

HUMAN COMPUTER INTERACTION

Module code: COMP1649

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Prototype

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1. Introduction

The coursework is about building mid-fidelity for car navigation and entertainment system, where it is said to develop a conceptual design of the car media player screen with the map to help the user reach the destination by viewing their location. There is a media player so that journey doesn't become boring or can pass the time in traffics. All the processes to User Interface design are elaborated in this coursework, from the frame to step by step process and the need to think users psychology for a specific limit and its comfort for using it.

2 .Background

The car's media screen shows the navigation system and lets the user listen to the music and see any video. Recently, it is being technologically developed and tried to bring more features in the car. The user can see the location and navigate them to the correct destination. However, it requires a better carrier for using the device. Something good lets the user see a movie on the screen while stuck in a jam. It also has Bluetooth and USB features and has a screencast option to see a movie directly to you by connecting your phone.

2.1 Process and framework for interaction design

2.1.1 Frame works:

The framework is the method where there are steps to complete the process. The ideas need to be gathered for a designer and set a final user interaction according to the client's requirement. The process helps the designer complete them quickly and make the standard design, so the client understands it, and software then develops according to it.

User Center design (UCD)

This framework follows the process by focusing on users requirements. The process involves users feedback and objectives, whether they are satisfied or want to add other features. Sometimes they have an issue with colour other changes than the standard one. The design is based on users design and is then evaluated. The process is shown on the diagram.

(Babich, 2019)

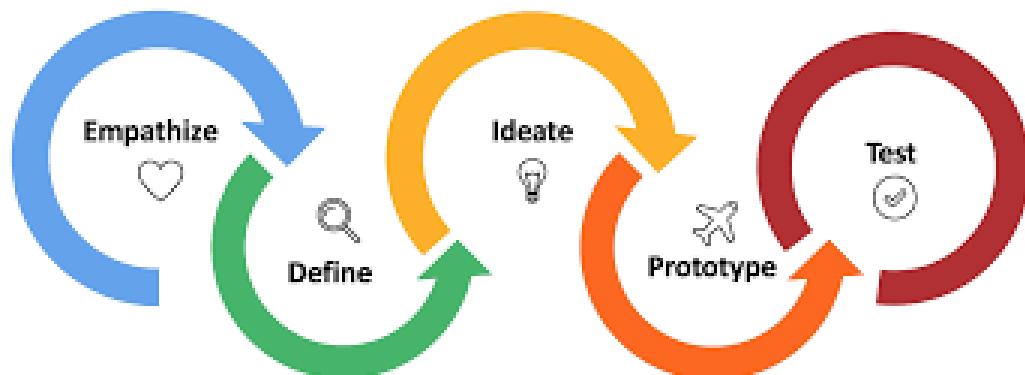


Figure 1 User-Centred Design

Goal-directed design (GDD)

This framework is research-based based software that tries to see the human reaction to this design. The collection of users requirements and figure out its usability in all environments like online or offline. These also included the techniques persona, scenario, interaction design, where both recent and modified satisfy the person. this method uses analysis and synthesis techniques done by a large developer team and works by seeing user's behaviour (Seid, 2013)

Goal-Directed Design Model

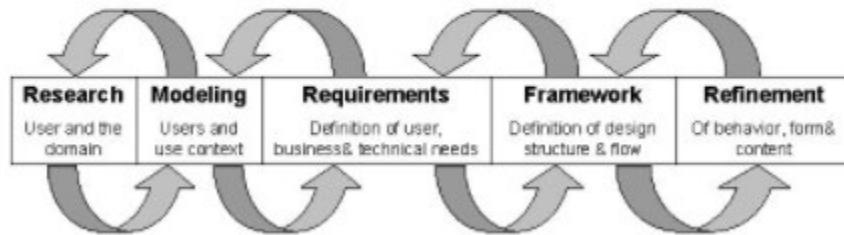


Figure 2 Goal-directed design

Participatory design (PD)

It is a new way to design products where stakeholders, designers, and end-users are present, which helps get the client's desirable products. The process involves a basic software sample and discussing it with a client on how they proceed. The process involves usability, design audits, testing and evaluation, which proceed after discussing it with the client (Cipan, 2019)

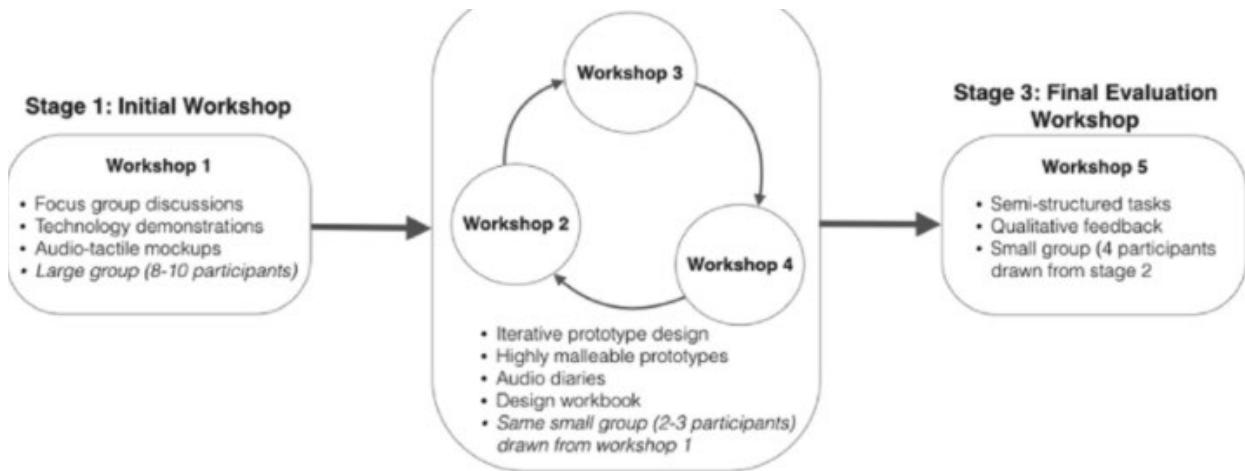


Figure 3 Partocipatory Design

Lean UX

The process follows agile development. Designers focus on the feedback they try to get as soon as possible, update the design and then repeat the cycle to make a better product. The process requires strong teamwork to finish the product. The hypothesis created in Lean UX is to test the assumptions. The assumptions are based on Worksop basis a, where team research to solve the problem. (interaction, 2021)



Figure 4 Lean UX

2.1.2 Chosen framework and justification

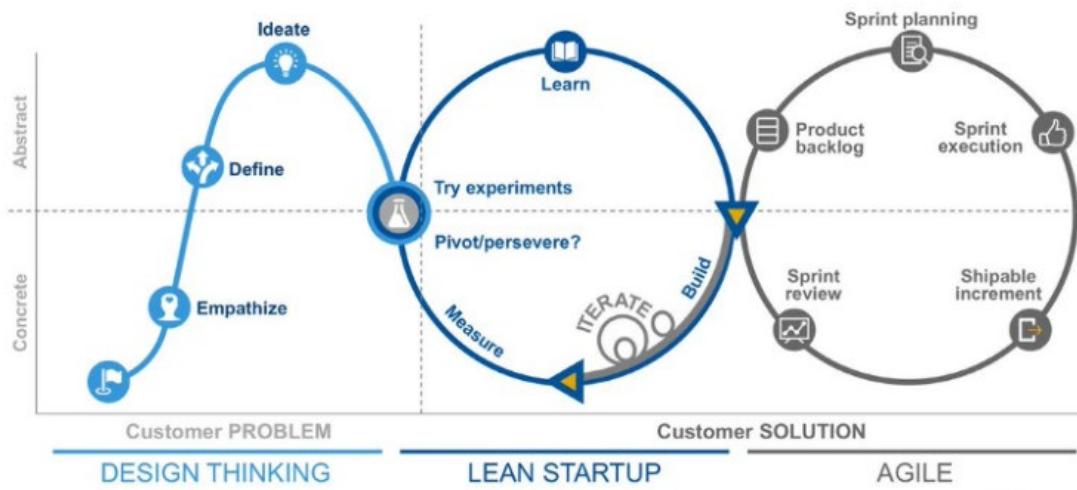
By going through all the frameworks, I select the Lean UX framework. It is simple and follows the agile process. This is also time-saving and reduces the cost. This is an

interaction of the cycle by taking feedback from the clients. This does not take a while to make the final process as it skips the trial and error process. This framework helps develop car navigation and entertaining system.

2.1.3 Discussion on the Design Process

The UX design is focused on agile methodology, as it is said earlier. It cuts down unnecessary parts and increases its productivity. The steps are involves planning, designing and feedback. The process will take out feedback frequently. The process starts with a sketch, wireframe design and mid-fidelity design. After rough work is completed, the team move forward to the main project, and frequent user feedback is taken and then updated. The users become part of this process unless the product is completed and satisfies the users.

Combine Design Thinking, Lean Startup and Agile



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Figure 5 design process

2.2 Cognitive Psychology

Cognitive psychology is about the studies of the human mind, how it works after showing something. It includes how they acquire the information and where it occurs, including functions like perceiving, remembering, learning, thinking, and solving.
(Cherry, 2019)



Figure 6 Cognitive Psychology

Attention

It focuses on some numbers information and makes a perception about it while leaving out other perceiving information aside. There are two types of attention, focused attention, only the input attention, and divided attention, where the process occurs. Again their types between focused attention and divided attention; are auditory, visual, and Task similarity, task difficulty, practice, respectively. Some designs can interact with the user's loke, icons, thumbnail, text size and fonts. These types of things add to my car stereo system.

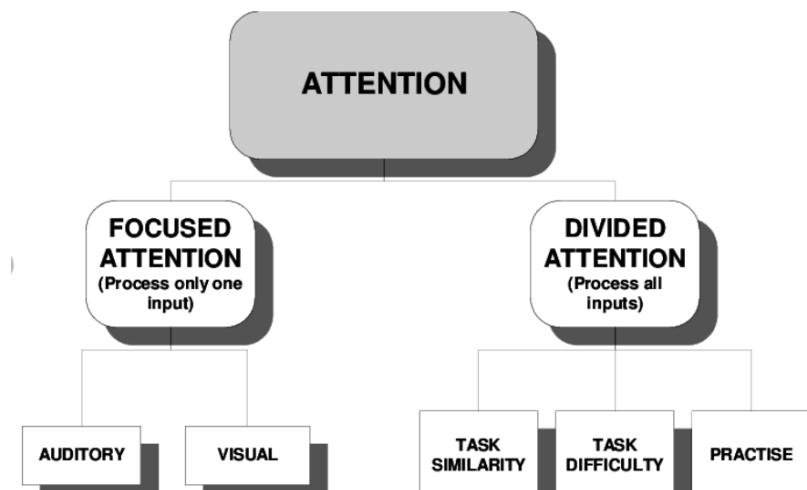


Figure 7 Attention

Memory

The human brain stores the information they learn, experience and see the things around them that had been a while ago. Sometimes, we forget something we learn or make mistakes in remembering old things. The thing is so troublesome to remember something from the past, which put much stress, so UI design should design with less memorable things or easily remember the things in the interface. The icons should keep simple similar to others so the users can relate to them. (Cherry, 2019)

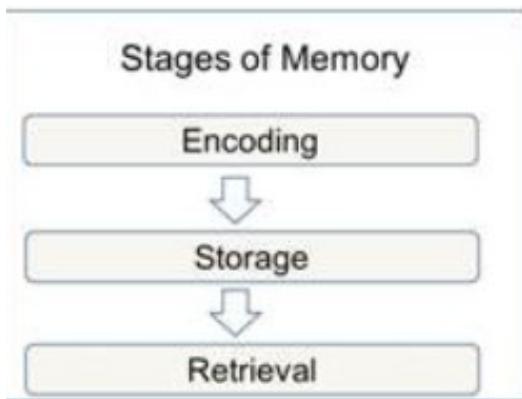


Figure 8 Memory

Perception

Certain stimuli process thoughts with our five senses and process. It is the thinking of a person or view that I differ from other people. Either that is comfortable the user and vice versa. It is the process of the stimulus to make any sense about it. (Anon., 2020)



Figure 9 Perception

Learning:

It is used to store the memory of some information or works that happens by iteration of the same topic and practising something from several times; for learning, there are some cognitive functions like attention, perception and memory. UI design should focus on making the user interface learn quickly. The user perceives the information, and a decision happens, where the information is processed, then action and feedback happen according to the cycle below. (Interaction Design Foundation, 2021)

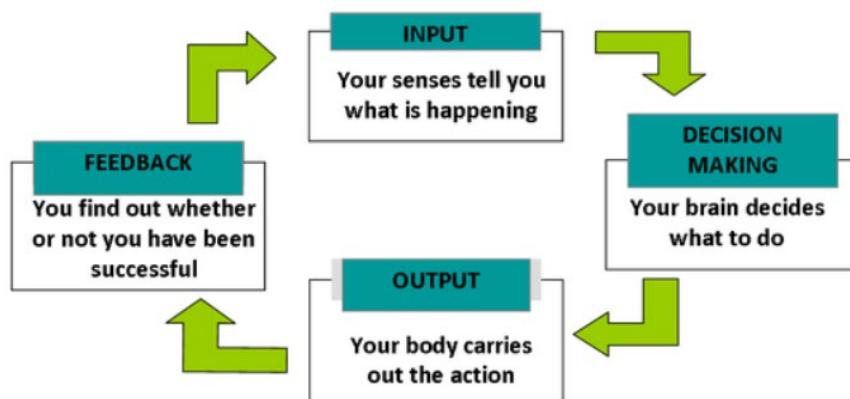


Figure 10 learning

Mental Model

The mental model is a model of thinking and how we see the design that users access.

The design is based on

Previous websites and applications so design a logical interface. The design needs to develop according to the user model so that it seems interesting to see the new thing about it. These are based on some logical assumptions. As it is a critical analysis from a user point of view, this mental model gives a solution to the problem; during learning Human-computer interaction, there are some tools, which are helpful for design.

(Vinney, 2021)

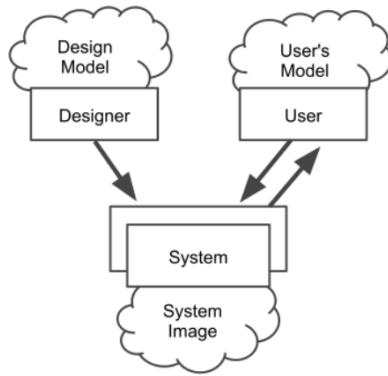


Figure 11 Mental Model

Distributed Cognition

Everyone in this framework knows the information. It is instead spread out through some components and several aspects and components of the sociocultural environment. This framework provides some insights about the user and tools. It kept this value by distributed cognition .desiner should use the components properly

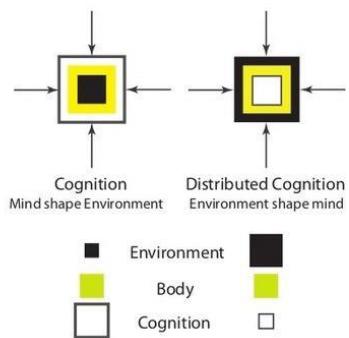


Figure 12 Distributed Cognition

External Cognition:

The process is gone through the internal cognition of the human mind, where internal cognition represents perception and manipulation. External factors focus on the cognitive activities of the human mind while they interact by representing different data. The designer can make the interface user friendly if the designer knows more about

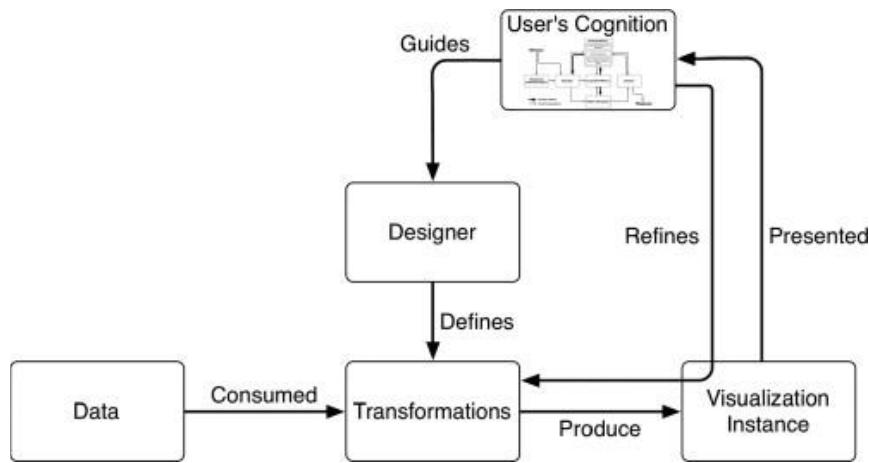


Figure 13 External Cognition

2.3 Interaction Design:

2.3.1 Different modes of interaction Design

There is various way to interact with the interface, like using voice command, Touch, GUI.

Voice :

Nowadays, voice command is famous among people because they recognize the human voice, interpret it, and digitally convert it to executable voice commands to complete the command task. I don't use the interaction with my device because there is a problem with accent sometimes doing the wrong task that is undesirable to you.

Touch :

Most of the stereo that comes along nowadays is with a touch-sensitive screen. In this mode, the user touches the screen control media and starts navigating to get to your destination. The finger should touch on a specific button to work correctly, which varies along with the device's quality.

GUI

This graphical user interface where the interface is shown visually. For instance, the icon button, radio button, and sound control are present in my car stereo prototype.

2.3.2 Types of interaction:

There are types of interaction for the users. They are as follows:

- Instructing
- Conversing
- Manipulating
- Exploring

Instructing

It uses writing commands by typing, options selected from the menubar, gesture and through speech

Conversing

The interface is present here, where the user could make conversation through text or speech by using a dialogue

Manipulating

It does with physical interaction by suing an object and using it virtually space to manipulate them

Exploring-

The users can move freely without giving the command to the system and explore the interface freely (quizlet, 2021)

3. Design process

It is a way to produce a conceptual design by splitting the projects into parts where different developers and UX designers complete the task and develop a project from a different perception

3.1.1 User Research

The research is to study users' points of view and how they design the project, which helps users access the system quickly by developing an appropriate design. User Research figures out every bit of the problem and finds every possible way to design the project at its best. The information from research used late on provides the designer with exact information.

There are different methods of approaching the research. They are as follows:

- Questionnaire
- Interview
- Internet Research

These approaching methods have some advantages and disadvantages. The interview method was selected for the research.

Interview

The interview method is more flexible and provides users with the opportunity to raise a question. In questionnaire is a specific and structured interview which have a dynamic and versatile method.

Identification of the user and the platform

Targeted Users:

The statistics show people of different ages using the navigation system. The range of car navigation is from age 29-60, and the optimum age is 45 -49. The number of navigation systems starts to increase from age 35-39, and there are more female users than males, but most of the time, male users are the same. After age 54, there are fewer users.

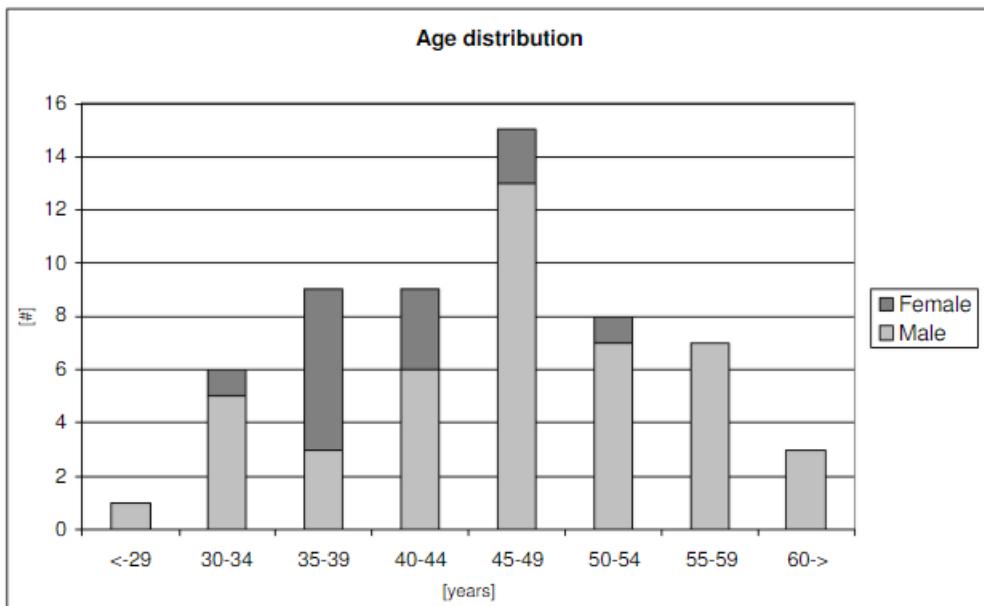


Figure 14 car navigation system usage across different ages (Svahn, 2004)

Selected platform

From the beginning, there is a car stereo, then it starts to upgrade from to car navigation and includes an operating system like ios, android, windows and others. Recently the car industry nowadays focused on android and ios systems, which is easy for the user. In UK, the ios system is used more than android, but I suggest android, which is more straightforward.

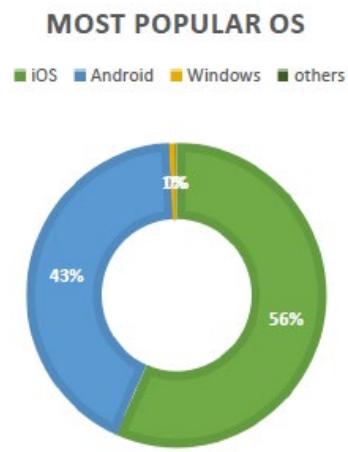


Figure 15 percentage of the operating system.

3.1.2 Task Description

Persona

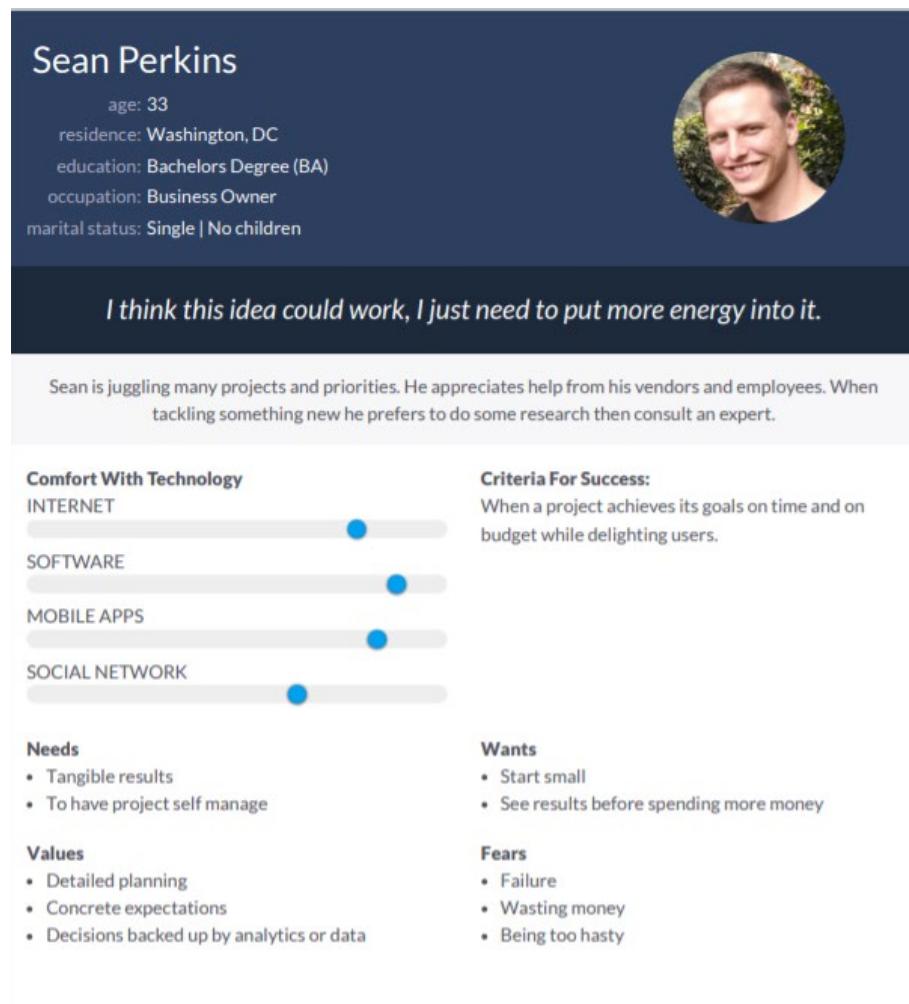


Figure 16 Persona

Persona Scenario:

Sean Perkins is a business owner who lives in Washington DC. He has graduated with BA, who is single right now. He is interested in some technology, like the internet, software, mobile apps and social network. He is always busy with his business; he needs ideas for users and wants to deliver the project on time. He can do detailed planning and decision backup analytics. As a business owner, he uses and navigation for arriving at decisions right on time.

Essential Use Case Diagram

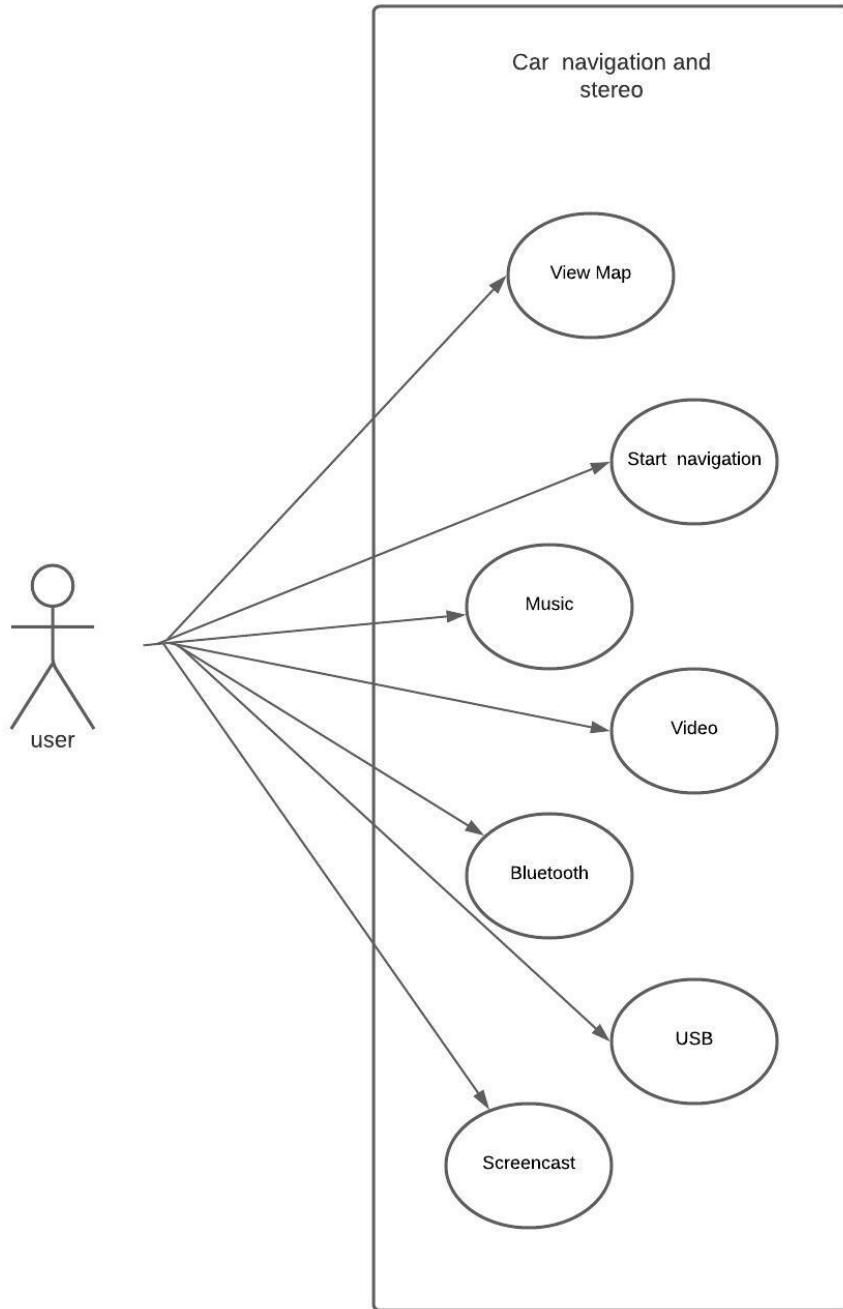


Figure 17 Use case

3.1.3 Requirement Specification

Functional Requirement

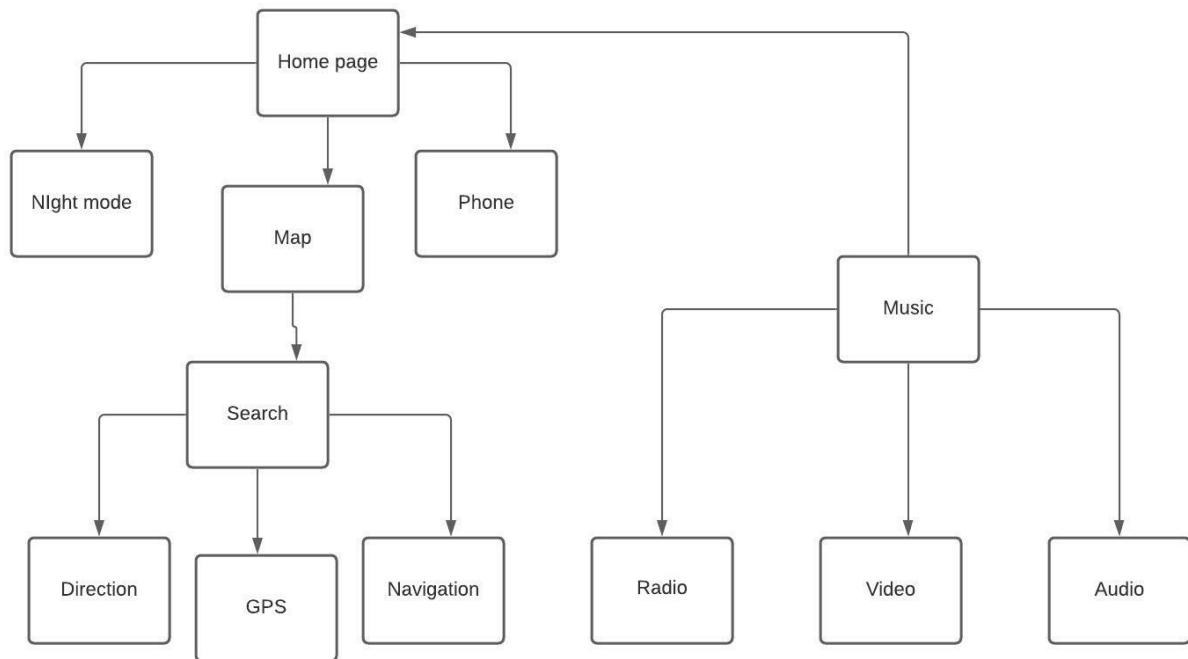
- Users can search on map
- Start navigation on map
- Users can listen to music
- See movie or video
- Screencast from phone
- Users can listen to the radio
- Use Bluetooth and USB to listen to music from phone

Non Functional Requirement

- User friendly
- Comfortable for a user to use at night
- Comfortable touch buttons from driving seat

3.1.4 Task Analysis

Hierarchical Task Analysis (HTA):



3.2 Conceptual Design

The design demonstrates a system like the one used in the real world. The design shows us how the system interacts with the user, how the system is in the future, and which operating system needs to be used in the navigation system.

3.2.1 Design principal

The interface design requires some principles are required, like Nielsen 10 usability for the user interface, and Ben Schneiderman's 8 golden rules are used to make satisfactory products and avoid

Functionality

The user can experience the navigation system, how it is working and what is the next step after tapping on that button to see its action

Features

Directions in map

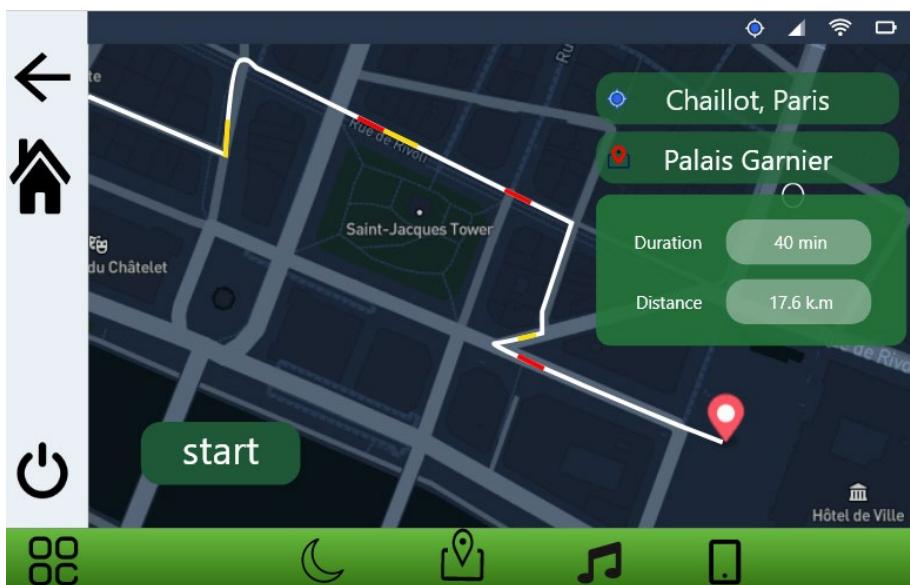


Figure 18 Functionality

Contents :

The information about the system and the image, text and icons.

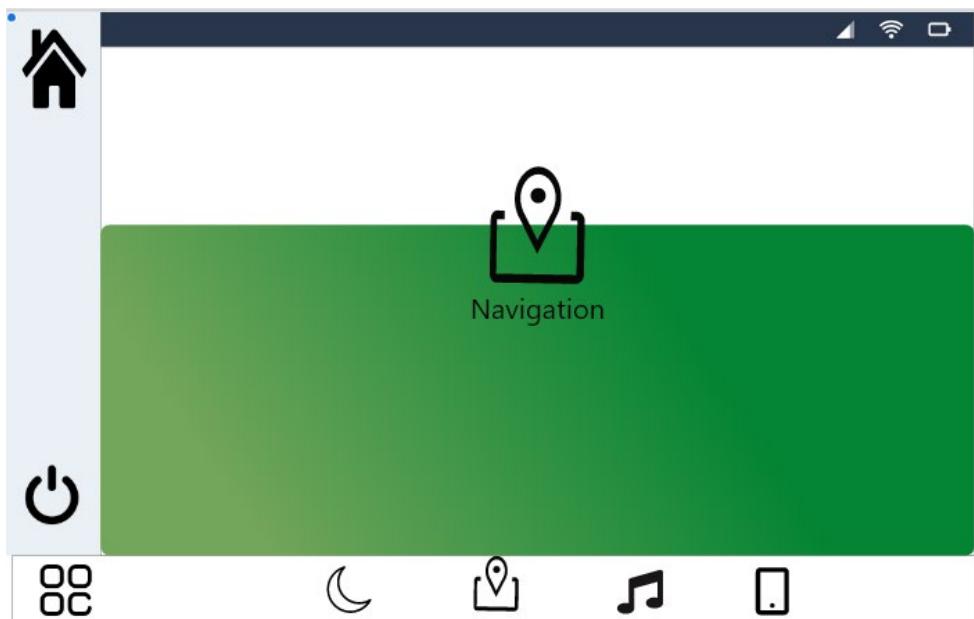


Figure 19 Content

Context :

It helps to understand the contents of some elements

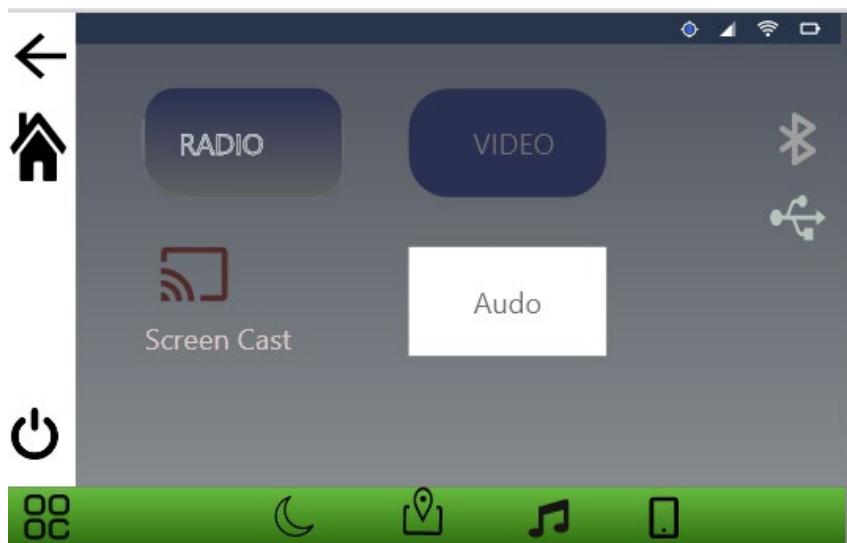


Figure 20 context

Usability – The user can interact with the system easily as icons, heading, images are present

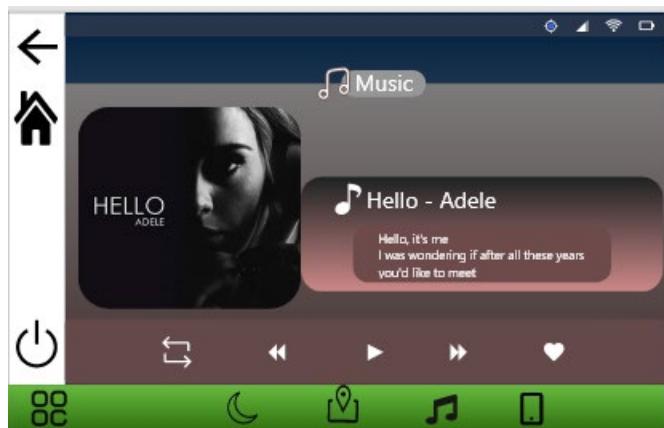


Figure 21 usability

Consistency – It means to create a system prototype similar to the sketch and wireframe. It is not essential to keep the same design all the time, but the user must quickly figure out the interface



Figure 22 Consistency

3.2.2 Ideation Process:

The process involves the collection of ideas and solutions for sketching and cognitive thinking, processing the ideas for the interaction design for the system to make a great final product.

Idea 1

Users can input the name of place in the map's search bar, see the distance and duration, and start navigation to get direction throughout driving.

Idea 2

Users listen to music radio and connect music with Bluetooth and USB. It has a memory where music can be stored, and a USB is also available to chose music from there.

Idea 3

Users can use screencast to see video from the phone, and it will connect wirelessly and see the movie youtube from the stereo

4 Prototype

4.1 Design Artefacts

Layouts: The system's structure where content will be set in the correct position, which is suitable for the user.

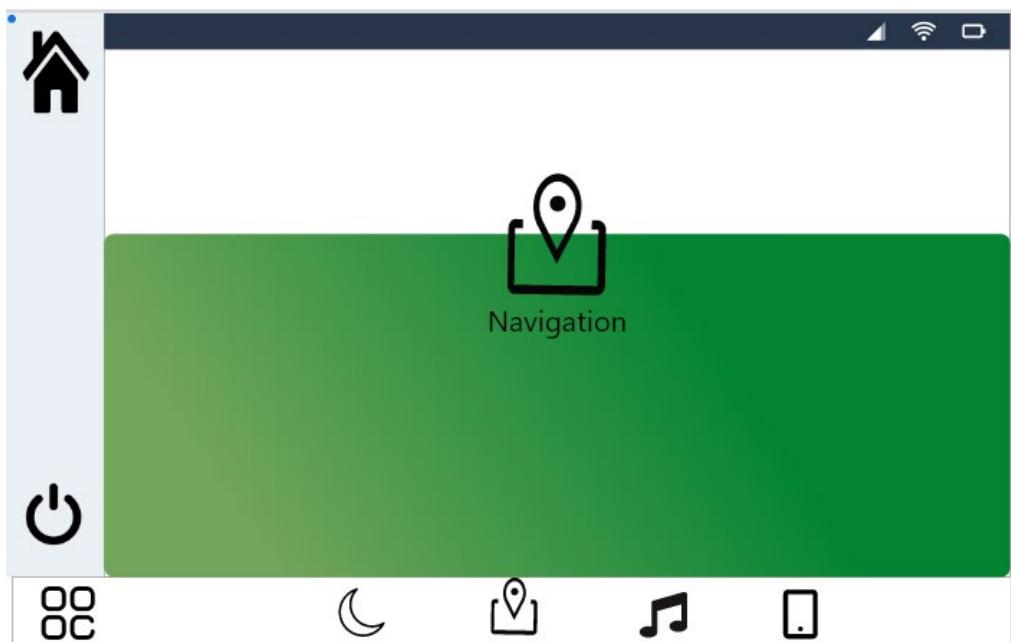


Figure 23 system layout

Navigation

In the system, navigation is the menu, where there are different options to get on map music video or phone



Figure 24 Navbar is present below.

Buttons

It is an essential part of the application; it is essential to have standard button size and colour to easily interact with the interface.

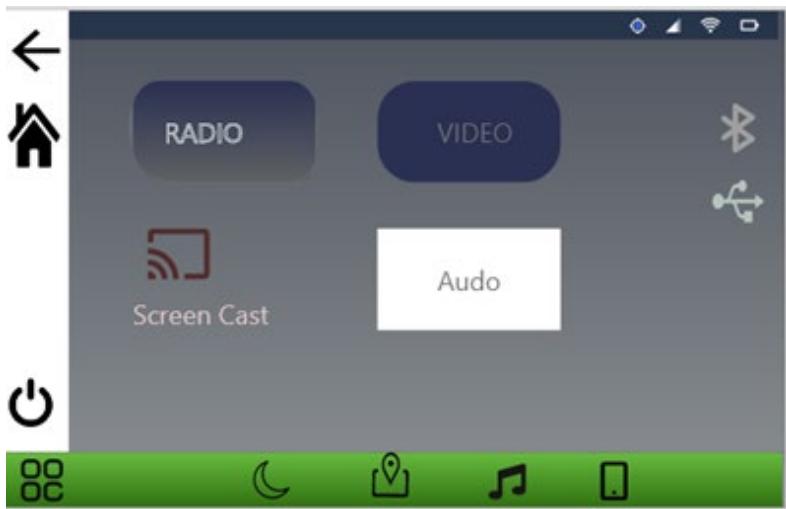


Figure 25 Buttons

Colors:

The colour is also essential because, while users drive in the dark, it is necessary to have a darker screen, so it does affect users while driving at night, and the colour is

also necessary to consult with user because some does have a story behind it or don't like it.



Figure 26 colours

Icons

As the system has been used for many years, users already know some of the icons, seeing everywhere, in website apps and everywhere.

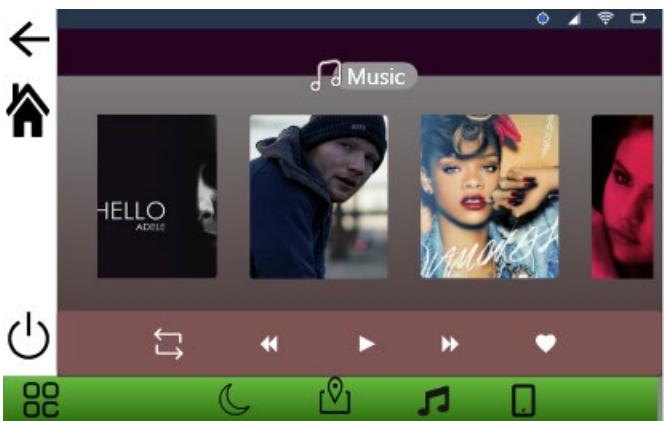


Figure 27 Icons

4.2 Low Fidelity Design

These are some sketches for the prototype, which is basic design to draw a wireframe and prototype Design.

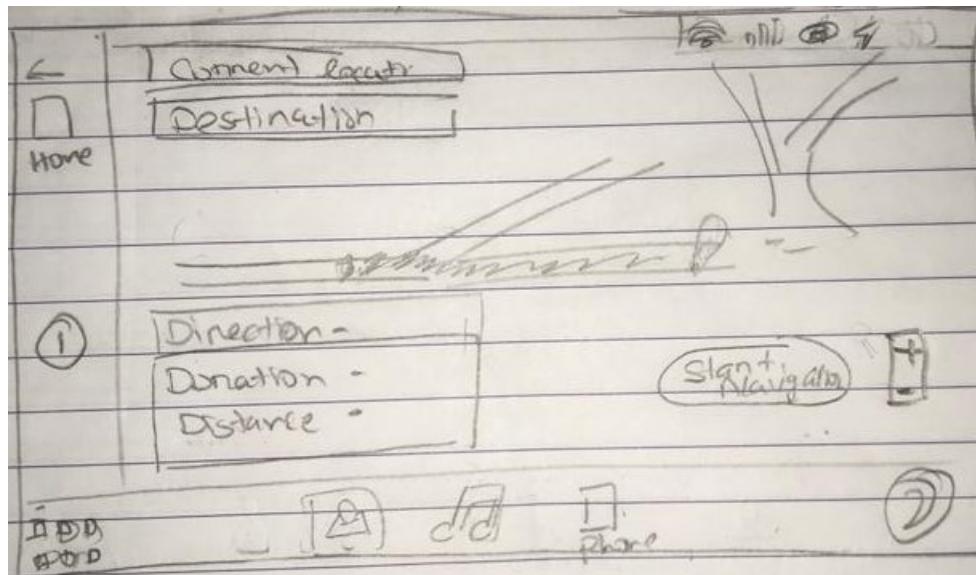


Figure 28 direction of map

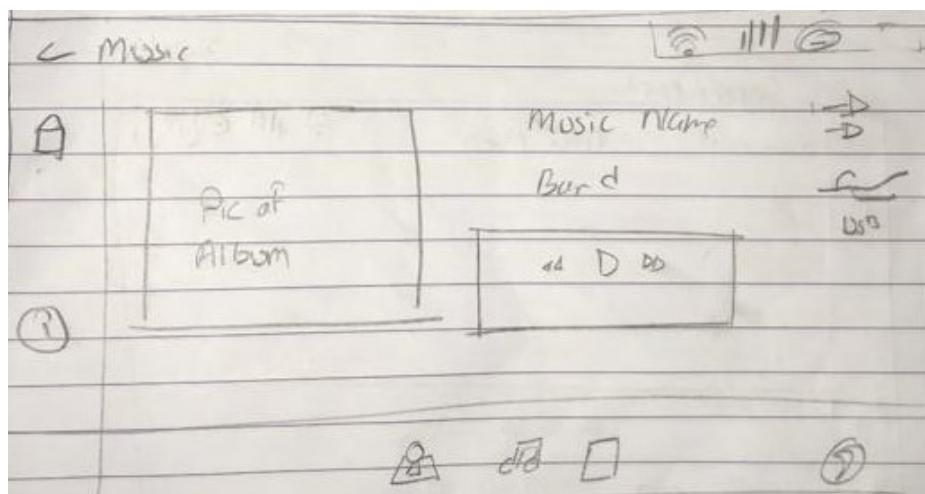


Figure 29 Music

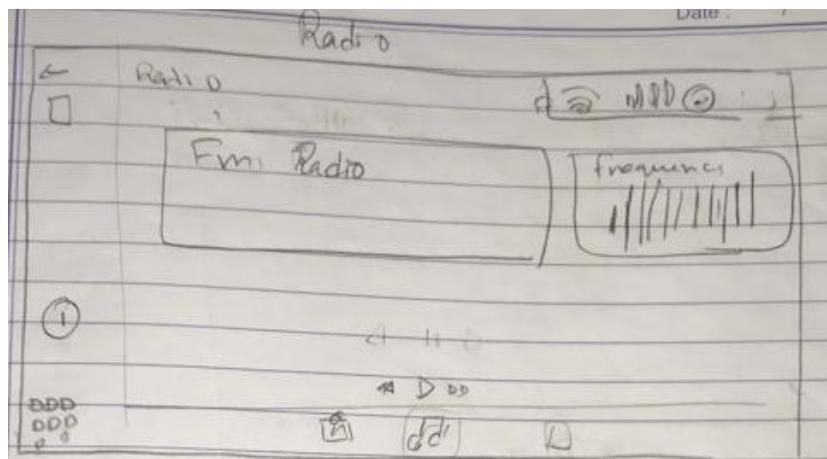


Figure 30 Radio

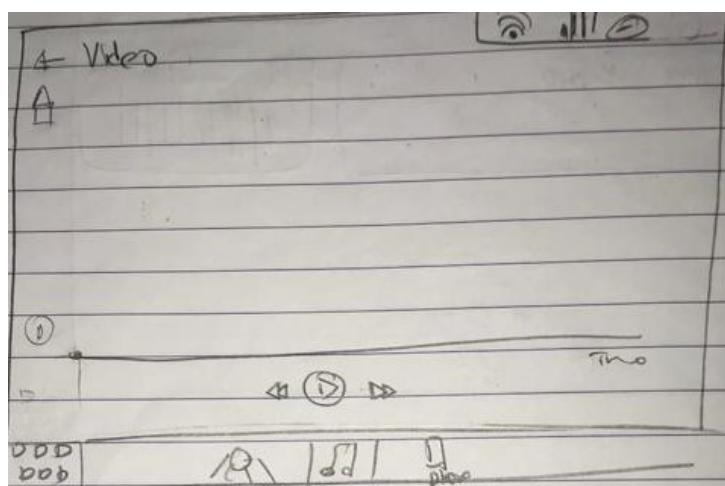


Figure 31 video

Wire Frame Design

This is the diagram in softcopy with the basic layout of od the interface.

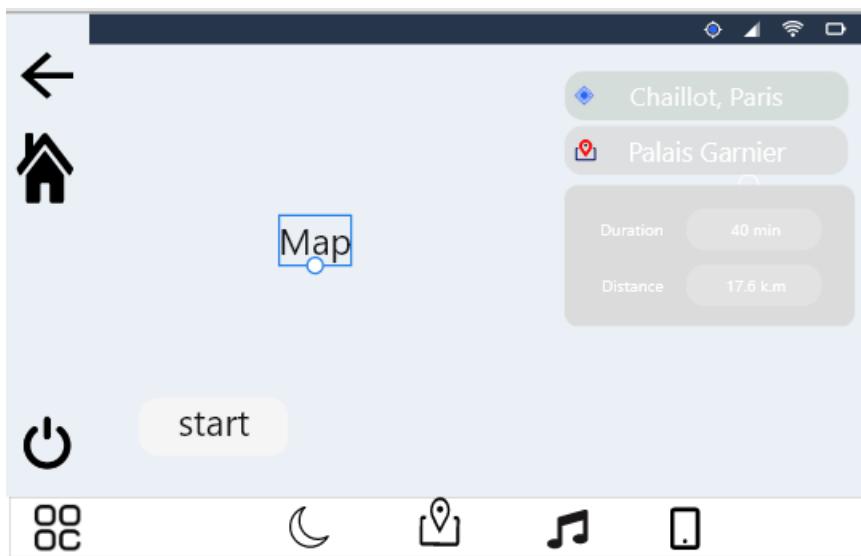


Figure 32 map with direction and duration

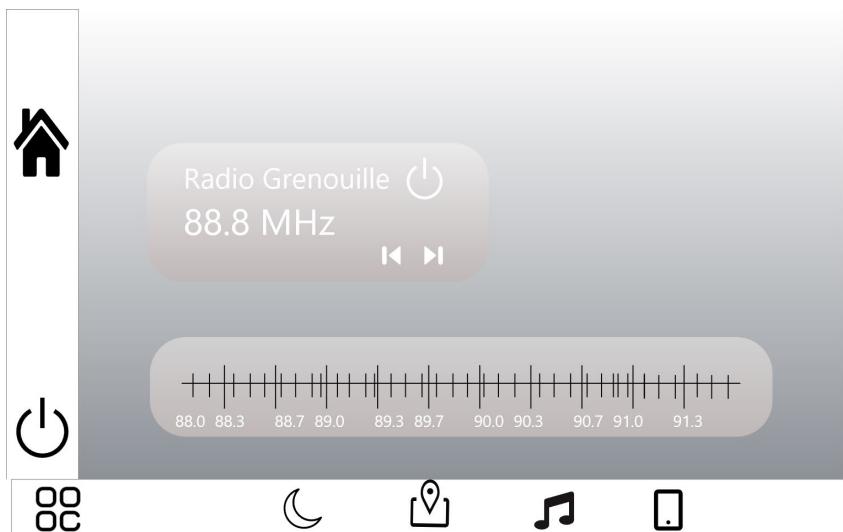


Figure 33 radio with controls

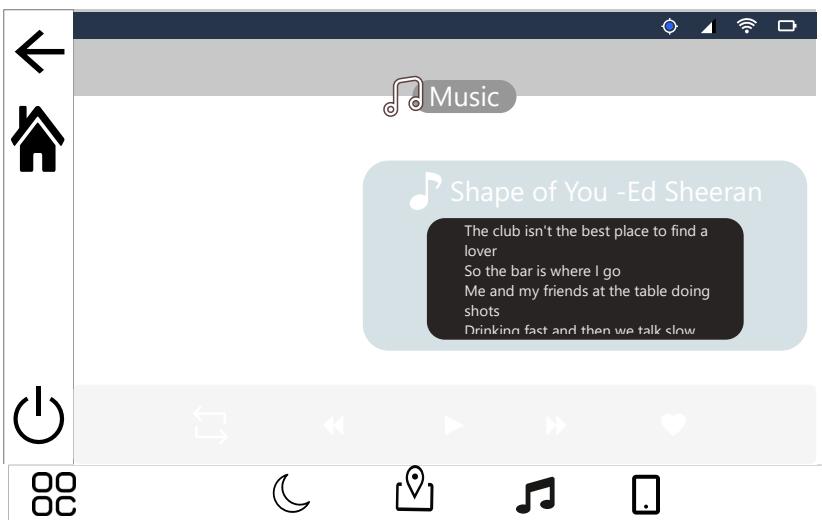


Figure 34 Music

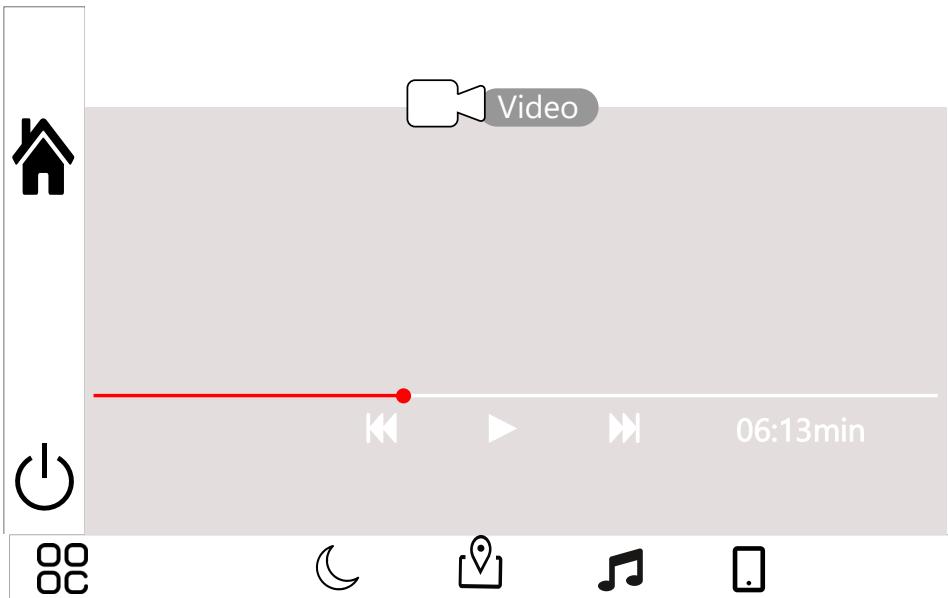


Figure 35 Video

Mid-Fidelity Diagram

It is the prototype of the user interface.

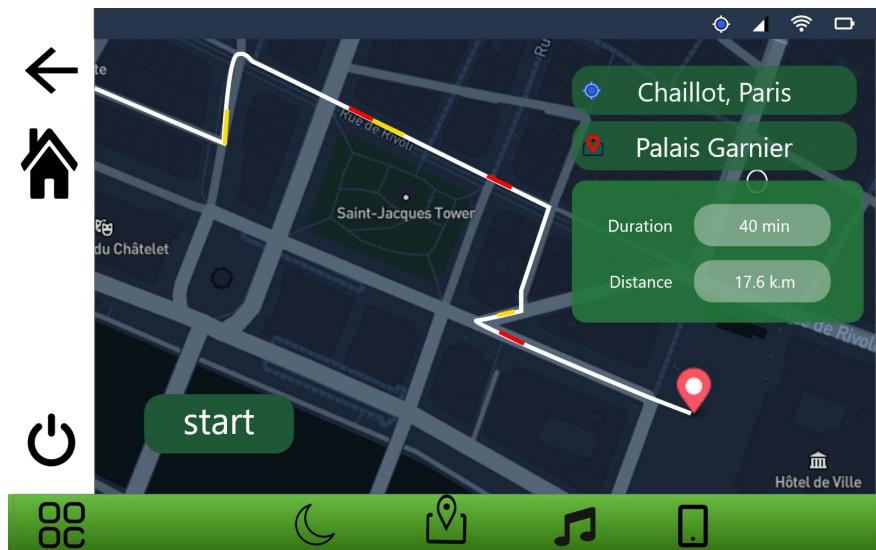


Figure 36 map with direction



Figure 37 radio

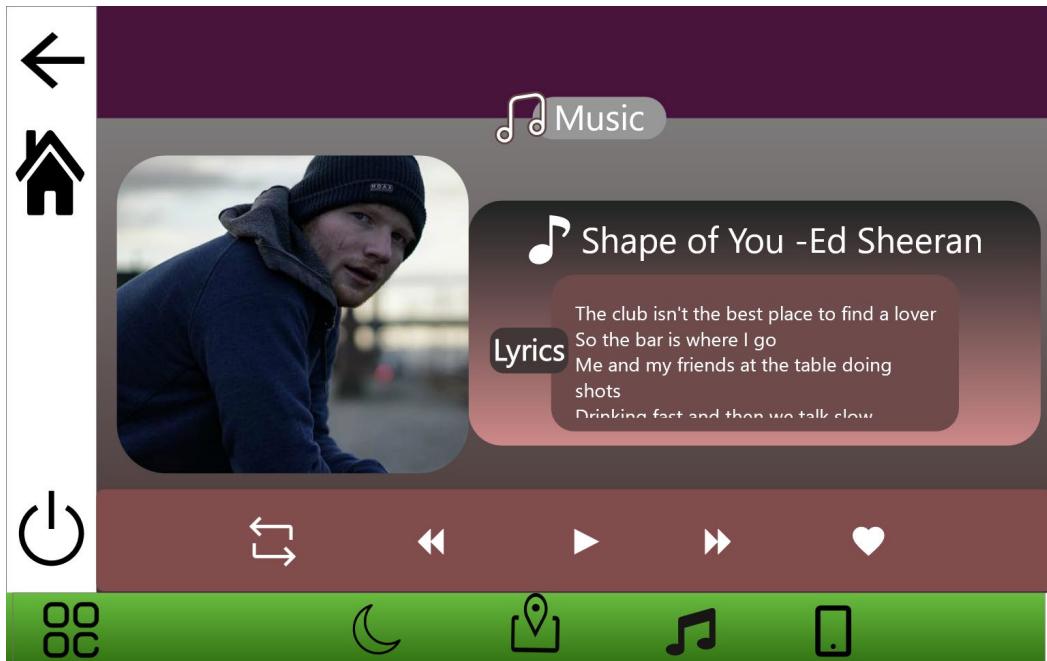


Figure 38 Music

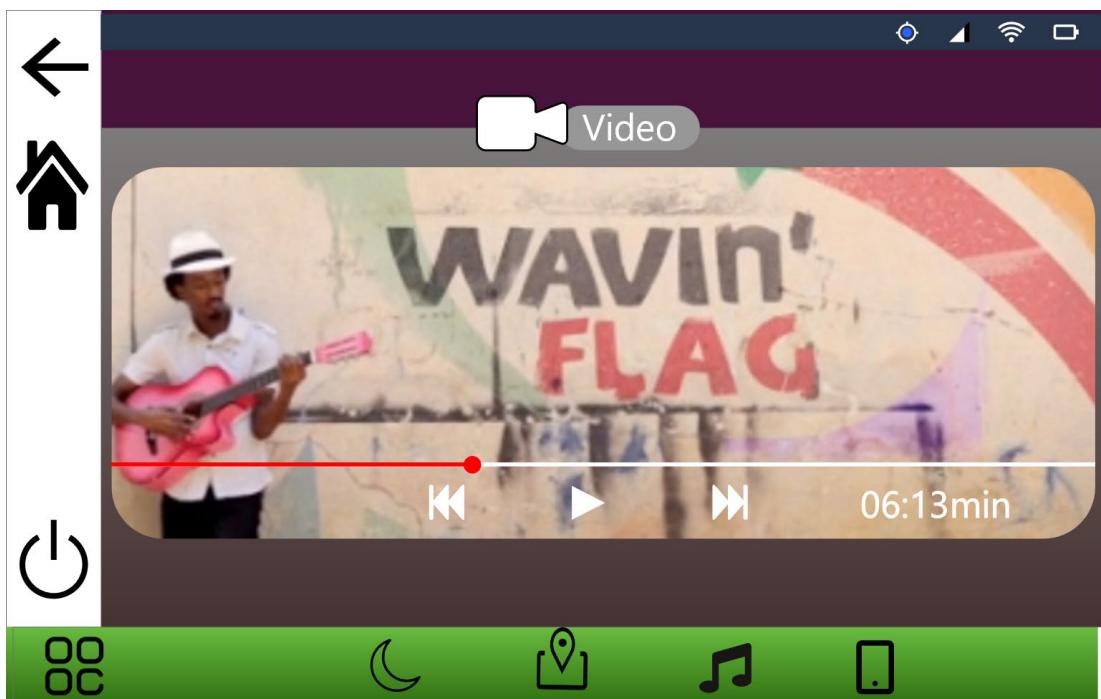


Figure 39 video

5 .Research Study:

The car navigation and stereo system are designed by doing much research among potential users and operating systems. The system gives priority to users' quickly get accessibility. The system's main feature is navigation so that users reach their desired destination with the shortest road without worrying about the map.

Step 1. The user needs to go through the paper manual given with the car and is also shown in the system.

Step 2 The user needs to select the map navigation menu

Step 3 Write text on the search bar, where the user goes

Step 4 Tap on direction, where the specific road with the line be shown

Step 5 Tap on start to turn on the navigation.

These prime features are based on interaction design. There is a method called SUS, where there is a questionnaire and score system to ensure the system's usability. It helps to get better user satisfaction.

5.1 Heart Framework

The framework is developed based on user-centred metrics. It is used to evaluate to increase the standard of user experience by helping the team figure out the impact on UX Changes.

The UX metrics of heart frameworks are simply into five factors.

Happiness – It is a survey to figure out user's satisfaction, their ratings and review and a net promoter score

Engagement – It is calculated by visit number, length of session or any necessary action that happens per day.

Adoption - It is figuring out by percentage of new users for a certain and their access to the new feature

Retention - Users return to the system to do any practical work.

Task Success – It is measured by the duration of the user to complete the task and the error rate. (Bonnie, 2021)

Conclusion:

The coursework has a task to draw the interface of the navigation and entertainment system. The car navigation and stereo system help the user to arrive at their desired destination. It has GPS and a navigation system, which helps down to marked destination; it also has an entertainment system where users can listen to music and see the video through screencast USB. These are some features where users can phone with the system to see the video.

During working on this coursework, I learned about cognitive psychology, framework, methods and the way to do user analysis. I learn to create a persona on how they rate the system as it is impossible to go through a person. I have learned about the heart framework and sus how to use it.

The prototype that I design is user-friendly, and hopefully and can make a better prototype by utilizing all the lessons that I have learned.

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[Accessed Tuesday November 2021].

Appendix A

Theory of Action:

The theory of action gives importance to the delivery of the project. It consists of the gulf of execution and the gulf of evolution. Combining these two gulfs helps to figure out exact information for the user by determining its effectiveness. Gulf of execution try to achieve system interface, and gulf of evolution modifies to start design.

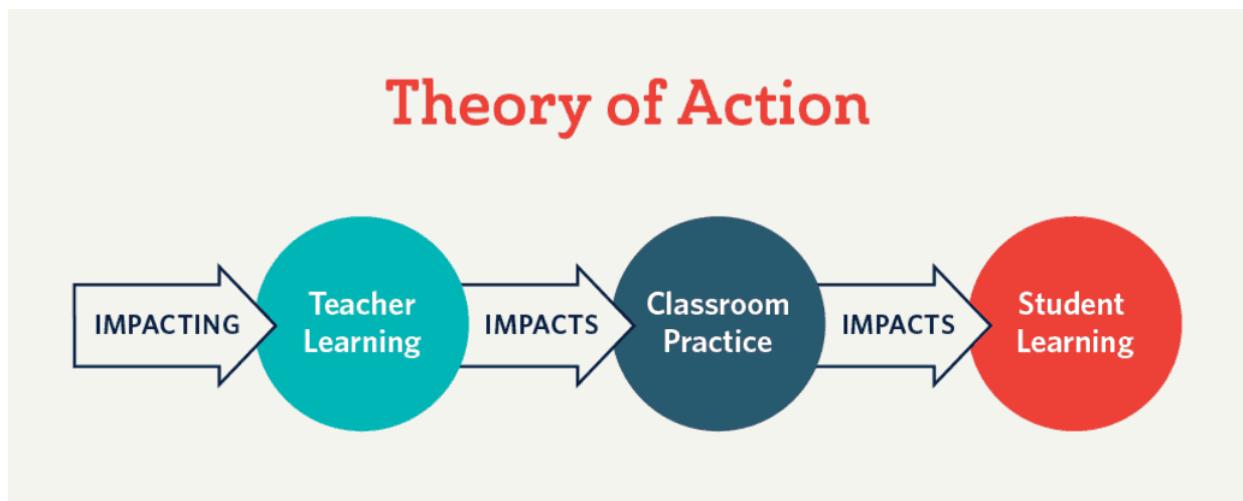
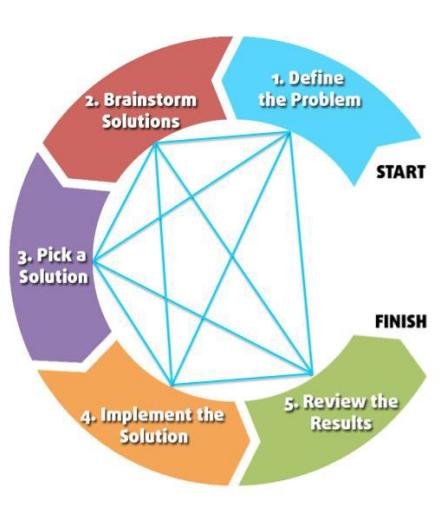


Figure 40 Theory of action

Appendix B

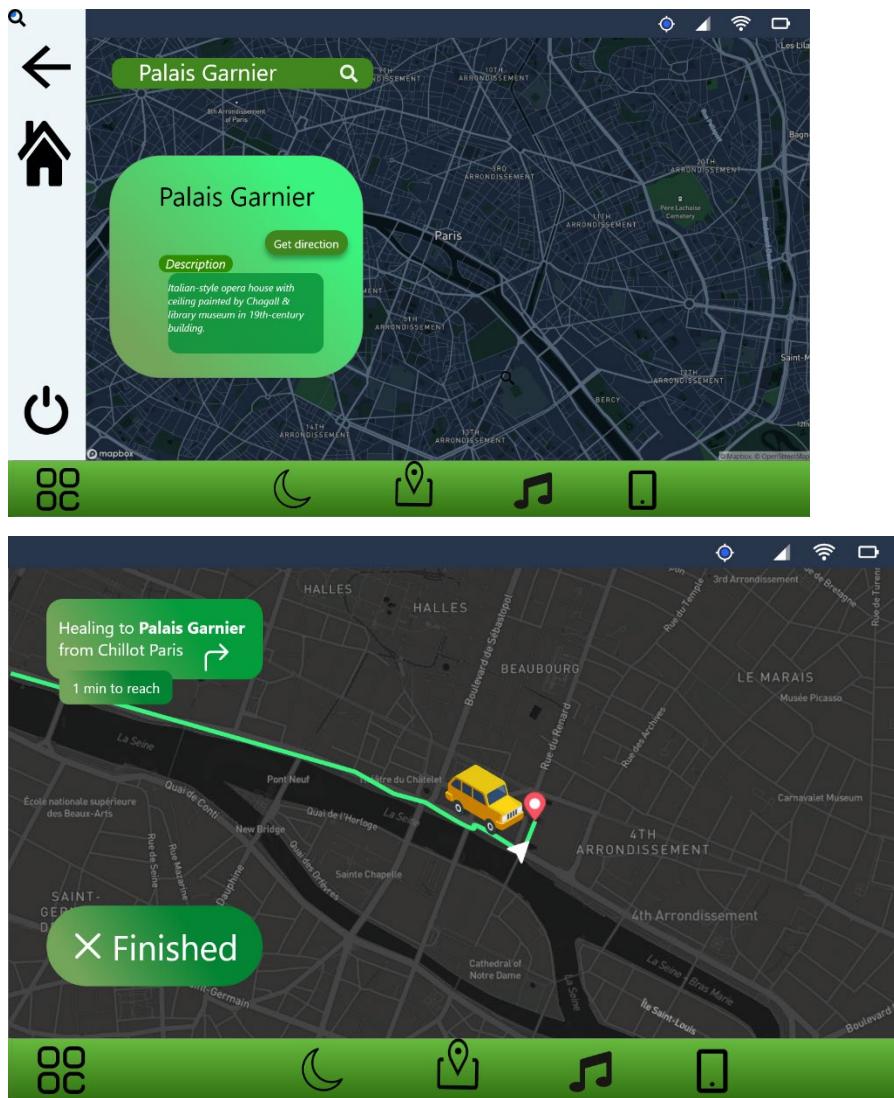
Problem-solving:

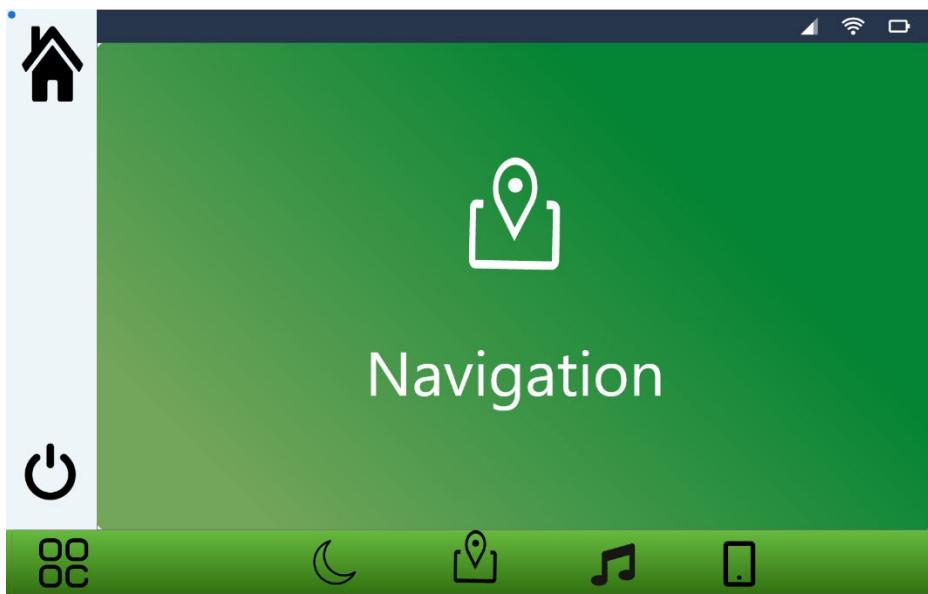
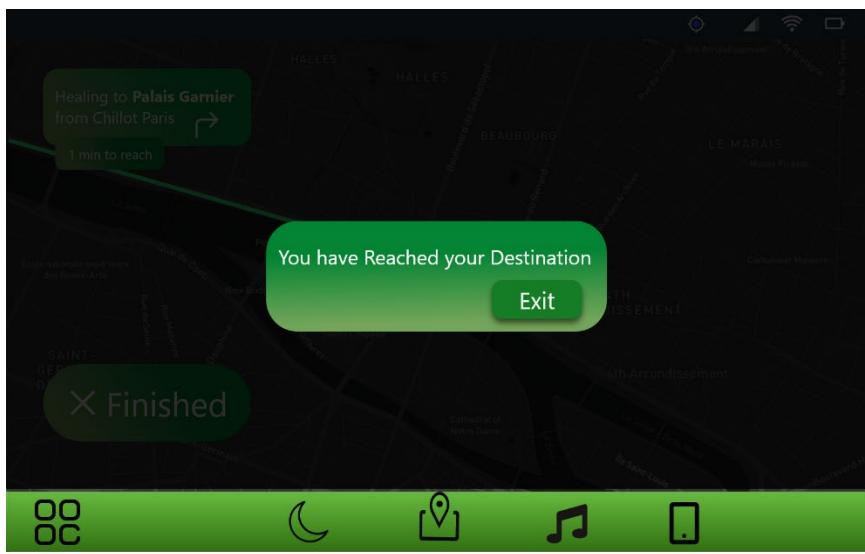
It is the process of figuring out a problem to solve it according to the cognitive process. There are three parts given, goals, operations. Given describe the problem. The goal is the final product, and the operation is modifying the problems to the final product.

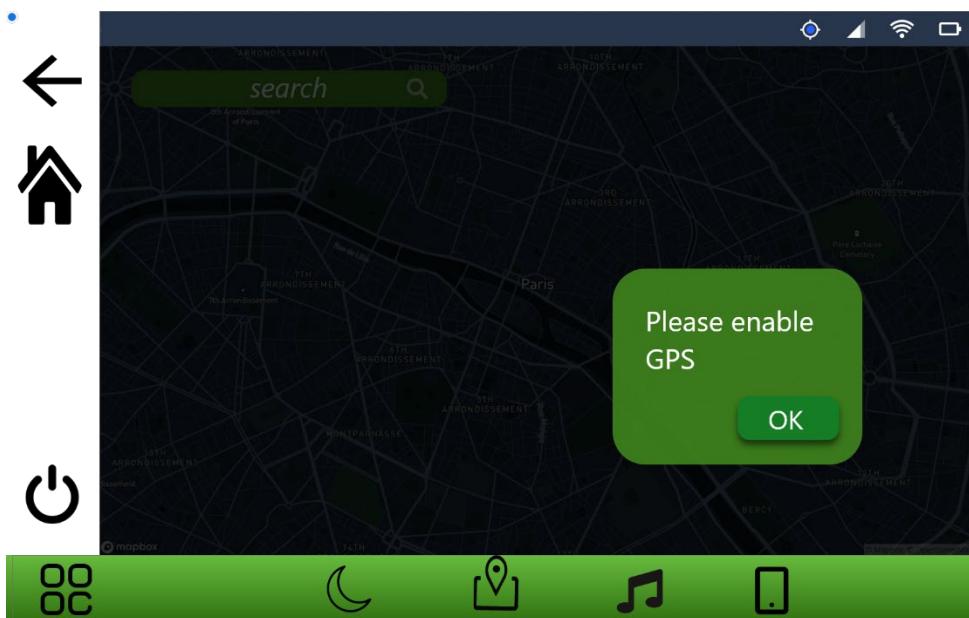
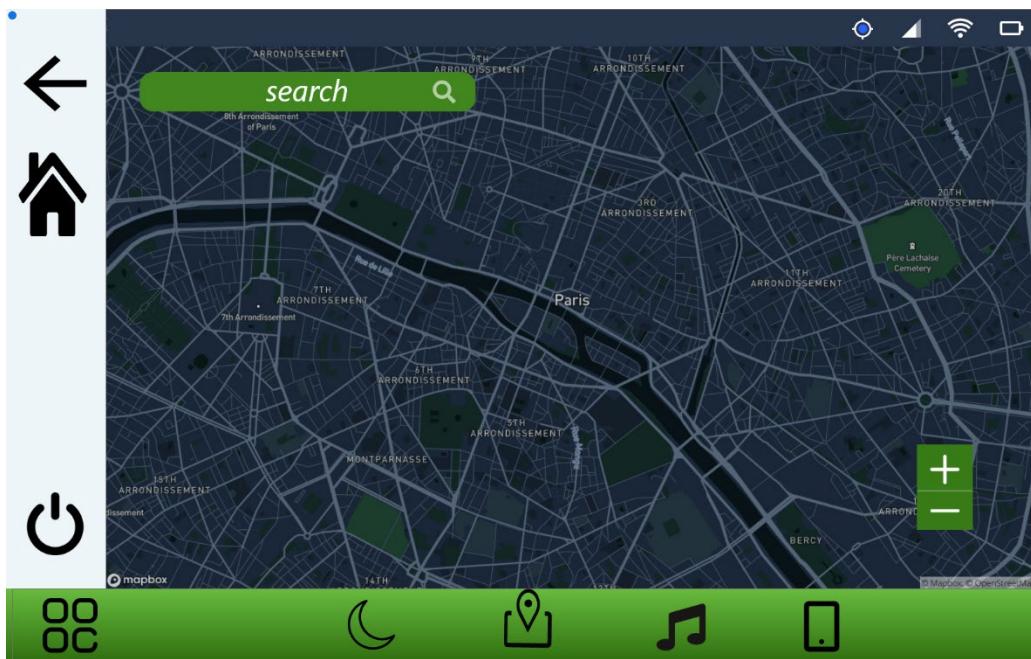


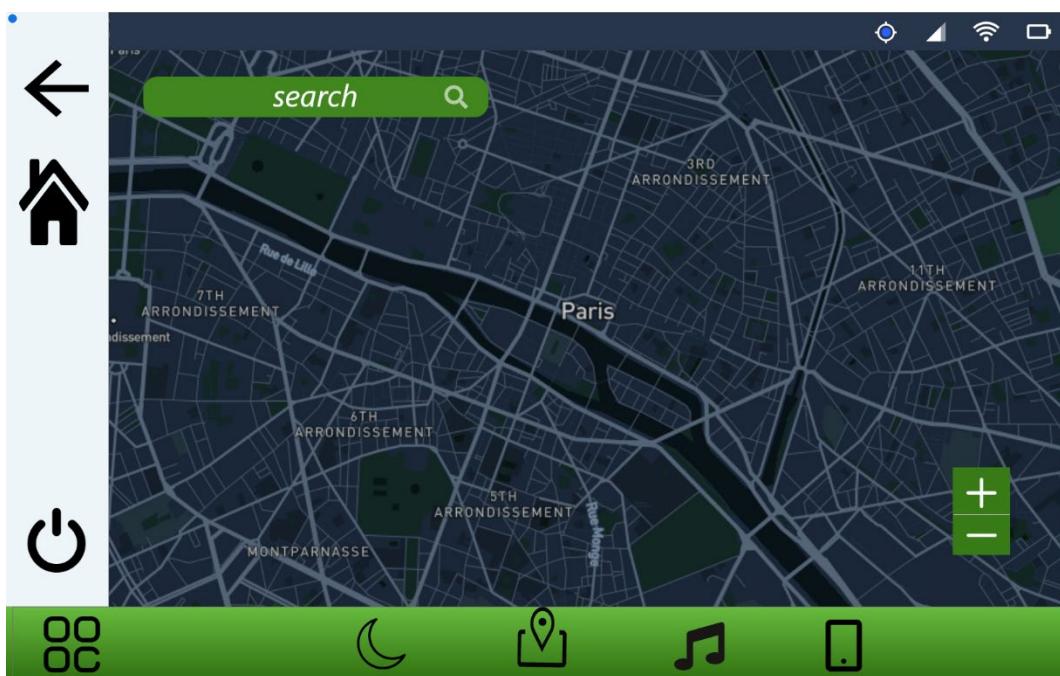
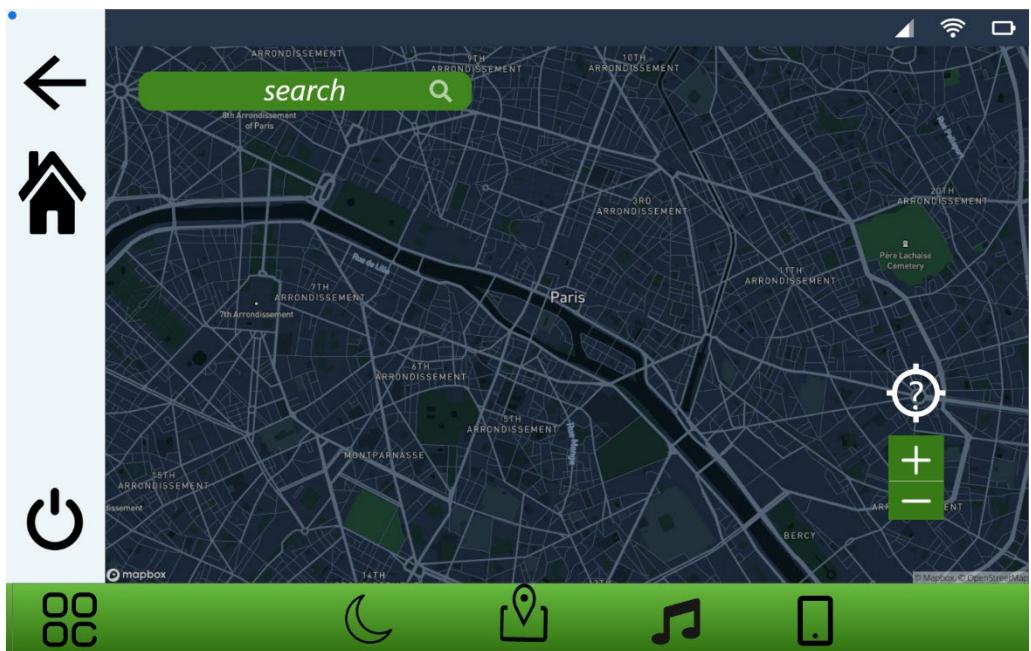
Appendix C

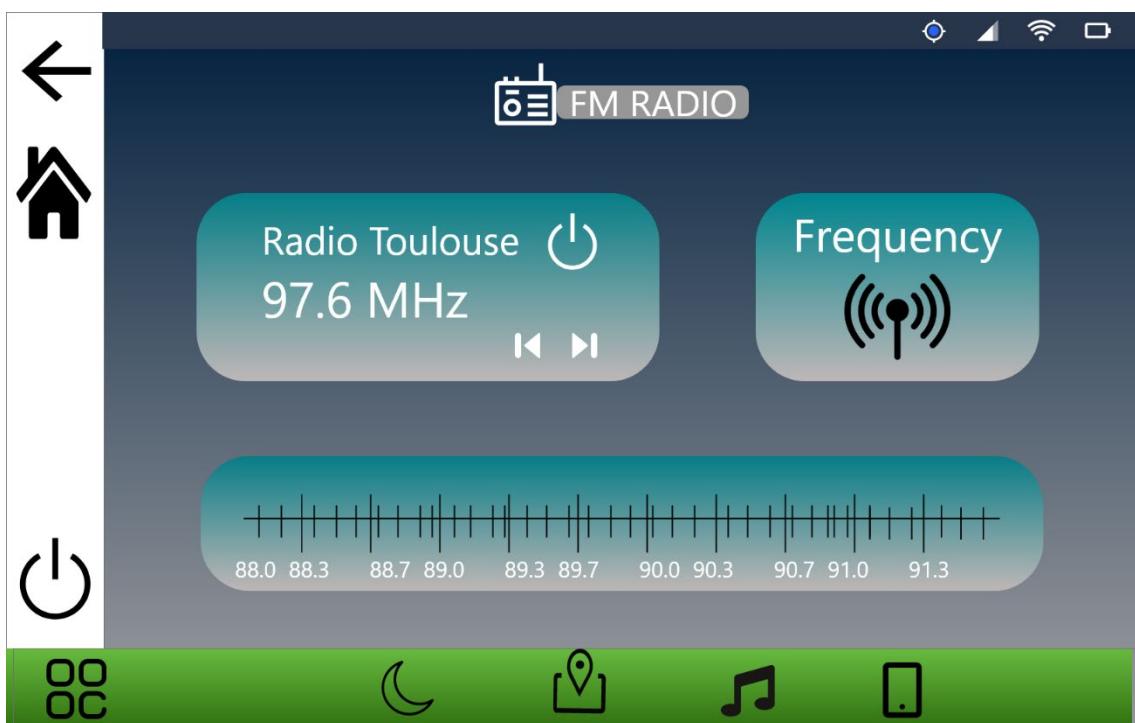
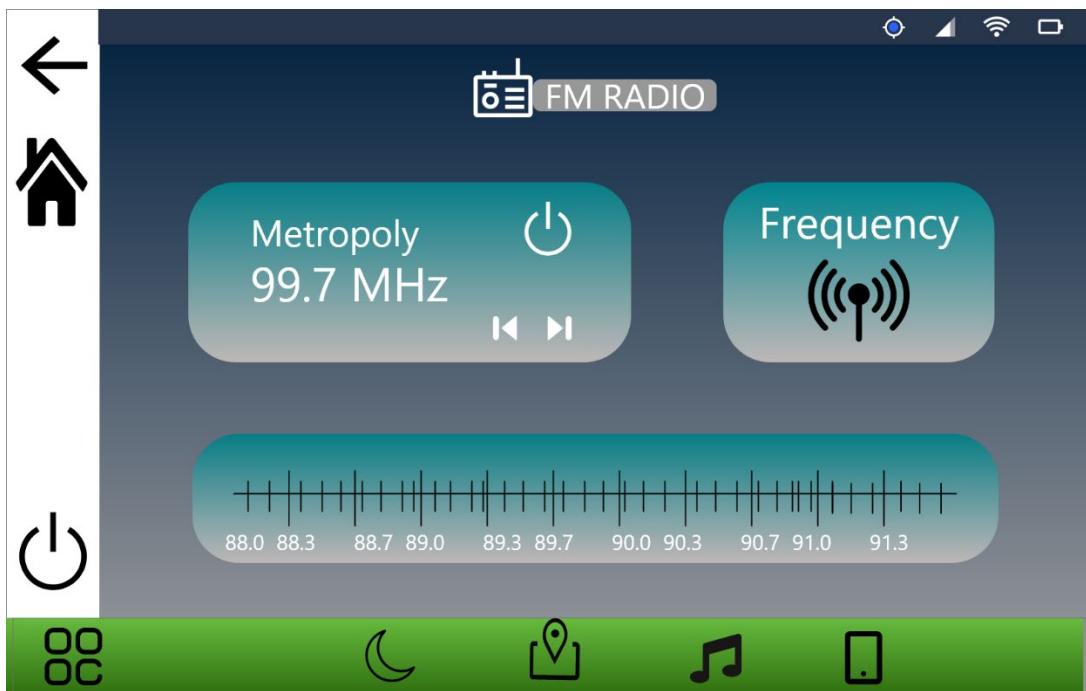
Mid Fidelity Prototype

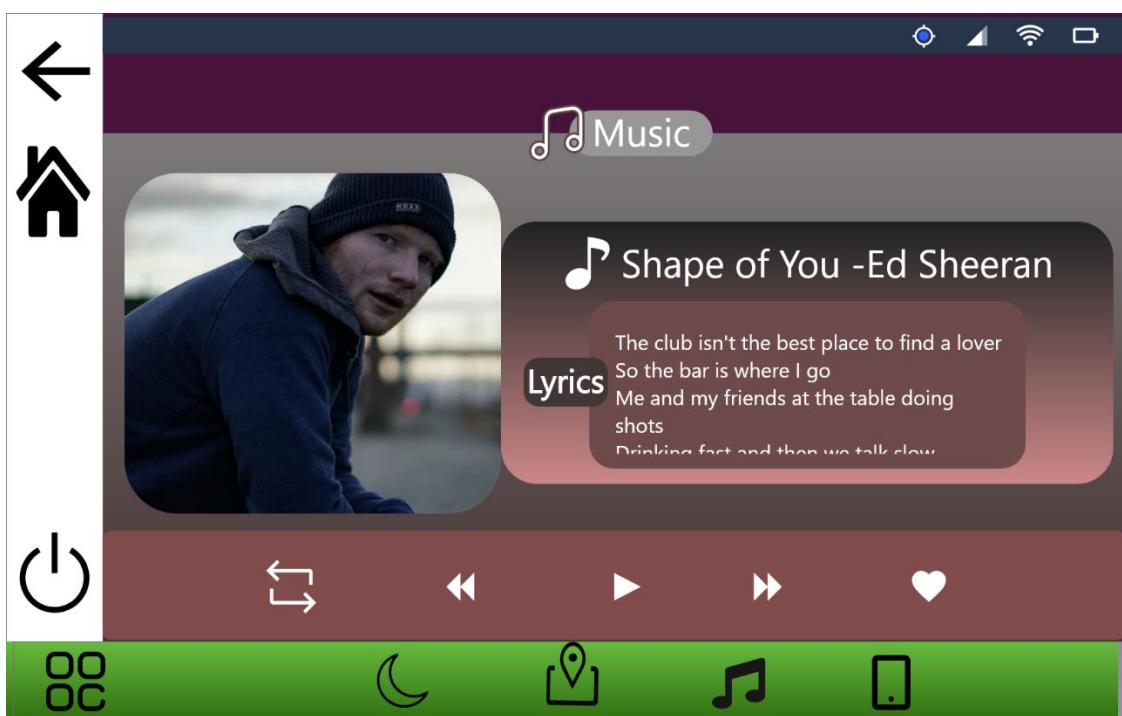
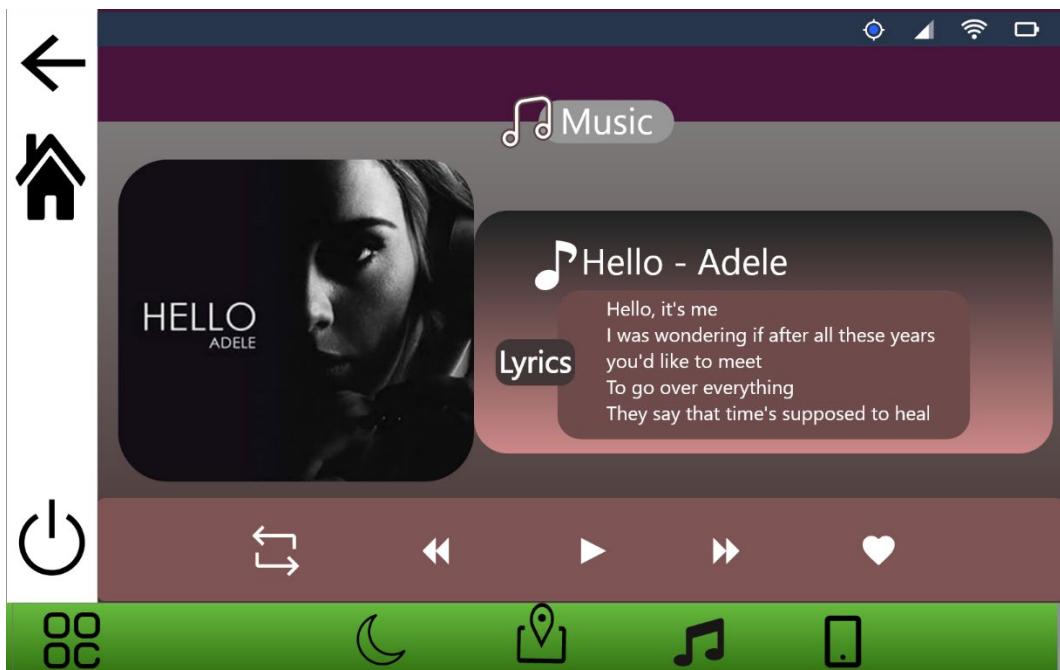


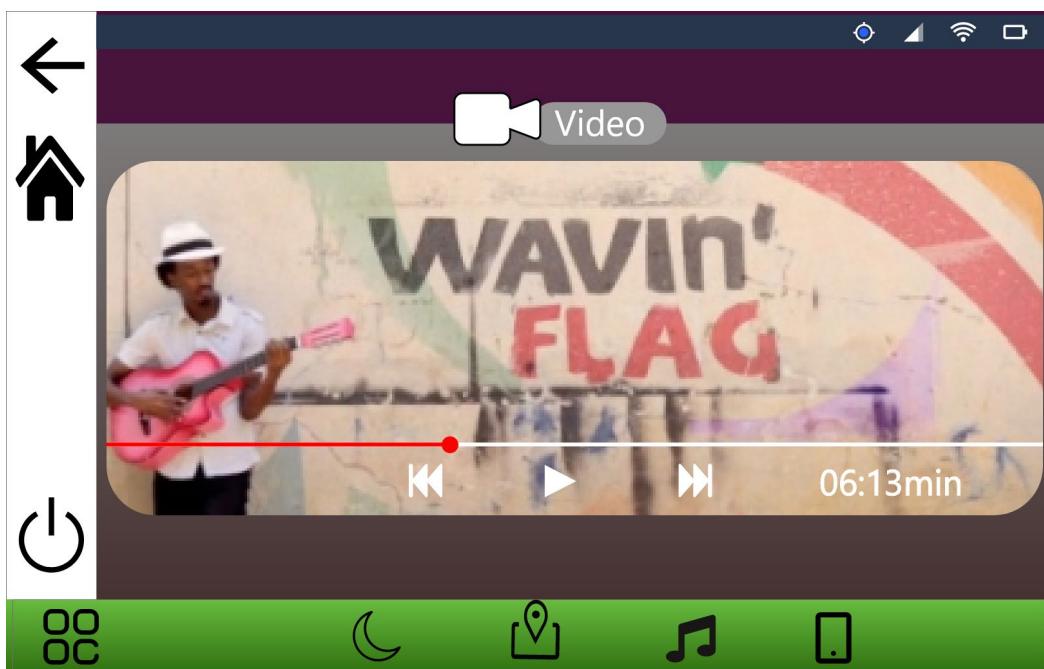
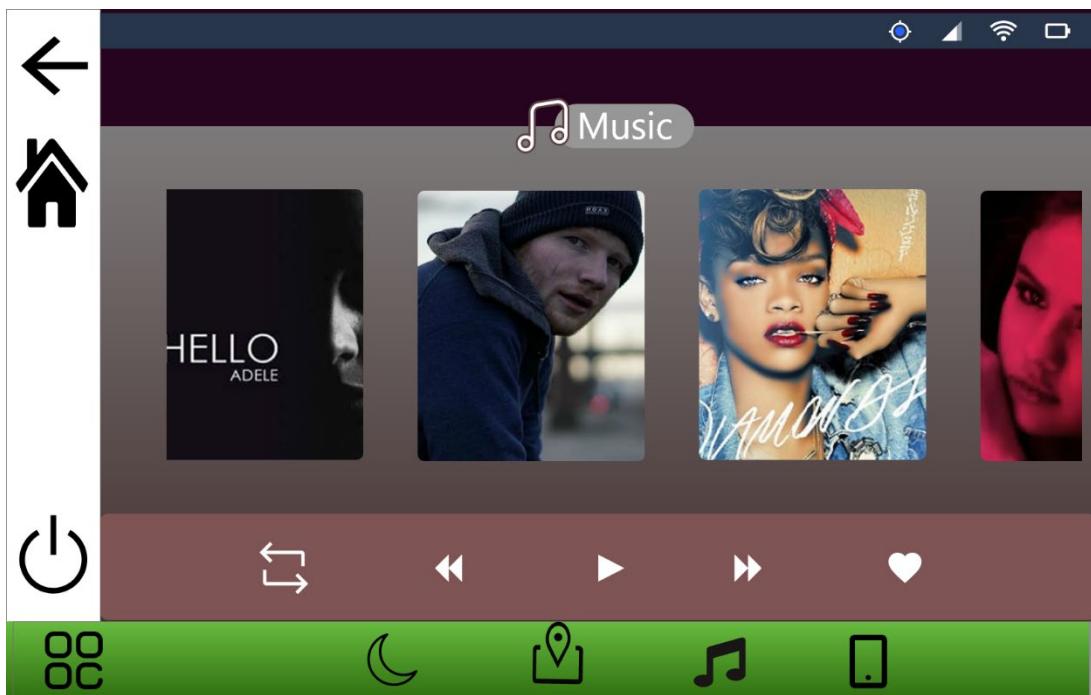


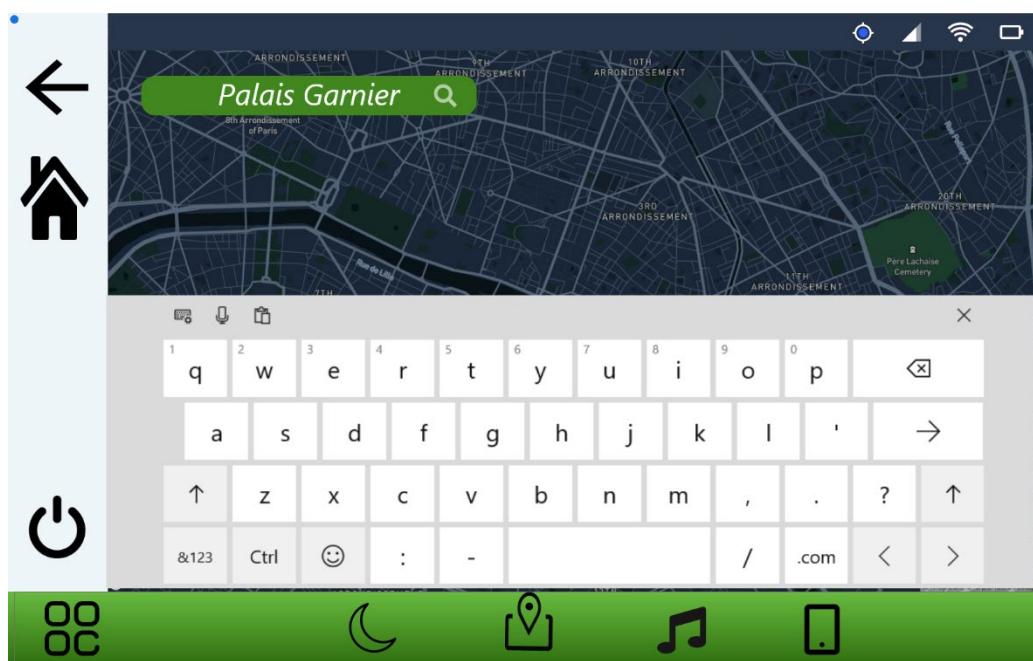
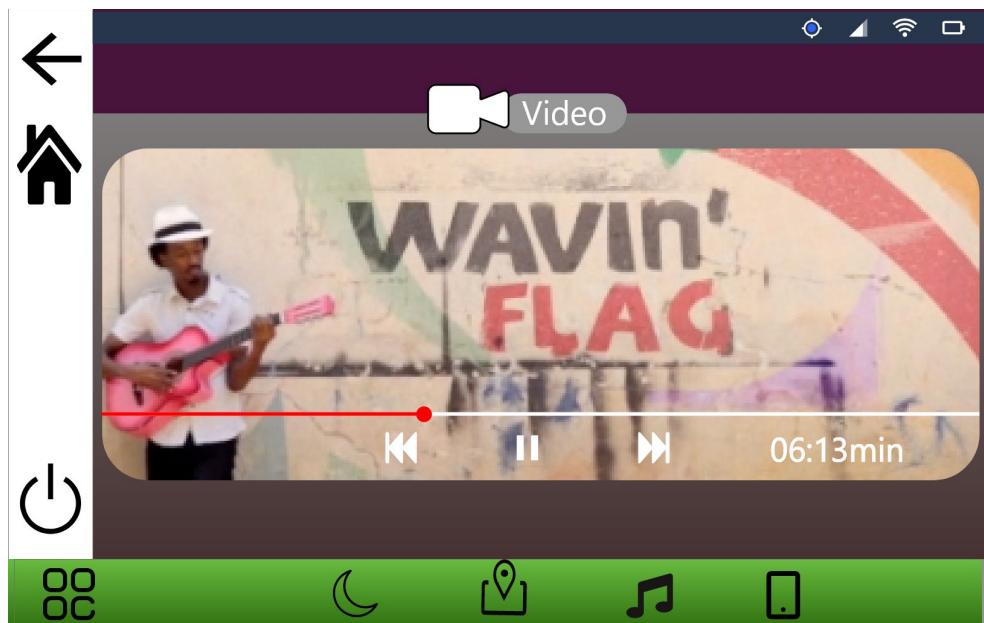


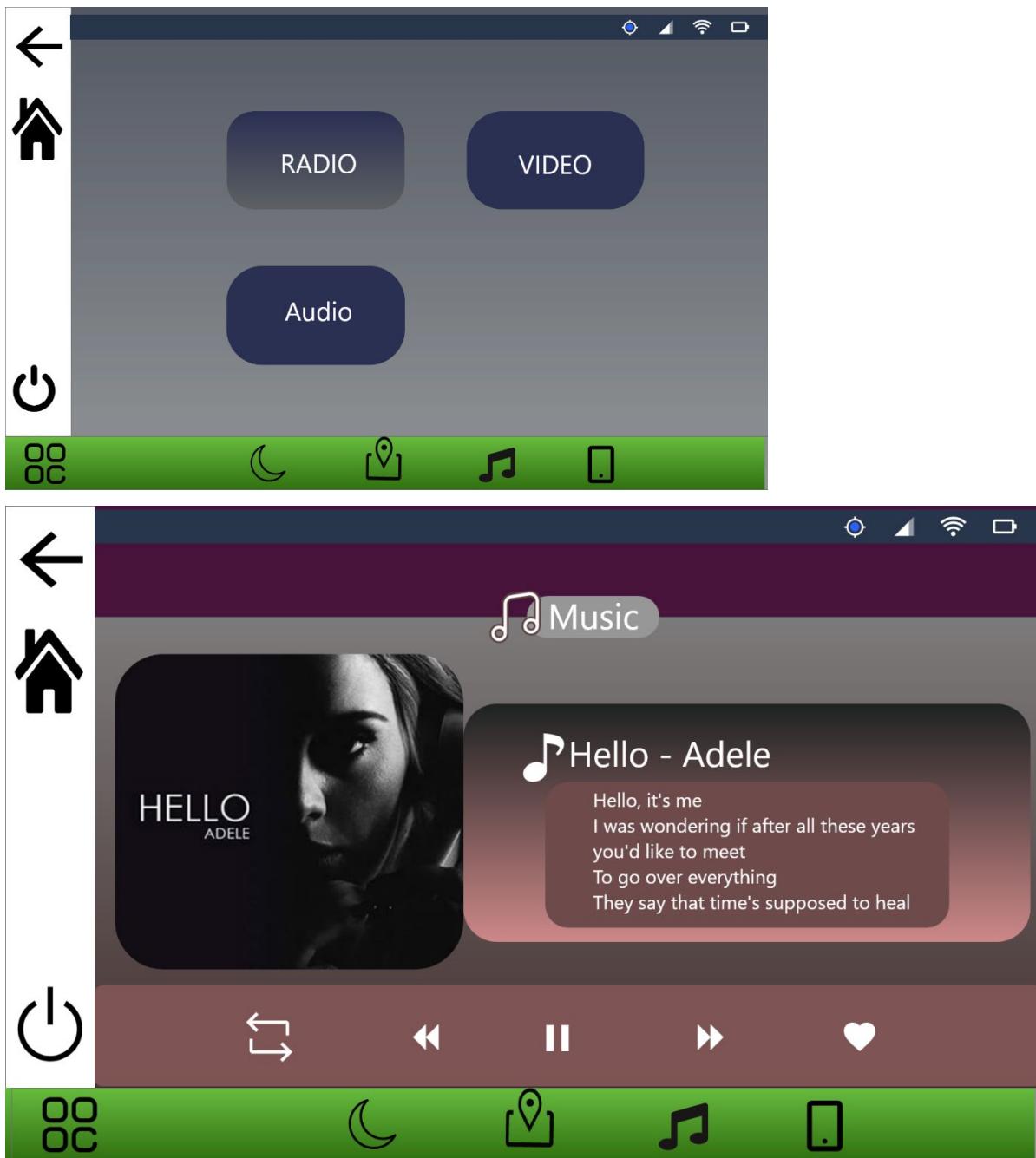


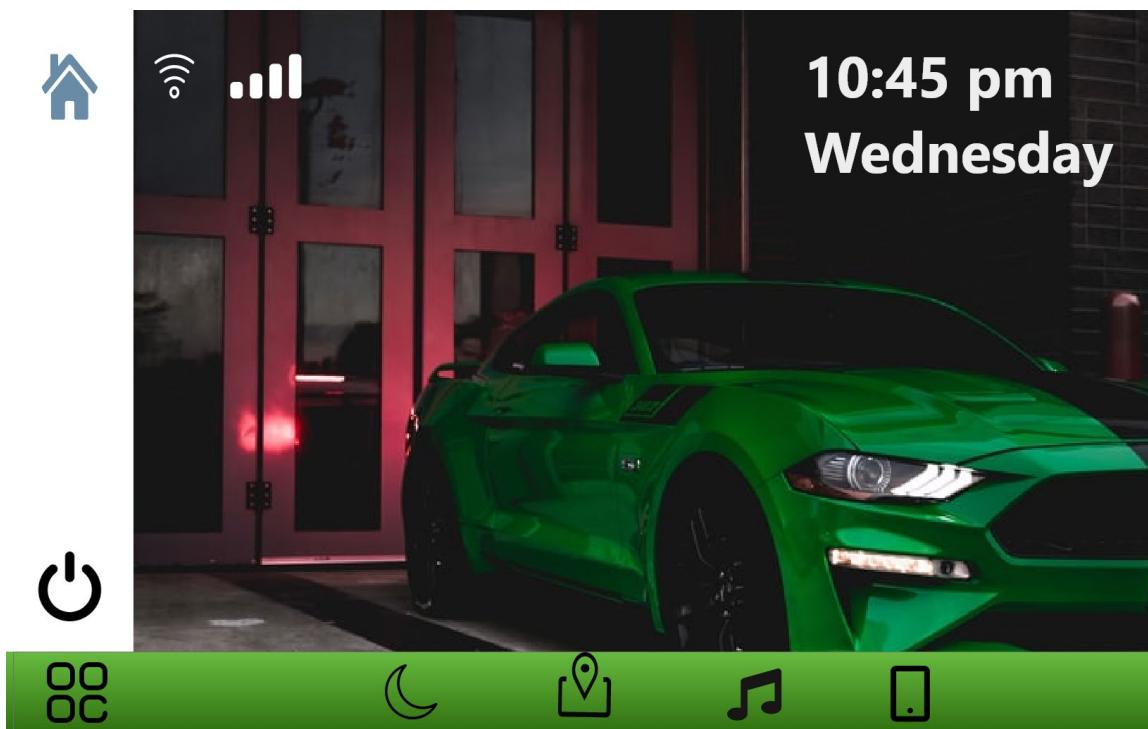
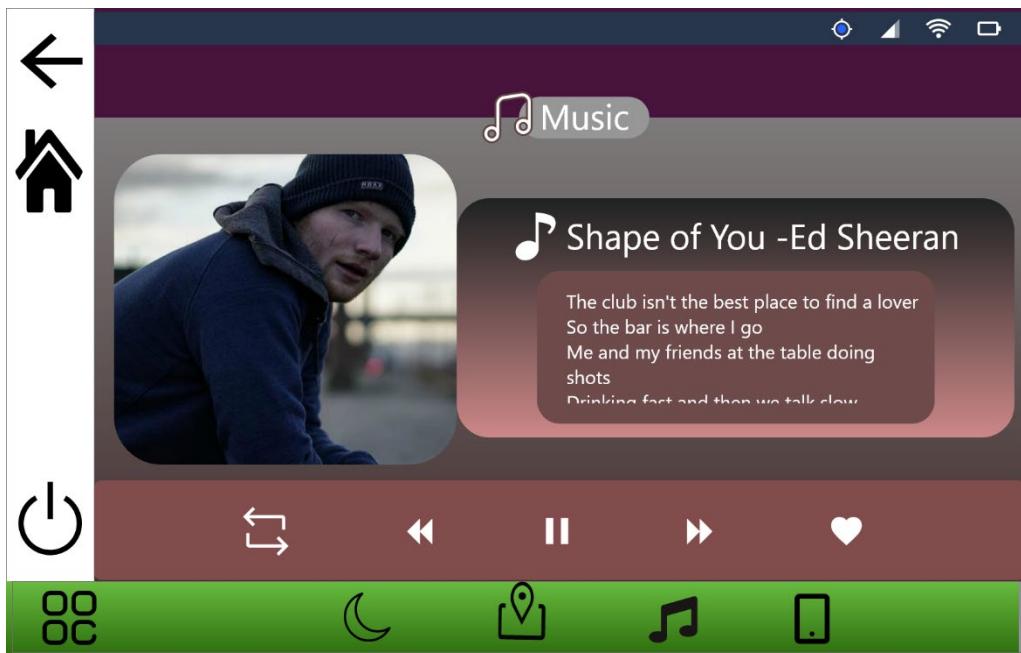


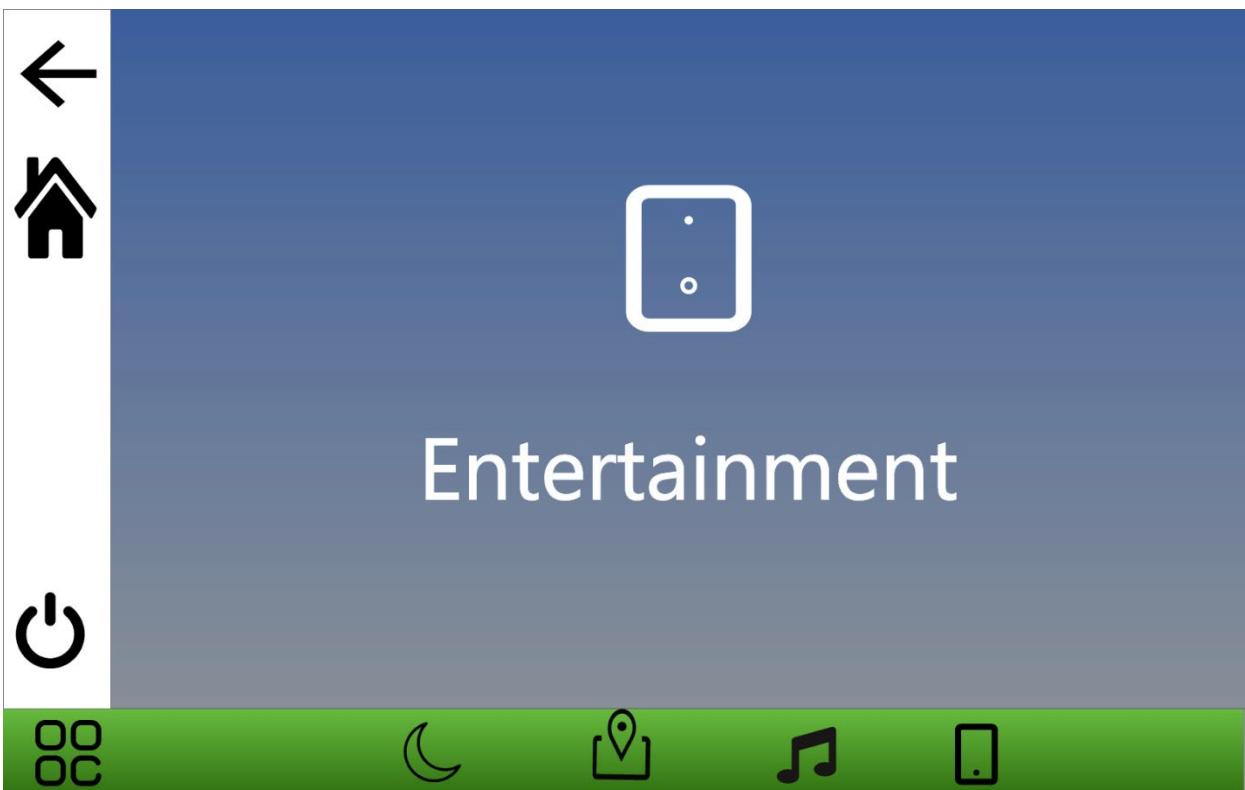


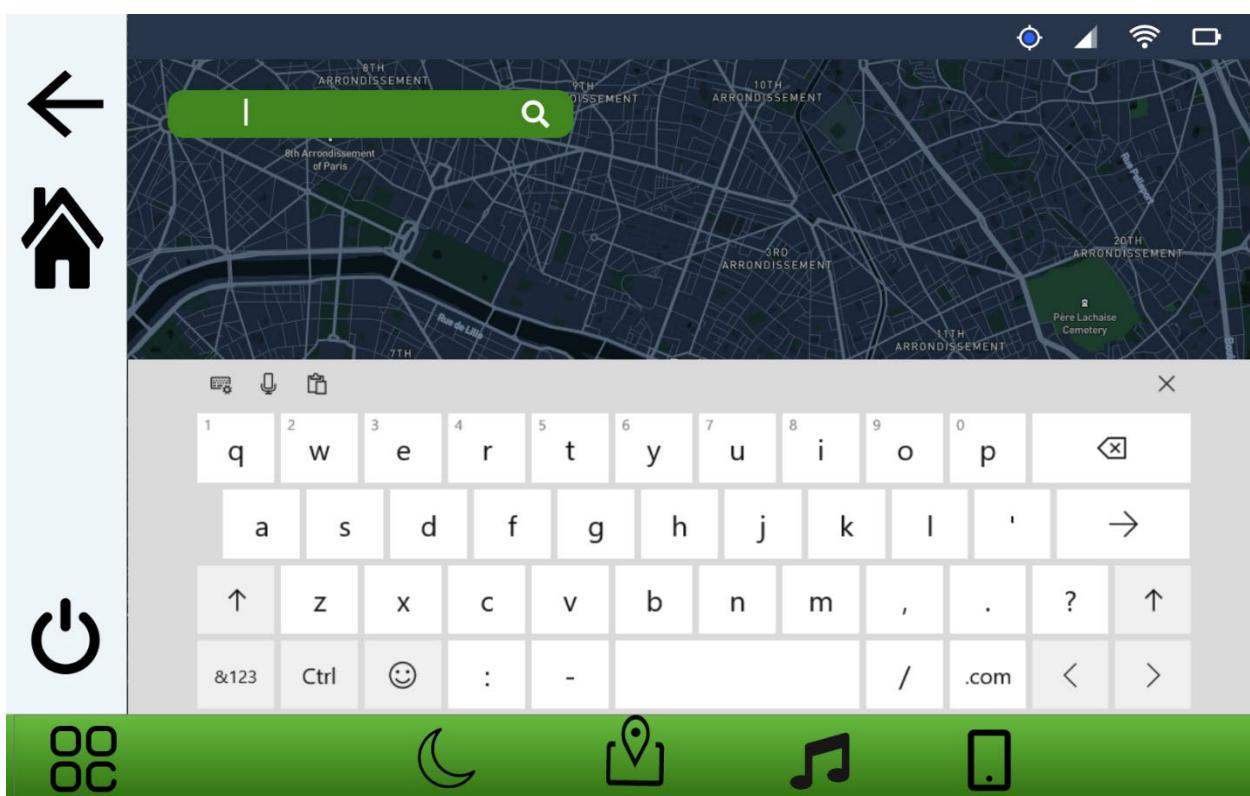
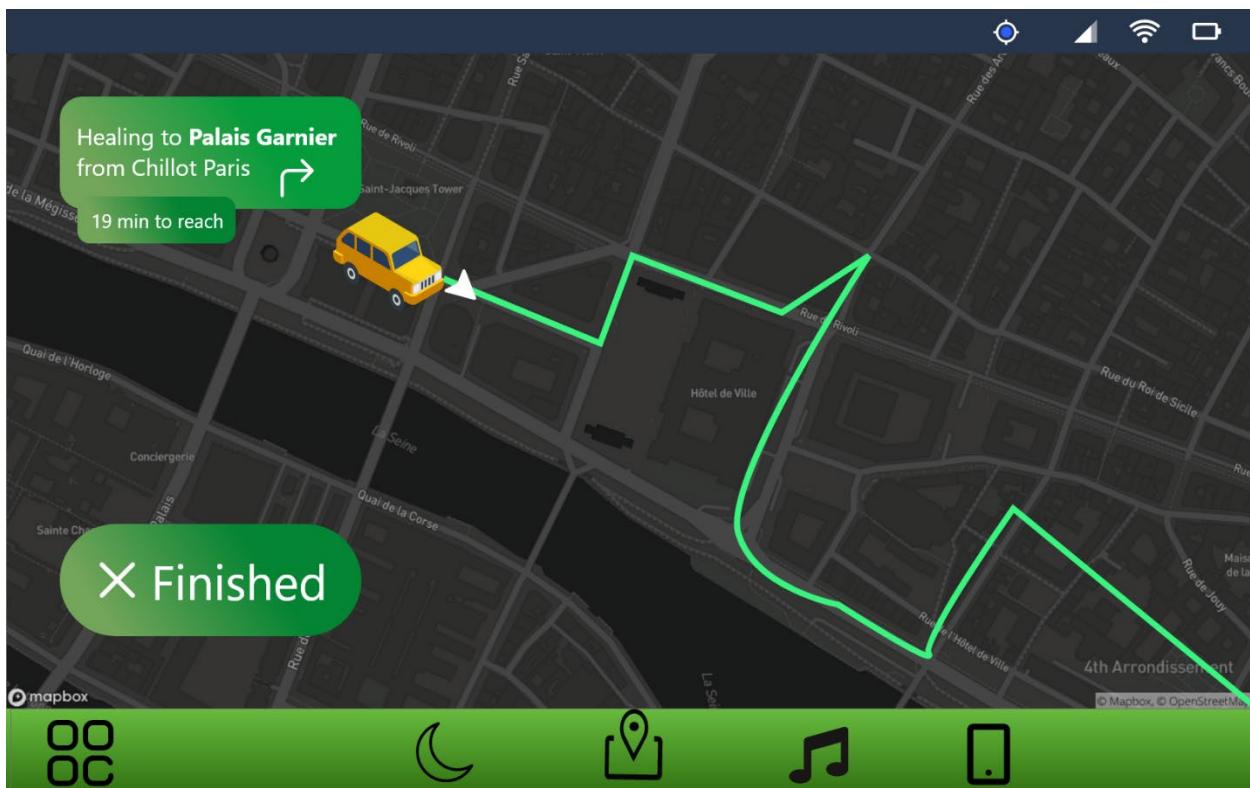












Appendix D

Heart Framework

	Goals	Signals	Metrics
Happiness			
Engagement			
Adoption			
Retention			
Task Success			

Figure 41 Heart Framework

Appendix E

System Usability Scale

It is the tool for checking out usability, which I have 10 questionnaire from steam strongly agree to disagree. It helps to differentiate between usable and unusable systems. It also has a scoring system. The best way to get a result is by percentile ranking. (usability, 2021)

The System Usability Scale Standard Version		Strongly disagree	Strongly agree			
		1	2	3	4	5
1	I think that I would like to use this system.	<input type="radio"/>				
2	I found the system unnecessarily complex.	<input type="radio"/>				
3	I thought the system was easy to use.	<input type="radio"/>				
4	I think that I would need the support of a technical person to be able to use this system.	<input type="radio"/>				
5	I found the various functions in the system were well integrated.	<input type="radio"/>				
6	I thought there was too much inconsistency in this system.	<input type="radio"/>				
7	I would imagine that most people would learn to use this system very quickly.	<input type="radio"/>				
8	I found the system very cumbersome to use.	<input type="radio"/>				
9	I felt very confident using the system.	<input type="radio"/>				
10	I needed to learn a lot of things before I could get going with this system.	<input type="radio"/>				