follows recent trends. Here are some decisions we made based on the research

1. Flat design
2. Color separation for each logical part of the app
3. High contrast color scheme and bright “calls to action” (buttons)
4. Thumb - focused interactions
5. Internationally understandable icons
6. Adequate size of the buttons



More images can be found in the appendix

7. Feedback on UX

“Usability testing can help in discovering potential bugs and potholes in the system which generally are not visible to developers and even escape the other type of testing” (Niranjanamurthy, 2014).

Due to limited time, we did usability testing in the form of 4 informal feedback sessions with different potential users on the UX of the app. Still, this provided us with valuable feedback:

1. The feedback was very short - the app looks good, but it's difficult to understand how it works without being able to press the buttons.
2. The feedback was very productive. The main input - It would be nice to be able to choose the right or left side for submenu. Currently the submenu is on the left side of the screen, which is not that useful for right handed people. For them it is difficult to do left hand thumb interaction.
3. The feedback said that she liked the look of the app. She did not have any problems understanding the navigation or functions. It was a bit hard to get an overview without having a functional app to try out. She found the design very appealing.
4. The feedback said that the design was nice. She found the sidebar a bit confusing. She didn't think it was intuitive enough. She pointed out that the challenge part was hard to understand. With a privacy button, that made it look like a personal setting page.

As our app is not functional, but is just a collection of screens from the envisioned app, the feedback on navigation and intuitiveness might not be very valid. We would like to incorporate the suggested improvements into our design, and to make a functional prototype, but we were unable to do this due to time limitations.

8. Conclusion

It seems that we are working on something that people are interested in and a product with a lot of future possibilities. The basic function of an alarm and ski locator has a high usefulness, based on focus group and previous surveys. The added functionality of collecting statistics and create an app for skiers, has proven to have high entertainment factor and has a great option for further development based on the research we have conducted. We also think that by researching design trends we have come up with a app that users find both nice to look at and to be functional. The feedback sessions on UX did provide us with some potential improvements, but due to limited time we did not have time to implement them.

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10. Appendix







