Project 2

Human-Computer Interaction

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This is where the date is supposed to be
CHANGE THIS BEFORE HANDIN

Contents

1 Introduction

The aim of our project is to give users a unique virtual experience of walking around their own designed homes in 3d. this will be accomplished by using the existing in-built smart device sensors. A feature that is accessible in almost every modern smart device will be used - the gyroscope (along with other sensors that might compliment the product). Users will be able to experience their preferred designs in a 3d environment, being able to explore it with an additional feeling of Immersion. With a fast and busy lifestyle, it is hard not to think about time efficiency, especially with the tasks that people do not want to spend too much of their resources on. This is why it is important to establish pleasant experiences. The application that will be developed will help people to save not only time but expenses too.

1.1 Initial Problem Statement

How can we improve user experience in an interior design app using non-traditional mobile sensors?

2 | Analysis

2.1 Target Group

Good understanding of our target group helps to create a good concept and design requirements, to accommodate users specific needs and wishes. This project is targeting people who are IKEA's customers and who are newly decorating or changing furniture, decor of their home. This part of the research includes two parts - understanding people who has need for the application, and IKEA's target group - people that Ikea attracts and who are coming to shop for furniture or decor.

There are many ways to segment target audience. Probably most popular is Geographic or Demographic segmentation. In this case we will go deeper and have a look at Psychographics as we want to know specific needs of customers which will help to design a helpful app.

2.1.1 Demographics

write a small introduction

What is IKEA targeted customer's age ?

There is no official specific range of age that IKEA is targeting at. Contacting IKEA also did not result in finding out their specific age range. IKEA's target group's age range is really wide - there are lounges for children, considerations for disabled and old people. At "IKEA'S Accessibility Plan" (Accessibility Plan 2013) they mention that there are consideration to accept people from children to old people and disabled people.The Report states that IKEA's staff is trained to help people with disabilities, their equipment and even help-animals. All IKEA shops has mini restaurants where different range of age people can eat. They serve special menus for children, sell wine, and have quick walk-by coffee machines. An Assumption can be made that IKEA is trying to appeal to all age range and has not created clear concept design around specific life-cycle stage nor age range.

However, looking at IKEA's actual customers and considering that in general the furniture price is low, we can state that IKEA attracts young people, who cares about expenses. At our first interview with customers we interviewed 10 people and average age was 35 years. Danish people become parents pretty late, on average women give first birth when they are 29 years old (Statistics Denmark 2014). On average Danish men get married at late age of 35 and 32 as woman. A conclusion can be made that IKEA attracts young people - students, young couples and families, who has less income and priorities of expenses are probably somewhere else as taking care of children or study expenses. It means that we should target at range of age 25-35 which includes, students, young couples and parents.

put into littera-tureList (exam-stu-tor.com, 2015)

2.1.2 Psychographics

Since IKEA is targeting at young people with lower income level, it is possible to do more accurate analysis of social class, lifestyle and personality traits of our target group (Examstutor.com, 2015). According "examstutor" website, social class is categorized in grade class, where IKEA's targeted customers could be defined as class C1, C2, D or E:

small description of what Psycho-graphics are

The socio-economic scale

Social grade	Description of occupation	Example
A	higher managerial, administrative or professional	Company director
B	intermediate managerial, administrative or professional	Middle manager
C1	supervisory, clerical, junior administrative or professional	Bank clerk
C2	skilled manual workers	Plumber
D	semi- and unskilled manual workers	Labourer
E	state pensioners with no other income, widows, casual and lowest grade earners	Unemployed

Figure 2.1: Scale of the economic classes

If most of our target group has lower income level, it would be reasonable to assume that most of IKEA customers does not have expensive gadgets as leading-brand, expensive smartphones. However, our first interview showed that 9 out of 10 have smartphones. Further investigation of finding out which smartphones users have, would be useful to know how optimized an application needs to be for slower mobile devices. Analyzing lifestyle traits, means touching upon values, beliefs, interests and opinions. According age, and other statistical information on "Statistic Denmark" it is understandable that IKEA's customers are busy people - students, young parents and couples, people who are beginning their career life.

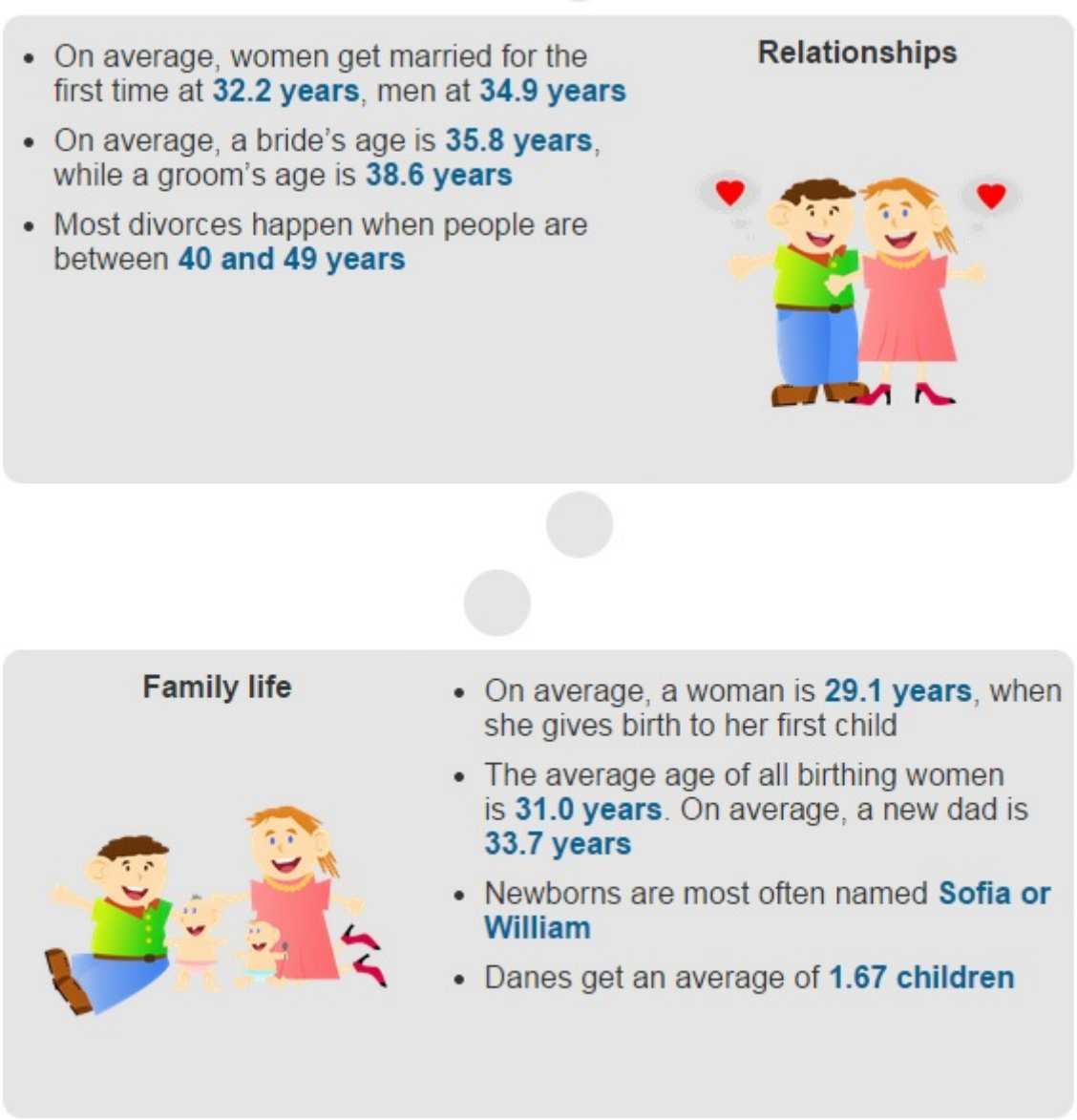

Figure 2.2: Relationship statistics

While interviewing customers we found out that around 50% count their expenses while shopping at IKEA. This only would put social class categorization in doubt. However, while interviewing employees, it was more clear that customers are actually concerned about the price of the product - in fact as employees stated, price is one of the most common topic to talk with customers about. This confirms social class categorization mentioned above.

2.1.3 Digital knowledge

Marc Prensky in his 2001 article categorizes his understanding of target group to two segments,when it comes to understanding or learning with digital technology. He categorizes them to "digital natives" and "digital immigrants".There are few more categorizations that people use as "Born digital" or "Digital Settlers", so it is common to separate people to "digital knowledge" groups.
Immigrant- is the one who was born and grew up before the technology revolution, so for example 65 years old man who did not have all the computers and digital tools or equipment as we do now. This person only adopted to technology at certain age or life point when it was needed.
Digital native is the one who grew up in technology era, where he had access for example to Internet, computers, probably experienced one or more ways of learning in digital environment.(Prensky, 2001). However, Prensky notices that time will make everyone a "digital native", as everyone will be born in world full of advanced technology, so old generalization terminology will not be suiting in future. He quotes Albert Einstein - "The problems that exist in the world today cannot be solved by the level of thinking that created them." Prensky later introduces "Digital wisdom" that is more general but suiting in this era.(M. Prensky, 2008). This "tag" is best suiting to our target group - if IKEA's customers are young students or people around 35 years of age it means that target group is on the edge of being called both- if person born in 80s or 90s he/she had a chance to learn or use modern technology, depending on geographical and social class of course. That is why terminology of "Digital wisdom" is useful - we can assume that most of our target group will be with digital wisdom. Therefore most of the targeted users should not have huge problems to start using any digital application. Interviewing our target group gave us knowledge that users plan and prepare before going to actual store. 100% of our interviewed people do some kind of measurements when buying furniture. 10/10 interviewed checked website before going to IKEA and 9/10 are shopping online. 7/10 had planned shopping the day before we interviewed.

2.1.4 Target group conclusion

Our target group are young and busy people - from age of 25-35 who are shopping at IKEA for new furniture or decor. Majority has access to personal smartphone and digital-wisdom in using it's applications. Our target group are careful with expenses and considering the price,

they also tend to know about the product before actually visiting the shop.

2.2 User Experience for mobiles

2.2.1 Introduction to user experience

A study of user experience[1] is a study of how a user feels when interacting with a system. The field encompasses a whole range of different and seemingly unrelated topics. The most known part of UX is probably the concept of usability which will be discussed later in the chapter, other things make up UX, such as: Design, Accessibility, System performance, Ergonomics, human factors and more concepts. The term user experience was originally coined by Dr. Donald Norman, who was the first to describe the importance of user-centered design. User-centered design is a design concept that lets the users dictate(to a certain degree) what the system should contain and what form it should take. Before user-centered design the general design process looked like:

insert the source

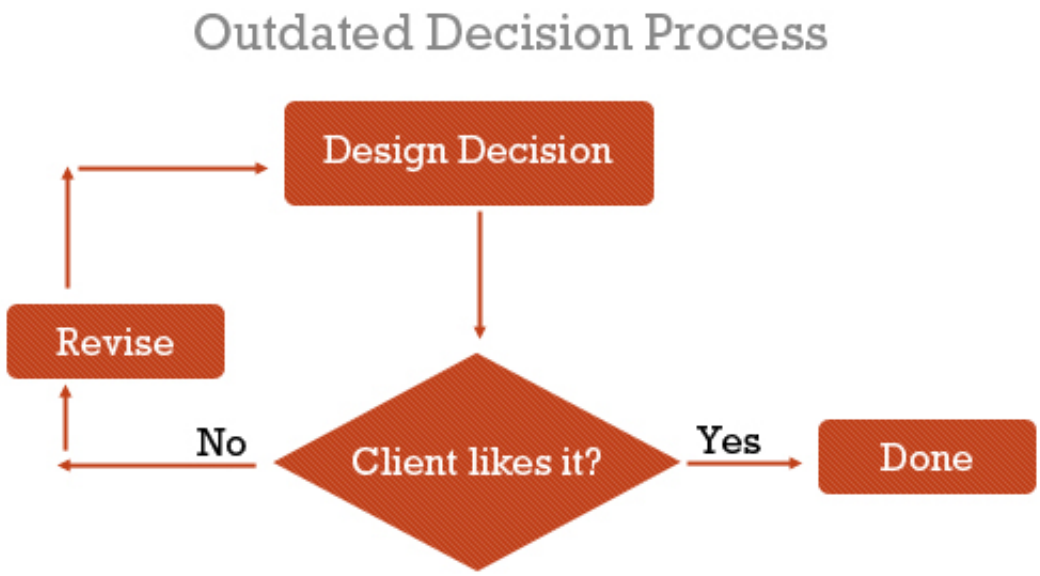

Figure 2.3: old decision process, Jacob Gube 2010

nowhere in the design process was the users a factor, the design was simply made according

[1] hereafter referred to as UX

to how the designers as well as the client felt it should be. making the same kind of chart for a user-centered approach would look differently:

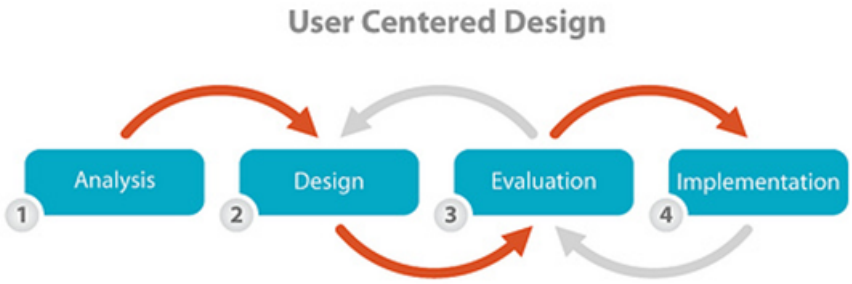

Figure 2.4: a chart of how user-centered design could function, Usabilla 2014

as this chart shows, user-centered design can be an iterative process. the grey arrow represents the user feedback, which shows that the users should be involved in the evaluation of a design. This method can be overwhelming if the evaluation is only being done on implemented prototypes. source

User Experience and usability is often confused since a large portion of the guidelines for proper usability also applies to giving a good user experience. What sets the user experience apart from usability is the feelings that the user is subjected to while using the site, app or programme. An example of which could be the iBooks app for iPad, which is basically an application for reading and browsing E-books. The layout is simple, it provides an overview of the owned books with a visual representation of the covers which is common for such apps and as such, do not set itself apart from the state of the art when it comes to usability, however the user experience is greatly improved simply by changing the background to resemble a bookshelf, it gives a "cozy" feel to the app, you can almost imagine yourself sitting in front of the fireplace sitting with a good book. source for the example

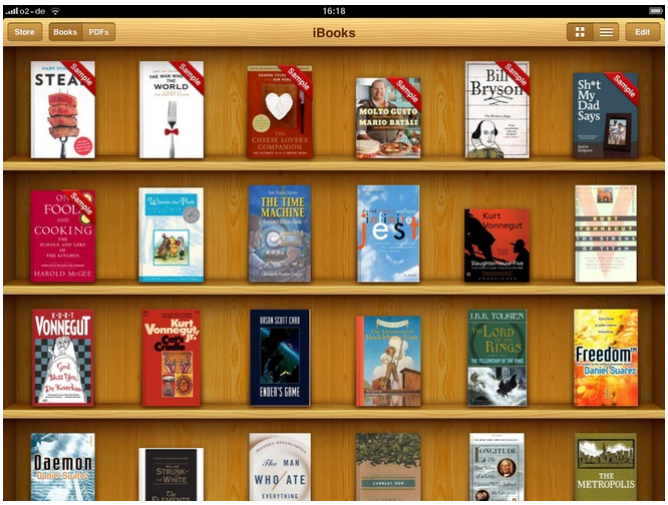

Figure 2.5: Apple iBooks for comparison

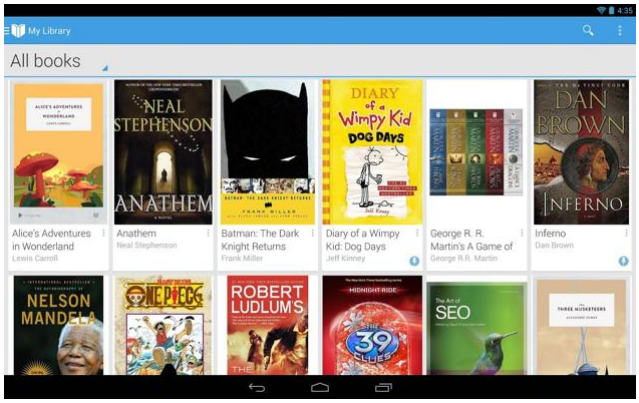

Figure 2.6: Google Play Books for comparison

2.2.2 User experience for mobiles

when designing a mobile app with UX focus, the unique challenges of the mobile platform has to be considered. A brief look at three of the most outstanding challenges:

- Screen size
  as opposed to a traditional computer screen the general mobile platform has a much more limited amount of screen space. This restriction will force the designers to eliminate as many redundancies as possible so as to not clutter the screen with unnecessary information. [3]

- User input
  user input is according to Giorgio Sardo one of the smartphones weakness. it is mentioned that "Entering text on a mobile phone is hard, and people tend to avoid it if they can"[3]

- Loading times
  Mobile devices are generally slower than a PC or Mac, both when it comes to processing power and internet speed, assuming they're using a mobile network [5]

When attempting to improve usability and user experience, for people using a site or a programme on a phone, the optimal way to do so is to make an actual app where you either port the mobile site or the web application so that it can be downloaded and accessed directly from your phone or tablet instead of via the internet browser. Some of the guidelines for optimizing for mobile devices are cutting features, reduce word count and enlarge interface elements to accommodate the "fat finger problem".[5] an example of poor simplification used in the book is IKEA where they simplify the mobile site by only showing a single item when browsing for bedframes.

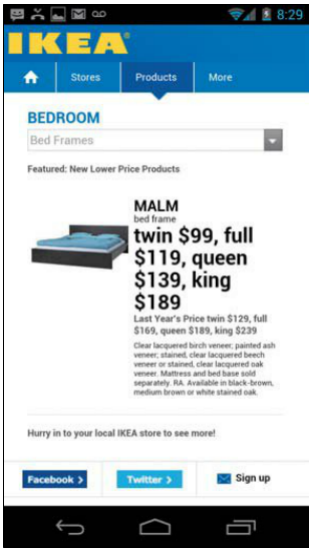

Figure 2.7: the mobile website from IKEA, anno 2013

2.2.3 Understanding our Users

Even though we have previously analysed out target group, when we want to focus on the user experience, further target group considerations has to be made, that is why this paper will next

talk about the concept of understanding the users. Georgi Sardo provides three points that will help with the design process of the app:

- What are your users' digital device skills? Are they used to working with digital devices and software applications?[3]
- What are your users' skills in using your application? Does the application revolve around their professional area?[3]
- Is the application the focal point for your users? Or is their attention limited?[3]

these three points can help develop an app that will be focused on the users needs, which is at its core what UX is all about.

2.3 Interaction Design

A very important part when developing the application to fit a pleasurable user experience is to make sure that it works as flawless as possible, and there are no misinterpretations when using the product. For the product that is going to be developed, the "traditional" interaction methods do not cover the functionalities that are needed to cover our initial concept needs. To assure that the alternative interaction is integrated in a convenient manner, knowledge about different sensors and possible combination of two or more to make more intelligent outcomes should be established.

needs intro ease-in

2.3.1 Traditional interaction methods and their replacement

As technology evolves, new ways of interacting with computational devices are constantly built. With that, people's needs also change. The transition from the classical buttons on a cellphone to a touchscreen has made new ways of interaction possible - the delimitation of physical buttons made it available to have any customised graphical interfaces on the screen possible. This made life easier for casual tasks - like zooming a photo using two fingers as multi-touch input, which is much more intuitive than the classical button alternative. The smartphone technology evolved further, where different sensors have started finding their place in smart devices. Soon enough there were devices with GPS, WiFi, Bluetooth, Light sensor, Camera, and other sensors. The implementation of these sensors in the smartphone allowed new forms of interaction, such as video calling, flashlight and screen orientation.

SOURCE

2.3.2 Sensors

needs an introduction

The Accelerometer

The accelerometer is capable of detecting the force and the movement in a three-dimensional space. This feature is most commonly used to adjust the display to match the position that the device is held in by the user (Chong, r.(year?)). If the accelerometer is rotated at the center of the system, however, it will not detect the movement. Accelerometer, along with other sensors is commonly used in the augmented reality concepts (examples 1, 2).

The Gyroscope

A gyroscope is a device that uses Earth's gravity to help determine orientation. Its design consists of a freely-rotating disk called a rotor, mounted onto a spinning axis in the center of a larger and more stable wheel. As the axis turns, the rotor remains stationary to indicate the central gravitational pull, and thus which way is "down."(Ryan Goodrich, 2013). Gyroscope, in comparison to magnetometer and accelerometer, is the physically largest and most expensive sensor, so the possible limitations in the smart devices in-built Gyroscopes have to be considered.

Figure 2.8: iPhone game using a gyroscope sensor

The Magnetometer

The magnetometer can be combined with an accelerometer (to complement in measuring the gravity) to get the input of the 3d orientation the phone is being held in. It can be useful in determining the absolute orientation of directions in the North/East/South/West plane. The issue with the magnetometer is that magnetic interference can disturb its flow, making the device output unpredictable results.

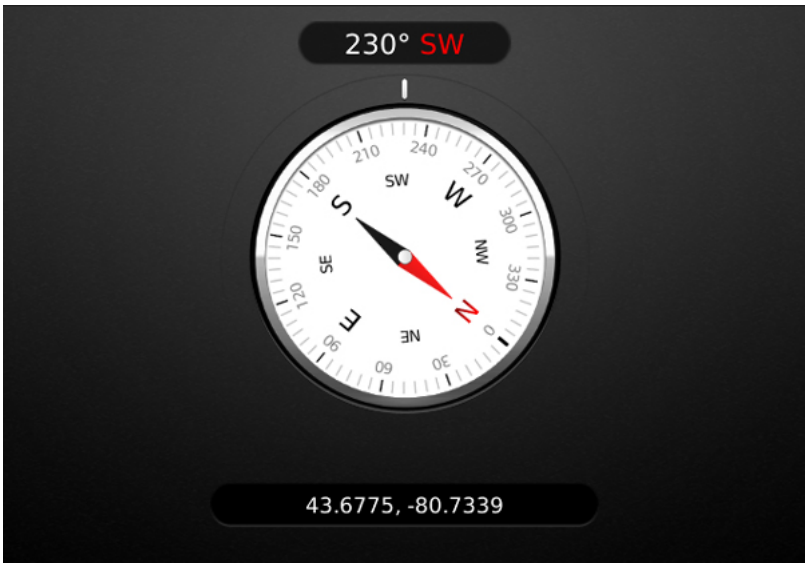

Figure 2.9: a simple compass app that establishes the magnetometer sensor

Combined Sensors (6-axis approach)

Combining accelerometer and gyroscope allows measurement of 6 orientations on X, Y and Z axis, allowing the apps to calculate orientation of the device in the 3D environment more accurately.

9-axis approach

Accelerometer, magnetometer, gyroscope could be all combined together for even more valuable user experience. For instance - enabling an online feature with more precise positioning in relation to other users could be considered. The data gathered from accelerometer, magnetometer and gyroscope can accurately position the artefact in the world, including the changes

in position and rotation. On top of that, multiple sensors could fill individual sensors blind spots.

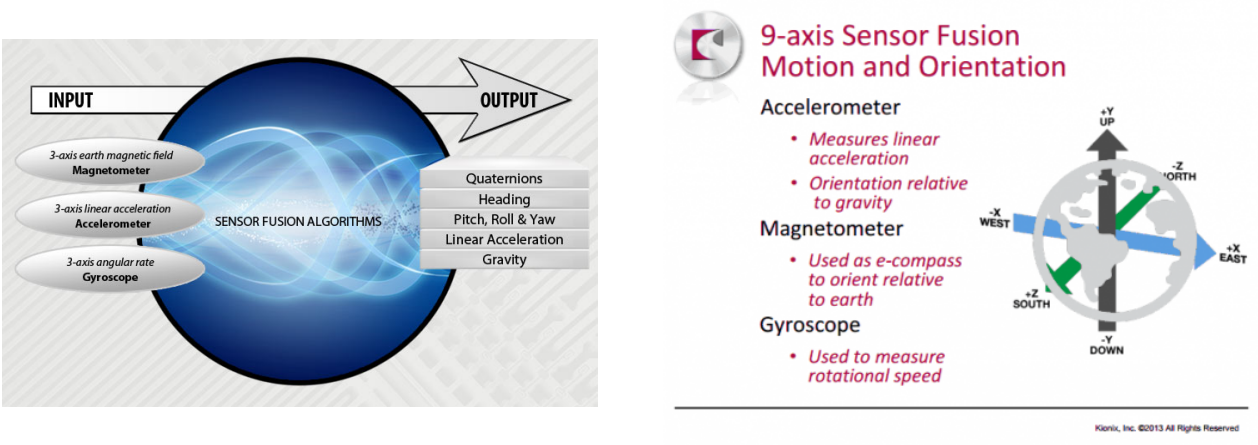

Figure 2.10: uses of sensors

2.3.3 CONCLUSION

After gaining more knowledge it can be seen that there is a variety of options how to use sensors in apps. Whether it is all of them together or using only few of them, it is mandatory to take all the options into consideration. As the project theme mentions it, the project has to be with non-traditional user interface, meaning that this project should aim for more complex or more "interesting" choices regarding sensors or user input.

2.4 GRAPHICAL DESIGN

Two of the things people often complaint about in applications is a confusing interface design and poor navigation. [4] This can be prevented by using design patterns. First, let's look at navigation. There are two ways to make navigating through an app easier. Persistent and transient. Persistent navigation is your list menus and your tab menus or menu structures if you will. Transient navigation has to be revealed through a tab action or the likes.[4] Does the user need to see the menu at all times? If not, you can use an off-canvas solution like the side bar. It has become more and more popular to use off canvas methods. [4] This helps the app hold more information but without being confusing e.g. If all your information has to go on one page. You don't want to put too much text into one page or have a simple form take up

several pages. A sign in for example should only be one page. A way to not get an over lapping look is by using vertical labels instead of horizontal. [4] Or you could have the horizontal labels where the text disappears as soon as the user starts typing, but you risk that the user forgets what they should fill in.[4] Some apps, like Instagram, shows the "sign in" and "sign up" option all the way through the tutorial. This also insures that the user do not have to go through a whole tutorial if they don't need it. Another important form is the "search" form. This should be very short. It is a good idea to offer a filter option like "saved searches". There are several kinds of searches.

Explicit search is the most standard search option and is pretty straight forward. But you can still give it a little extra. E.g. When the user chooses the search bar but haven't typed anything in yet you could give them some options in a list e.g. have a "scan" option at the top, latest searches, saved searches etc. [4]

Implicit search will give the user something they didn't search for and what they might not know they needed. E.g. Search for coupons when you enter your local grocery store and give an alert if there is anything useful. This will enhance the user experience as well. [4]

Scoped searches is searching for something more specific. You can choose to search in different categories to minimize the results and not get a result of 1500 different chairs if you are looking for one specific chair. [4]

Lastly there is the dynamic search or dynamic filtering. This is used to minimize choices in set lists like in music library. This is however only good with small data sets.[4]

There are many more patterns and anti-patterns to discover. [4]

Keeping these patterns in mind there are still many things to consider. First of all, remember the size of the screen that you are designing for. Avoid using big scaled photos and put to much information at one page. This will make it look cluttered and make it less intuitive. [2] In short, make everything as clean and simple as possible.

When designing your layout it is, once again, key to keep everything simple and streamlined. Follow the general rules, left-to-right and top-to-bottom. Make sure the most important feature is in the top left corner where the user will look first.[2]

Be careful when choosing a font type. You cant control the devices fonts and thus try to pick an common type font. [2] To make the text easy to read make sure that the contrast between text and background is present. Either black and white or a light coloured background with dark text. [2]

Last but not least; colors. Make sure that the colors are bright enough and that the contrast

is sufficient since the weather can affect the UX. [2]

2.4.1 GRAPHICS PART 2

Fonts The most popular combinations of fonts is sans sherif and a sherif body type. [6] Something about rythm, balance and proportions. [?]

The basics of color [?] There are to primary colours. Additive and subtractive. Additive is used on screens as it gives away light and subtractie is used for e.g. bookcovers as it reflects light. [?] These are also known as RGB(Red, blue and green) and CMYK(Cyan, magenta and yellow). In additive colours white is colours mixed together where black is the absence of color. In subtractive white is the absence of color and black all the colors mixed together. Since subtractive colour do not fully absorb light a fourth element has been added, hence the K in CMYK. K stand for 'key' which essentially is black.[?]

The colour wheel can helps us see which colours are complimentary, adjacent and triadic.

Figure 2.11: The colour wheel. [?]

hue, saturation and brightness.
which font to choose [?]

Eugeniu Clim has come up with a three point guide to design the most powerful icon for your app. [?] 1. Discovery state

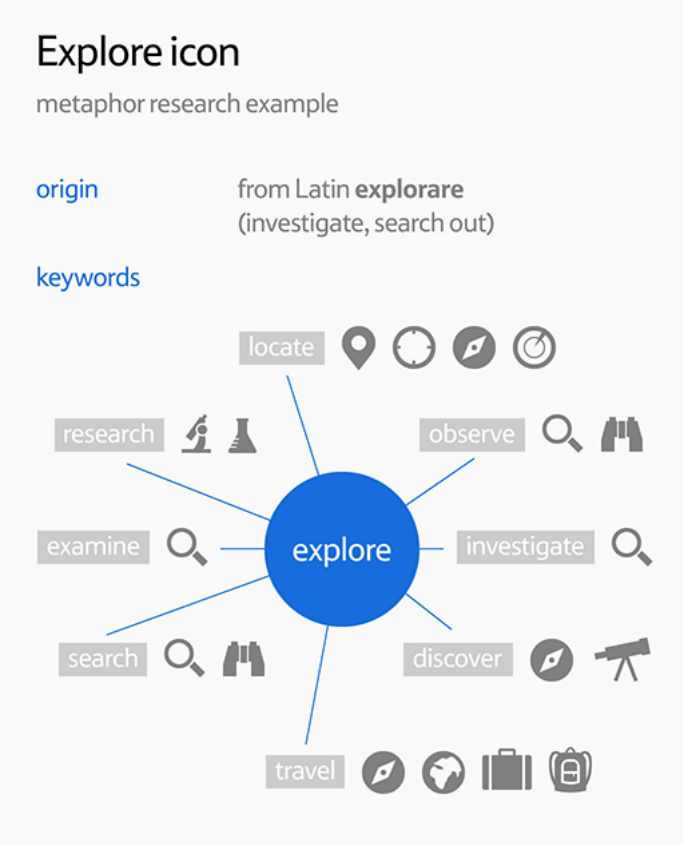

Figure 2.12: First stage. [?]

Find keywords and images that shows what you have to represent. Make a lot of skecthes and doodles. ’

2. Design State Here you explore your icon. Be careful to balance the use of detail. If there is not enough detail it will look poor, but again, too much detail will make it look plastered and won’t be regonized as easily. When you have settled on a sketch and made a mood board (?) you can begin to decide it style.

2.5 Mobile Hardware Considerations

2.6 State of the Art

1

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2013