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# PROJECT 2

*Human-Computer Interaction*

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# 1 | Introduction

The aim of our project is to give users a unique virtual experience of walking around their own designed homes in 3d. We will accomplish this by using the existing in-built smart device sensors. A feature that is accessible in almost every modern smart device will be used - 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.

## 1.0.1 INTRODUCTION THE PROBLEM AREA

With the 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. Application that we will try to develop will help people to save not only time but expenses too.

## 1.1 INITIAL PROBLEM STATEMENT

How can we improve user experience in interior design-centered app's 3d environment using non-traditional mobile sensors?

## **2 | Analysis**

### **2.1 TARGET GROUP**

### **2.2 USER EXPERIENCE FOR MOBILES**

#### **2.2.1 INTRODUCTION TO USER EXPERIENCE**

A study of user experience<sup>1</sup> 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 makes up UX, such as: Design, Accessibility, System performance, Ergonomics, human factors and more concept. 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:

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<sup>1</sup>hereafter referred to as UX

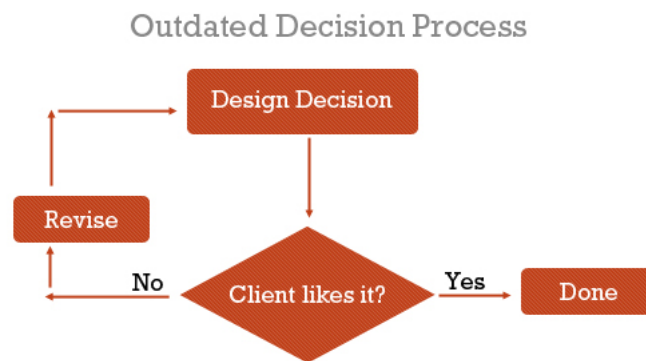


Figure 2.1: old decision process, Jacob Gube 2010

nowhere in the design process is the users a factor, the design was simply made according to how the designers as well as the client felt it should be. making the same kind of chart for a user-centered approach could look like:

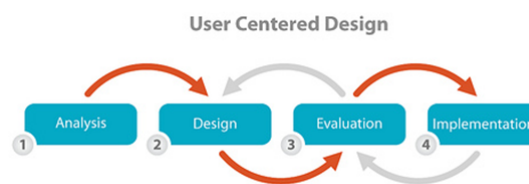


Figure 2.2: a chart of how user-centered design could function, Usabilla 2014

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.

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/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.

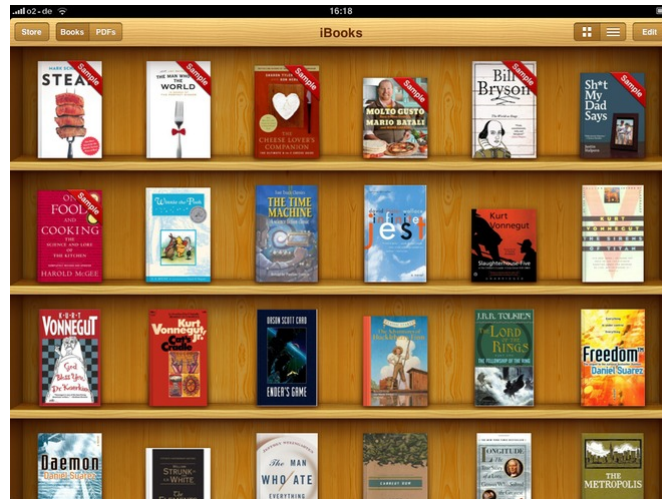


Figure 2.3: Apple iBooks for comparison

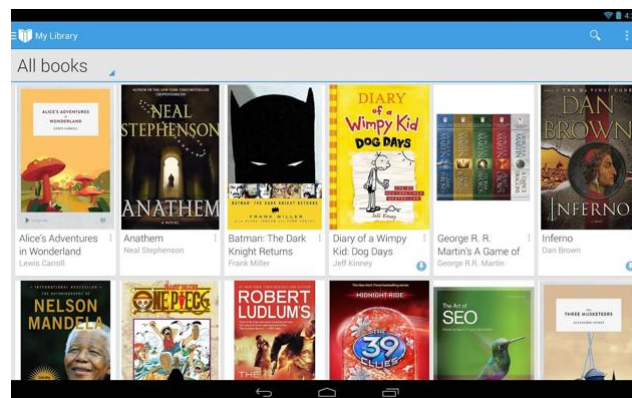


Figure 2.4: Google Play Books for comparison

## 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 two of the most outstanding difficulties:

- 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]

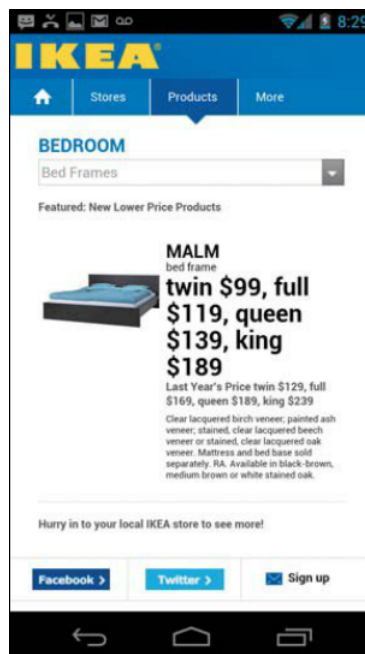
- User input

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.



### 2.2.3 UNDERSTANDING

### OUR

### USERS

Even though we have previously analysed our target group, when we want to focus on the user experience, further target group considerations have 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 artefact 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.

### 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.

## 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 2.5: 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.

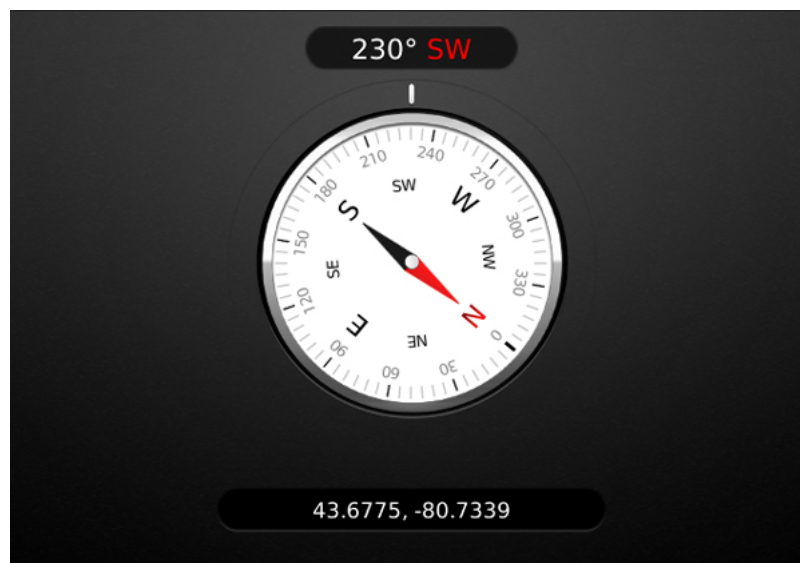


Figure 2.6: a simple compass app that establishes the magnetometer sensor

**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 placement 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.

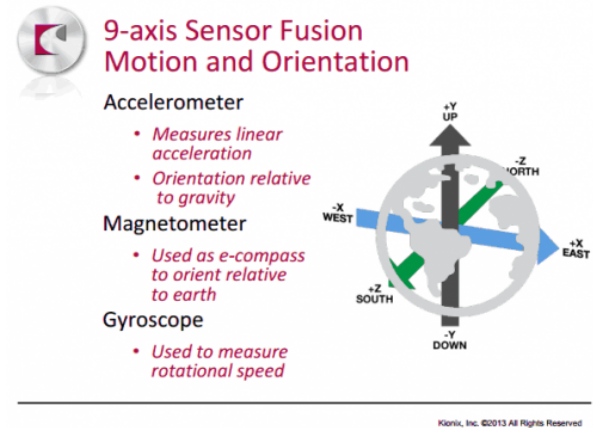
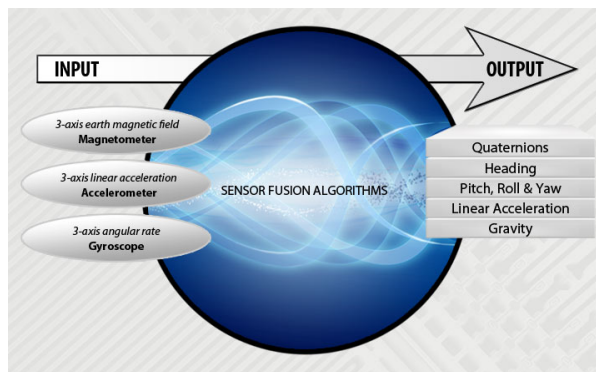


Figure 2.7: uses of sensors

## OTHER

## SENSORS

For example it is possible to create an app using microphone as the only input sensor, in one case the creators decided that the phone records sounds and plays it back in theme of The Batman Rises (<http://darkknighttrises.rjdj.me/>).

### 2.3.2 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 overlapping 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 too 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]

## **2.5 MOBILE HARDWARE CONSIDERATIONS**

## **2.6 STATE OF THE ART**

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