

Commercial Car Infotainment System

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Group L-

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Executive Summary



NOVUS

Vehicles are a lucrative segment of the car market with an annual growth projection of 35% from 2019-2023 (Bendre, 2019). Buyers expect a unique consumer experience and superior build quality from their car as well as novel and exclusive features. That is why investing in a premium infotainment system is fundamental in the success of any luxury car brand. Novus provides a powerful, multifunctional system which compromises of both an adjustable touch screen as well as a comfortable keyboard/mouse pad and control dial allowing passengers to freely interact with the system. It offers a variety of functions, from controlling the in-car climate to real-time journey information and from media consumption to accessing work-related tools and materials.

When designing this system, we adopted a user-centred approach. Apart from aligning our goals and general strategy with industry standards, we conducted extensive user research. We began by creating the context in which our product will be used, seeking to incorporate as many features as possible. We then developed several unique personas and scenarios to understand how different individuals will use and benefit from our systems. Extensive interviews and discussions with potential users were then conducted to further explore potential features. After concluding our research, we compiled our user requirements document, which was the base of our design process.

Several different interfaces were designed with a view to explore different styles and approaches that will better accommodate our users' needs and make navigating the system an intuitive and effortless experience. This process required a constant reiteration of our designs. Due to the COVID-19 lockdown, any user testing of our product was not possible. However, the non-user evaluation we conducted was extremely useful for our system and added several improvements to our design. For example, labelling and button placement in our interfaces needed to be clearer and more concise and certain information, such as weather, was essential for the journey related application. Overall our system achieved a balance between functionality and aesthetics, and we are confident that users will enjoy using it.

Value Proposition Statements

“For Business Executives who want to engage with information and services on the go. Our “Novus Infotainment System” is a state of the art, multimedia headset that allows for internet and wireless connectivity , media consumption, as well as in-car climate control and accurate journey related information.”





Task 1: Personas and Scenarios





Aristotle O'G. Yam-Yam

"I am a futurist, cyber collectivist and experience-environment envisioner. I am a Digital Prophet. I ping from here to there by any means necessary and need rugged security on the fly."

Laser-focused

Freaky

High-speed

Age: 52

Status: Divorced, fled

Personality: Artist-Savant

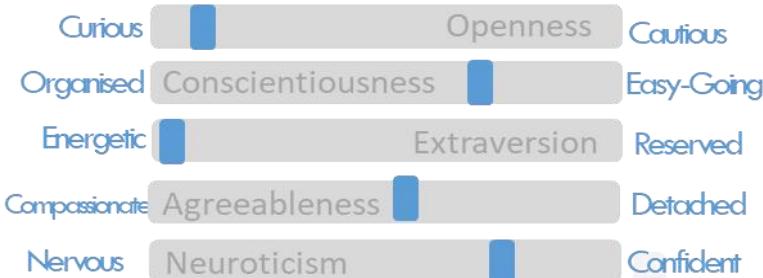
Education: D-school, baby

Occupation: Senior Consulting Marketeer

Income: £500k pa + perks



Big Five Personality



Biography

Yam-Yam dropped out of high school to work for Max Verity, the festival entrepreneur, before heading to Parsons for Design and took his MS in Symbolic Systems at Stanford on a Wicked Edge scholarship. Famed for making shipping containers “sexy again” (Fast Business), he now swings around the world to reshape clients’ struggling images. He hits London on the regular to touch base with his children and estranged wife, Ludmilla “Tiki” Kovacs.



Goals

- To spread the (marketing) word
- To stay on top of the network
- Keep his views fresh



Frustrations

- Bad hair product
- Not enough Vegan-yoga bistros
- Boomers



Motivations

Incentive

Fear

Achievement

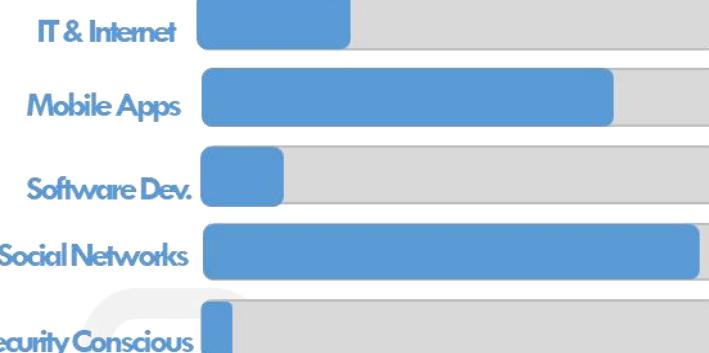
Growth

Power

Social



Technology



Relation to the Product

Aristotle needs to use the product mainly for communication. He likes to be kept updated with what's happening in the world and uses this information for his social media network. He doesn't like the idea of any products not being vegan and must be against animal testing- therefore the materials used in product must be considered.



Sir Xavier Rodrigues-Bermudez

"Inspired by setting up East Anglia's first recycling business as a schoolboy I studied Economics at College and trained as an accountant. Over the years I have been very fortunate to be asked to help several businesses turn their operations around."

Methodical

Circumspect

Reflective

Age: 67

Family Status: Married (to Lady Jill, since 1975; five children)

Personality: Patrician; professional; oblique

Education: Ampleforth College; St John's College, Oxford (PPE); Harvard Business School (MBA '77)

Occupation: Executive Chairman; various directorships

Income: > £1m pa + Directorships



Big Five Personality



Biography

Sir Xavier is a firm favourite with the City; since the 1980s he has been trusted with some of the most contentious and politically charged turn-arounds in Europe and Latin America. Often cited as a business "natural" and low-tech, old-school operator, he has inspired generations of youths who see the markets as a way out of destitution. He has been knighted for services to commerce and charity and helped several Latin economies back to stability.



Goals

- To bring pride to his family name.
- To promote good business practices.
- Continue charity work.



Frustrations

- New Technology.
- Changes to the system.
- Loss of control to machines.



Motivations

- Incentive
- Fear
- Achievement
- Growth
- Power
- Social



Technology

IT & Internet

Mobile Apps

Software Dev.

Social Networks

Security Conscious



Relation to the Product

Sir Xavier is an intelligent and educated man, who appreciates technological development, but he isn't slavish to it. He delegates his PC to his secretary but was an early advocate of the Blackberry. Xavier isn't worried about adapting to the latest fashion: he would rather see what emerges as a longer-term trend. He admires technology, but he won't use it for the sake of looking up-to-date.



Genevieve Forbes-Smythe

"I am a hard-working Oxford graduate looking to shake up the financial world. My set of financial and technological skills puts me in a unique position to modernise money."

Analytical

Tech Savvy

Perfectionist

Age: 38

Status: Single

Personality: Fierce

Education: Oxford

Occupation: Finance Director

Income: £150k pa



Big Five Personality



Biography

As an alumni of Queen Anne's school, Genevieve went on to graduate with a first-class economics degree from Oxford University. With her tech knowledge and drive she quickly rose up the ranks at a major UK-based bank in the heart of London. Seeking to modernise the financial landscape, she moved to the then start-up company Painless Pay as Finance Director where she contributes to the development of contactless technology.



Goals

- Modernise money
- Stay connected with developments
- Facilitate company growth



Frustrations

- Inefficiency
- Lack of data access at anytime
- Poor data visualisation

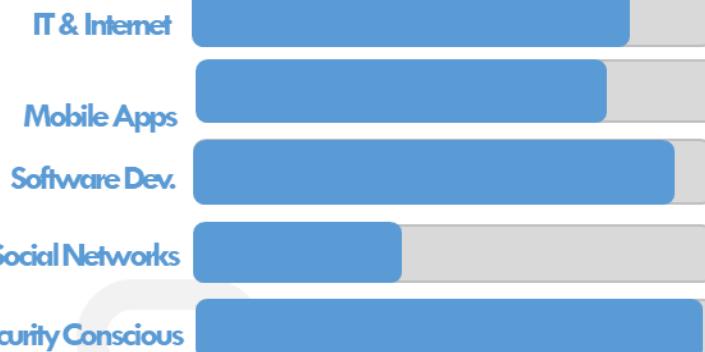


Motivations

- Incentive
- Fear
- Achievement
- Growth
- Power
- Social



Technology



Relation to the Product

Genevieve travels for work on a regular basis. She uses a company car for traveling with her and her colleagues. She would find the product useful to be able to present her work on a screen so she could explain to her colleagues her plans and actions. Not all the journeys are long, so she would like to be able to access her work without using her laptop and would like the product to work quickly.



Lee Wu-Huang

"I've had many people doubt me in my life, but I've shown with hard-work and determination any goal is possible. Stay focused and you will achieve!"

Fun loving

Family oriented

Down to earth

Age: 28

Status: Single

Personality: Artist-Savant

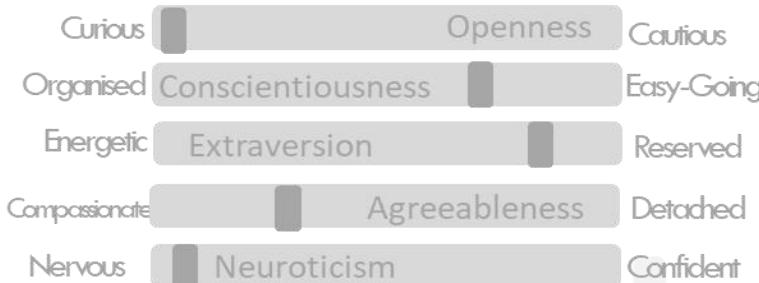
Education: Zhejiang University

Occupation: Owner of app

Income: £400k PA



Big Five Personality



Biography

Lee comes from a conservative Asian household and always wanted to be an app developer. This was always against his family's wishes, but Lee still strived towards his goal. After getting his degree, Lee decided to develop an app in his free time. This app turned out to be a huge success and Lee started making a small fortune for himself. Currently, Lee is enjoying his newfound fortune and fame by traveling the world and speaking at IT fairs.



Facts

- Be the best at his craft
- Enjoying life
- Loves spending time with family



Frustrations

- Social expectations
- Boredom
- A lack of creativity



Motivations

- Incentive
- Fear
- Achievement
- Growth
- Power
- Social



Technology

IT & Internet

Mobile Apps

Software Dev.

Social Networks

Security Conscious



Relation to the Product

Lee would like the devices to be able to work in sync with his mobile phone, therefore acting as a screen sharer. This means that he can focus on his mobile apps. Lee would also like the machine to help him plan his talks when he's traveling and allow him to access these. He would prefer the device to have speakers to listen to music. He's also worried that he may get motion sickness if he spends too long staring at a screen.



Zac Miller-Brown

"The future of IT will be determined by me and I need to shuttle to various places to introduce my product."

Creative

Genius

Promising

Age: 31

Status: Married

Personality: Imaginative

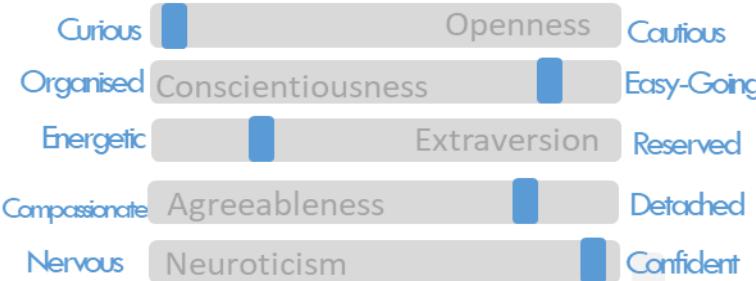
Education: MIT

Occupation: CEO

Income: £100k pa



Big Five Personality



Biography

In Zac's school-day, he was always the best student in science. After he received his master's degree in computer science from MIT, he created his own IT company (STAR). STAR is developing rapidly because of his creativity. Now, his IT products are hot. He is married and has a son. Although he is very busy, he spares as much time as possible to stay with his family.



Goals

- To design creative product
- To be representative in IT field
- Have more subsidiaries



Frustrations

- Low sales
- Bad entertainment
- Bad IT skills

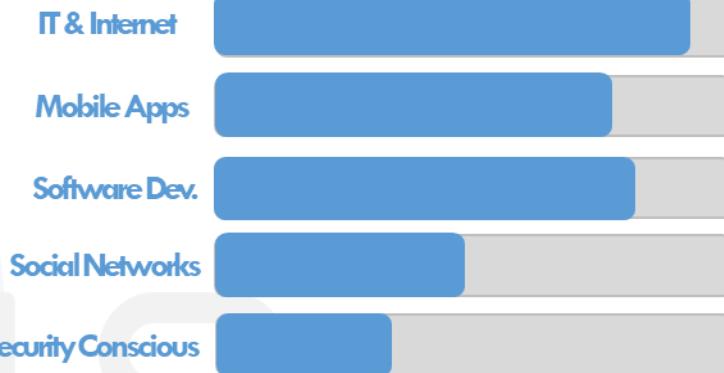


Motivations

- Incentive
- Fear
- Achievement
- Growth
- Power
- Social



Technology



Relation to the Product

Zac likes to stay in contact with his family as much as possible. In any spare moment he would like to be able to call his family, so would like the device to be able to video call and have hands-free calling so he can look at other work while talking to them. He would also like the device to operate on the same server, so he doesn't have to constantly change when changing vehicles.

Aristotle O'G. Yam-Yam

Aristotle has built a portfolio career. He is a thought-leader and keynote speaker at headline marketing conferences around the world. His contracts are for major conglomerates to which he commits a number of days per month or year. He coordinates this kinetic environment through a small private office in London. Because his schedule is so hectic and tight, he is given first-class transport everywhere. Chauffeur-driven vehicles collect him from airports and deliver him to hotels, conference centres and factories. Sometimes, for news-grabbing impact, he heads to unusual locations for the photo opportunities. These trips last between thirty minutes and five hours, so he needs good communication with the office, project management capacity, thought-capture and the ability to continue and record research. High processing speeds and sound graphics will help exploit this cache of work and ideas. He is interested in gamification of business and work information to exploit his “non-linear thinking”.

Aristotle has taught himself about both marketing and technology, so he is a very idiosyncratic user of ICT systems. He is able though not conventionally trained, so intuitive UI is important to him. He knows what he finds hard to use will be difficult for common users and clients as well. He wants ease-of-use so that he can follow his intuition. He works differently to those in conventional business functions, such as law or accounting. He makes no apology for working in a wacky way. If others cannot see any point to what he is doing, then all the better!

Sir Xavier Rodrigues-Bermudez

Sir Xavier leaves home in Bishop's Avenue at around 6.30 a.m., arriving in his St James' office before 7 by chauffeur-driven car. On his way to the office he collects a print copy of The Financial Times and checks markets on his phone. This helps him to predict the impact of Asia's overnight trading. He has a deep understanding of global politics, which he uses to contextualise economic and financial indicators. When getting his paper he might also order a Bolivian espresso and take a pastry, which he'll eat at the bar talking to Rudolph as the car waits on the curb.

Arriving at the office Xavier reviews the day's schedule with his chief secretary, Hazel. At 7.45 he begins conference calls with directors of firms he invests in. Hazel is stationed outside Xavier's office; in his personal area he has two conjoined desks. The section he uses most of the time is for paperwork - files are piled up in several stacks. The second part of the desk features a Bloomberg screen showing a tailored feed of information. Xavier likes an even split of quantitative and qualitative information.

In meetings he'll ask: “what's the narrative here?” Xavier ensures that all his business emails are visible to his secretaries, so that nothing is ignored. He discusses the contents with a secretary or dictates a response. A peer once remarked, “Roddy's got more secretaries than Churchill!” Xavier loves to be in touch with as much reference and background material as possible in those meetings. When meetings are in his own office, he has staff at computers ready to take his search requests. He likes to have access to all relevant background information. Xavier is a fan of the “thick description” ethnographic technique from the Geertz method of anthropology.

Scenario's

Genevieve Forbes-Smythe

Genevieve is the financial director of start-up company Painless Pay. It is 8.00 a.m. Genevieve lives thirty minutes from her office and is chauffeur-driven; she analyses the financial markets as soon as she gets into the car. Today, she notices an investment opportunity and decides to capitalise. She is confident and wants to invest a million pounds once she has data to confirm her hypothesis. She uses a markets platform to carry out her research. She sees on the news wires and global legal digest that the Government of Japan has approved on the use of driverless cars in suburbs. She checks market indicators and reports on the car's prior testing. She can read all the data with ease on the large screen. With so much information available, she can make this decision in the car. When Genevieve leaves after a busy day she needs to send emails for tomorrow's meeting, while on the road. After getting in the car, it drizzles outdoors and the temperature drops. She adjusts the heat to her liking. She opens the music app, adjusting the volume and composes the emails. The next day, Genevieve repeats her morning routine again. Since there was not much movement in the financial markets today, she decides to read up current affairs on a news app.

Genevieve travels for work on a regular basis. On a recent business trip, she used the company car to travel with her colleagues. After an hour's ride they arrive at a conference. They are in a place unfamiliar to Genevieve. Getting in the car, she checks the destination and the estimated travel time. Since relevant information is stored on her mobile phone, she transfers it to the screen, and then displays her work on the screen. She explains her plans to colleagues. During the presentation colleagues comment while she adds notes to the document. Genevieve shares her work with colleagues while preparing for the next meeting, so they can work separately.

Zac Miller-Brown

It is 11.00 a.m. and Zac will attend his new product's launch at 2:30pm. He looks at his presentation slides to check again if there are improvements to be made. Once satisfied, he plays his favourite music to relax and begins to read the tech news, scouring it for competitors' designs. He makes notes of any interesting designs, which he can discuss with his employees. At 5:00 p.m., after the product launch, Zac takes the car to the airport: he's going for a holiday to see his family in China. He looks at the route on the GPS and checks the week's forecast for China. After launching his new product, he wants to relax, so he plays games on his phone. Then he calls to check in with his family in China.

Lee Wu-Huang

At 11.00 a.m. Lee is on his way to speak at a business technology conference. He practices his talk on the way, to make it perfect. He watches videos of previous talks to improve. Well-prepared, Lee relaxes by watching science fiction shows on Netflix, which are downloaded to his phone. To avoid distracting his driver, he uses headphones. At 4:30 p.m., after his speech, Lee is on his way home. He feels hot, so he turns on the air-conditioner. Due to taking the conventional working route this day he is delayed in traffic, which he complains about on Facebook. Then he reads latest technology news to see what apps are most popular. During this process, he also checks the messages from his apps' users, which inspire him. After a short break, Lee continues to program another, unfinished, app.

Persona and Scenario Commentary

We have used scenarios of two types: narrative and analytical. The former expresses the attitude of a persona; the latter shows the persona's requirements. These approaches complement one another and together give a clear picture of a persona that point to product requirements.

The narrative scenario about Aristotle shows an extreme user in his context who demands much of his equipment. The scenario reflects Aristotle's pattern of thought and presentation: he is a marketing "guru" who thinks and speaks in a non-logical way. The scenario's style is surreal and frenetic; it reflects the presentation of publications such as Fast Business, Wired and Vice, which present business and related technology in a 'cool' or 'edgy' style. This scenario focuses on work on the go and the importance of a slide-viewer with editing tools. The ability to communicate with another person is helpful to aid discussions.

Xavier's narrative is smoother, reflecting his demeanour. References to times and tasks make this more analytic than Aristotle's but less than Genevieve's. The scenario reflects Xavier's style of work, which was learnt in a time before desktop computing and the internet.

Genevieve is a logical thinker. She deals in quantitative data, so the analytical style of scenario reflects her manner. She requires consistency, reliability, and repeatability because her routine is consistent. This scenario highlights the importance in having a functional business centre where the user can maximize their work efficiency even when on the go. Tasks such as sending out emails or checking the news are important to Genevieve as it allows her to keep up to date with the latest developments.

Zac often has to work on sensitive presentations while travelling. So the compartment between him and the driver should be sound-proofed. A Speak-to-Driver application would enable Zac to control information flow within the car. And a clear GPS application is also essential for Zac as he is on his way to the airport. Being able to check the weather in China would enable Zac to better plan his trip as well.

Lee's scenario highlights the importance of a high-fidelity media centre. Lee watches videos on YouTube and records video memos for employees. Therefore, video clarity is vital. Lee likes to unwind watching Netflix. Phone-connectivity via USB would give Lee greater access to a range of content.





Task 1: User Requirements



Emailing

Unique ID- No. 1

Type | Functional; Conscious

Description | The system will allow users to send, receive and view emails in order to communicate with their office, clients and other stakeholders.

Rationale | Email is now a ubiquitous service in commercial and personal life. Users require up-to-date communication with their offices, business partners and clients at all times.

Source | Group Discussion. Mentioned often in interviews with Prof. Gary Burnett and Dr Rowland Travis as a main activity during travel. Our personas all have a high demand for up-to-date communications which can be seen in the scenarios, whether in IT (Lee, Zac), Marketing (Aristotle) or Finance (Genevieve).

Priority Scale

Low

High

Phone Calling

Unique ID- No. 2

Type | Functional; Conscious

Description | This system will allow users to make and receive calls in order to communicate with their office, clients and other stakeholders.

Rationale | Real-time communication via phone is a necessary function in order for users to be able to continue to contribute to work tasks while working remotely. It is an important facet of working remotely that aids users to communicate effectively.

Source | Initial group discussion. Common task elicited from interviews with Prof. Gary Burnett and Dr Rowland Travis. Aristotle, Xavier and Zac Scenarios.

Priority Scale

Low

High

Document Management

Unique ID- No. 3

Type | Functional; Conscious

Description | The system will allow for users to create, edit and save text documents, presentations and spreadsheets.

Rationale | Users have a fundamental need to access and manage work-related documents while on the go. These documents may be of many different formats which need to be able to be manipulated.

Source | Context of use analysis document. Group discussion. Interviews with Prof. Gary Burnett and Dr Rowland Travis. Aristotle, Genevieve and Zac scenarios.

Priority Scale

Low

High

Access to Financial & Market Information

Unique ID- No. 4

Type | Functional; Conscious

Description | The system will be able to access accurate financial information about a client's company as well as sectoral, national and international markets.

Rationale | Users require access to financial information and market information in order to carry out their work duties, make important business decisions and keep up to date with the financial world.

Source | Initial group discussion of the broader responsibilities of executives. Reading of business press. Genevieve, Aristotle and Lee scenarios.

Priority Scale

Low

High

Access to Shared Business Files

Unique ID- No. 5

Type | Functional; Conscious

Description | The system will allow users to access shared business files and documents.

Rationale | Users want to be able access their shared files on the go, without having to keep a backup copy of their main office device on the system or transferring files via USB.

Source | Group Discussion. Interviews with Prof. Gary Burnett and Dr Rowland Travis. Genevieve, Aristotle and Zac scenarios.

Priority Scale

Low

High

GPS and Journey Information

Unique ID- No. 6

Type | Functional; Conscious

Description | The system will allow users to set a destination of travel and view location information about their journey, including their current position, traffic and possible reroutes.

Rationale | Users want to be able to set a destination of travel. Additionally, users want to be able to quickly understand how long the journey may take and the reasons for delays, as they often have important meetings to get to and may need to adjust meeting timings or notify others of potential lateness. Rerouting allows users to select faster routes in aid of arriving on time.

Source | Context of Use Analysis Task. Interviews with Prof. Gary Burnett and Dr Rowland Travis. Genevieve, Zac and Lee scenarios.

Priority Scale

Low

High

Climate Control

Unique ID- No. 7

Type | Functional; Conscious

Description | The system will allow users to set the in-car climate via control of temperature, fan speed and air distribution.

Rationale | Users want to be able to control their environment to be comfortable during journeys and as a luxury service this will be expected.

Source | Group discussion. Context of use analysis task. Interviews with Prof. Gary Burnett and Dr. Rowland Travis. Genevieve and Lee scenarios.

Priority Scale

Low

High

Web Access

Unique ID- No. 8

Type | Functional; Conscious

Description | The system will allow users to be able to access the internet on the device.

Rationale | Users want to be able to write emails and stay in touch with work while on the move. They also want to be able to download and update documents that require internet access. Additionally, users want to watch live video or access online content for entertainment and social purposes.

Source | Group discussion. Context of use analysis task. Interviews with Prof. Gary Burnett and Dr Rowland Travis. Genevieve, Aristotle, Xavier, Zach and Lee scenarios

Priority Scale

Low

High



External Device Connectivity

Unique ID- No. 9

Type | Functional; Conscious

Description | The system will allow users to connect external devices to it.

Rationale | Users want to be able to connect external devices to the system in order to access, manipulate and consume documents, videos and other such information. Headsets and external keyboards are key examples of devices that users want to be able to use.

Source | Context of use analysis. Interviews with Prof. Gary Burnett and Dr Rowland Travis. Genevieve, Zac and Lee scenarios.

Priority Scale

Low

High



Touch Screen Display

Unique ID- No. 10

Type | Functional; Unconscious

Description | The system will display its content to the user through a touch screen.

Rationale | Users want to be able to view content on the device and be able to interact with and manipulate this content. Touch screens are now commonplace in vehicle-device interaction.

Source | Group Discussion. Context of Use Analysis. Interviews with Prof. Gary Burnett and Dr Rowland Travis.

Priority Scale

Low

High



Audio Output

Unique ID- No. 11

Type | Functional; Unconscious

Description | The system will be able to play out sound to the user.

Rationale | The user wants to be able to perform tasks that require audio output such as telephony, watching videos and listening to music.

Source | Interviews with Prof. Gary Burnett and Dr Rowland Travis. Aristotle, Genevieve and Lee scenarios.

Priority Scale

Low

High



Screen-Mirroring

Unique ID- No. 12

Type | Functional; Unconscious

Description | The system will allow users to mirror the screen of a device onto the system screen.

Rationale | Users travel with personal assistants and other colleagues and may need to display information on their devices to the other passengers in a more manageable fashion. Users also want to be able to view their content on a larger, more ergonomically viable display.

Source | Group Discussion. Context of Use Analysis (Physical Capabilities). Genevieve and Lee scenarios.

Priority Scale

Low

High

Voice Control

Unique ID- No. 13

Type | Functional; Unconscious

Description | The system will allow users to control features using voice commands.

Rationale | Users want to be able to control the system from the comfort of their seats.

Voice control also increases the accessibility of the system for those with certain impairments.

Source | Group Discussion. Context of Use Analysis (Tasks). Journal (10.1080/0743461921233127633)

Priority Scale

Low

High

Data Storage

Unique ID- No. 14

Type | Functional; Unconscious

Description | The system will allow users to store their own documents and applications on the device itself.

Rationale | Users want to be able to transfer/download their own files to the device for easy access. Additionally, wireless communications are known to be unreliable, especially during journeys where signal can be weak or non-existent. Physical data storage is therefore necessary to access information and documents offline.

Source | Group discussion. Context of Use Analysis. Interview with Dr Rowland Travis. Aristotle, Genevieve, Xavier, Zac and Lee scenarios.

Priority Scale

Low

High

Automatic Brightness Adjustment

Unique ID- No. 15

Type | Functional; Unconscious

Description | The system will be able to be used in different lighting conditions.

Rationale | The system will be used at varying times of day in any season, as such it is necessary for the system to appropriately react to the changing light conditions.

Source | Group discussion. Context of Use Analysis.

Priority Scale

Low

High

Premium Appearance

Unique ID- No. 16

Type | Non-Functional; Conscious

Description | The system will be attractive to a business executive audience.

Rationale | Users want the system to have a premium look and feel as this is what they expect from a chauffeured driven experience. Additionally, a cheap and unsightly look and feel may lead to an assumption that the product does not function well, reducing the acceptance between the user and the system. A good brand identity will also help the user feel more positive about the product.

Source | Group discussion. Xavier, Aristotle and Genevieve persona.

Priority Scale

Low

High

Ease of Remembering

Unique ID- No. 17

Type | Non-Functional; Unconscious

Description | The system will be able to be used without training, with appropriate affordances and skeuomorphs utilised to aid in its use and learnability.

Rationale | Users want the system functions to be immediately apparent and easy to use without the need to consult instructions. The users of the system do not have the time or in some cases the patience, to learn a new system.

Source | Group discussion. Interviews with Dr Rowland Travis and Professor Gary Burnett. Xavier and Aristotle Personas.

Priority Scale

Low

High

Efficiency of Use

Unique ID- No. 18

Type | Non-Functional; Unconscious

Description | The system will allow users to quickly and easily access the information or complete the tasks they wish to carry out

Rationale | Users want to be efficient with their time as they often have busy schedules with a large workload. If the user interface is not easy to use and less efficient than current methods (mobile/laptop), they may not want to use the product at all.

Source | Group discussion. Nielsen's 10 usability heuristics. Schneiderman's 8 Golden Rules.

Priority Scale

Low

High

Feedback

Unique ID- No. 19

Type | Non-Functional; Unconscious

Description | The system will provide appropriate feedback to the user when using the system, such as device vibration, sounds and prompts.

Rationale | Users want to feel confident that their interactions with the system provide the appropriate outcomes. If a user does not know whether their action has had an effect, they will not be able to understand the system state and will become frustrated.

Source | Group discussion. Interview with Dr Rowland Travis.

Priority Scale

Low

High

Personalisation

Unique ID- No. 20

Type | Non-Functional; Unconscious

Description | The system will allow users to personalise their experience of the device including language, stock currencies and text size.

Rationale | Users of the system will be from varying countries and cultural backgrounds. It is therefore important that the system can be altered to cater for these differing individuals. Elements such as text size and graphical buttons should be able to be increased or magnified to cater for physical and sight impairments.

Source | Group discussion. Context of Use Analysis. Interview with Dr Rowland Travis. Personas of Xavier and Zac.

Priority Scale

Low

High



Low Response Time

Unique ID- No. 21

Type | Non-Functional; Unconscious

Description | The system will have at maximum a 3 second response time between user input and system response in both lightweight and intensive tasks.

Rationale | Users of the system expect fast and responsive operation of the device given the premium chauffeured experience. Additionally, users want to be efficient with their time. The system must not be slow and unresponsive if it is to replace current methods (mobile/laptop).

Source | Group discussion. Context of Use Analysis. Interviews with Dr Rowland Travis and Professor Gary Burnett. Aristotle, Genevieve, Zac and Lee scenarios.

Priority Scale

Low

High



Software Security

Unique ID- No. 22

Type | Non-Functional; Unconscious

Description | The system will secure data stored internally and any data sent externally through any communication.

Rationale | Business executives commonly interact with sensitive data such as financial, business, personal and hiring information which needs to be kept secure and safe.

Source | Group Discussion. Interviews with Dr Rowland Travis and Professor Gary Burnett. Genevieve and Xavier personas.

Priority Scale

Low

High



Safety

Unique ID- No. 23

Type | Non-Functional; Unconscious

Description | The system will comply with the vehicle safety regulations set by the European Union and the United Nations Economic Commission for Europe.

Rationale | The safety regulations set by the EU and the United Nations Economic Commission for Europe are deemed the highest level of standards set by any regulatory body. In the unfortunate event of a crash, it is important that the device does not impose any increased risk to the user.

Source | Group Discussion. ISO 26262

Priority Scale

Low

High



Reliability

Unique ID- No. 24

Type | Non-Functional; Unconscious

Description | The system will achieve 99 percent uptime and will be able to function without access to the internet or other cellular networks.

Rationale | Users want to be able to use the system at any time of day for hours at a time without malfunction. Additionally they want to be able to use the system in any surrounding environment, regardless of signal strength to external networks.

Source | Group Discussion. Context of Use Analysis. Interview with Dr Rowland Travis.

Priority Scale

Low

High



Low Mental Workload

Unique ID- No. 25

Type | Non-Functional; Unconscious

Description | The system will be designed in such a way to reduce the mental workload needed to use the system. This will include utilising techniques such as skeuomorphs, functional grouping, redundant colour coding and cultural conventions.

Rationale | Users want to be able to easily use the system without high levels of mental workload required. Higher levels of mental workload is more likely to lead to motion sickness and reduced work efficiency.

Source | Group Discussion. Interview with Dr Rowland Travis. ISO 9241-125:2017. Nielsen's 10 Usability Heuristics (NY ISBN 0-471-01877-5). Shneiderman's 8 Golden Rules (ISBN 978-0134380384).

Priority Scale

Low

High



Reduced Motion Sickness

Unique ID- No. 26

Type | Non-Functional; Unconscious

Description | The system will be designed in such a way as to reduce motion sickness where possible.

Rationale | Users of the system want to be able to use the system comfortably. This includes working efficiently and being entertained. Motion sickness will reduce the comfortability of system use and may dissuade usage.

Source | Group Discussion. Interviews with Professor Gary Burnett and Dr Rowland Travis. Journal ([10.1007/s00221-014-4008-8](https://doi.org/10.1007/s00221-014-4008-8))

Priority Scale

Low

High



Matching Exterior and Interior

Unique ID- No. 27

Type | Non-Functional; Conscious

Description | The system should be able to match the branding, exterior and interior of the vehicle it is being used in.

Rationale | Users expect a premium look and feel for the device in a chauffeur-driven car. This includes matching the cars branding and colours in order for it to seamlessly integrate into the car aesthetics.

Source | Group Discussion. Interview with Gary Burnett. Aristotle and Sir Xavier persona.

Priority Scale

Low

High



Device Placement

Unique ID- No. 28

Type | Non-Functional; Conscious

Description | The system will be placed in the headrest in an ergonomic position allowing for tilt and forward and backward extension.

Rationale | Users will be of varying heights, reach and visual capability. Therefore it is important that users are able to adjust the device placement to suit their own physiology. Users of the system will expect that the system will be built into the headrest, much like other available systems.

Source | Group Discussion. Context of Use Analysis. Interview with Dr Rowland Travis.

Priority Scale

Low

High

A photograph showing a person's hand holding a pencil and sketching on a white piece of paper. In the background, there is a tray containing many different types of pens and pencils. The entire image has a blue tint.

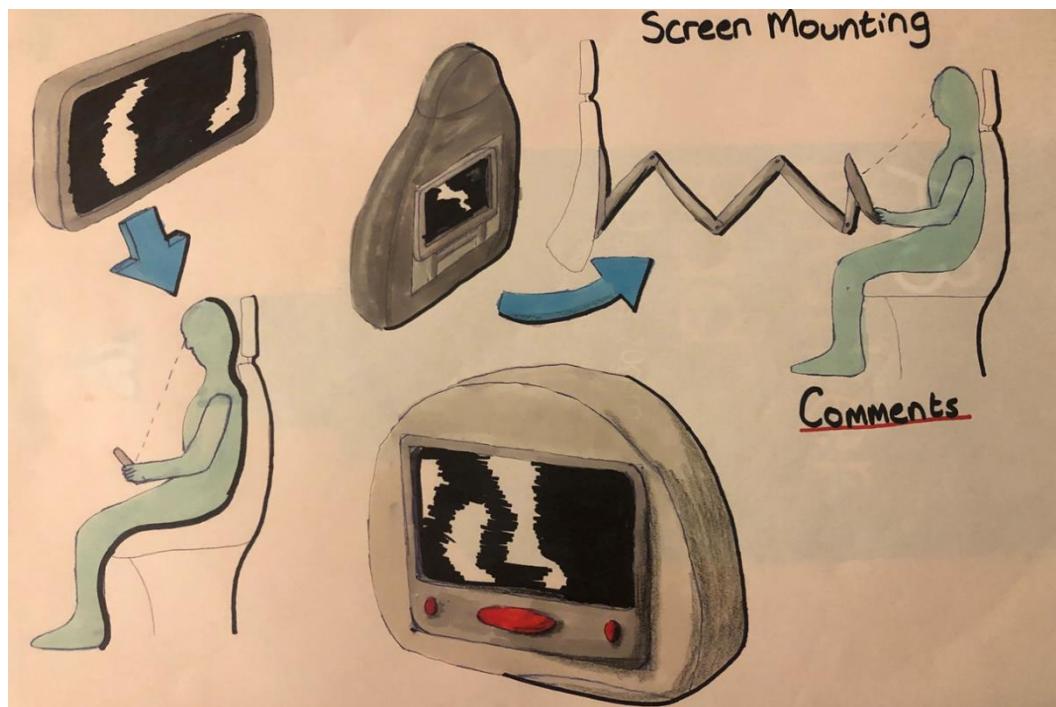
Task 2: Hardware Prototype Sketches



Hardware Prototype Sketches

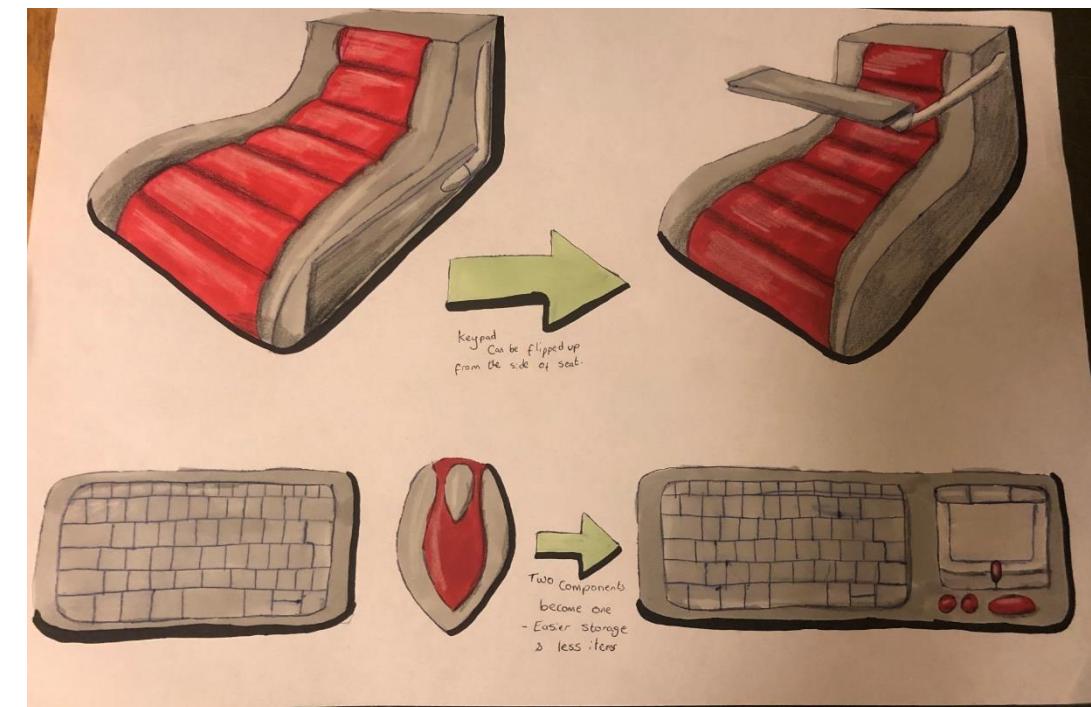
Screen Designs

We first looked at how the user would interact with the screen. We intended it to be handheld, like that of a tablet. We then considered attaching the screen to the in-front seat, below the headrest. For ease of use, we then discussed the possibility of having the screen be able to be pulled towards to the user, but this was disregarded due to safety concerns. Finally, we decided that the best place to situate the device was in the in-front seat headrest, so that the user can see it clearly and also show presentations to other people in car.



Keypad Designs

We have designed a keypad that will be set on a fold away table where the user can bring it out and use it when needing to type, but also allowing it to fold away during a call. It will also have a mouse tracker pad built into the keyboard, making the device easy store, more ergonomically viable and reduce the number of cables in the cabin



Hardware Prototype Sketches

Control Dial

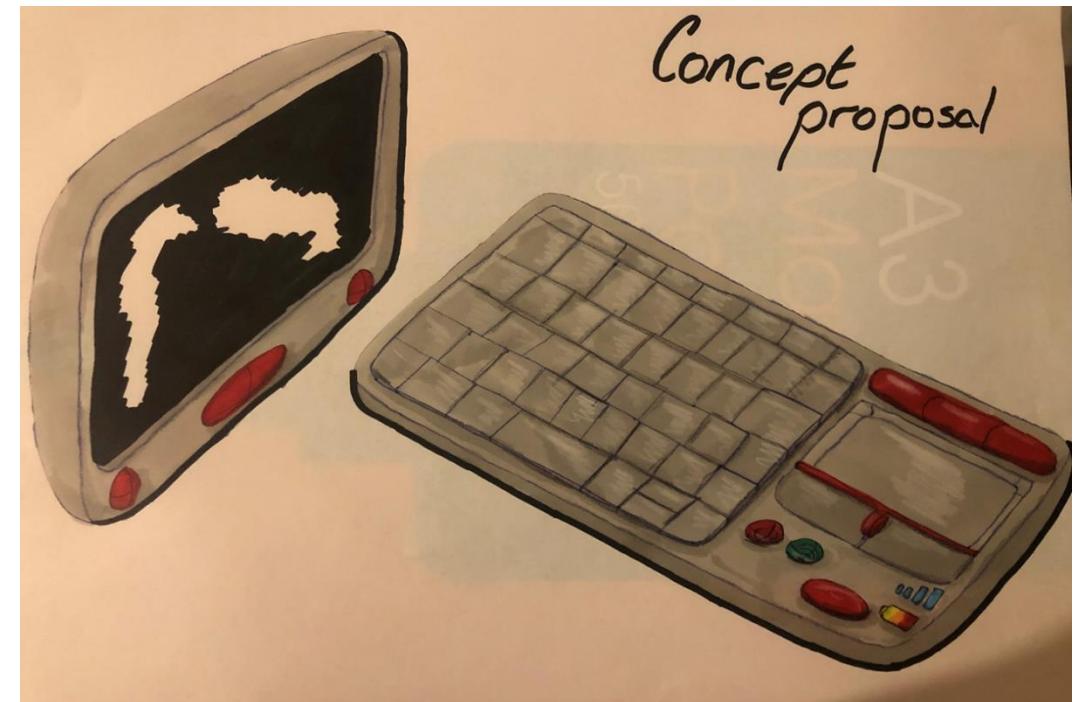
The control dial will be a larger mouse that the user can use to control the screen. The large dial in the middle will work by twisting the dial and then pressing downward upon it to click on the apps. The other buttons will allow for climate control without accessing the app.



Control Dial

Concept Proposal Design

These were the final designs for the screen and the keypad. The screen will have built in screws holding it together and a large “NOVUS” button in the middle for branding. It also has audio output speakers and a video camera for video calls. The keypad has a USB plug in as well as an AUX cord plug in. There are lights on it indicating Wifi and signal strength.

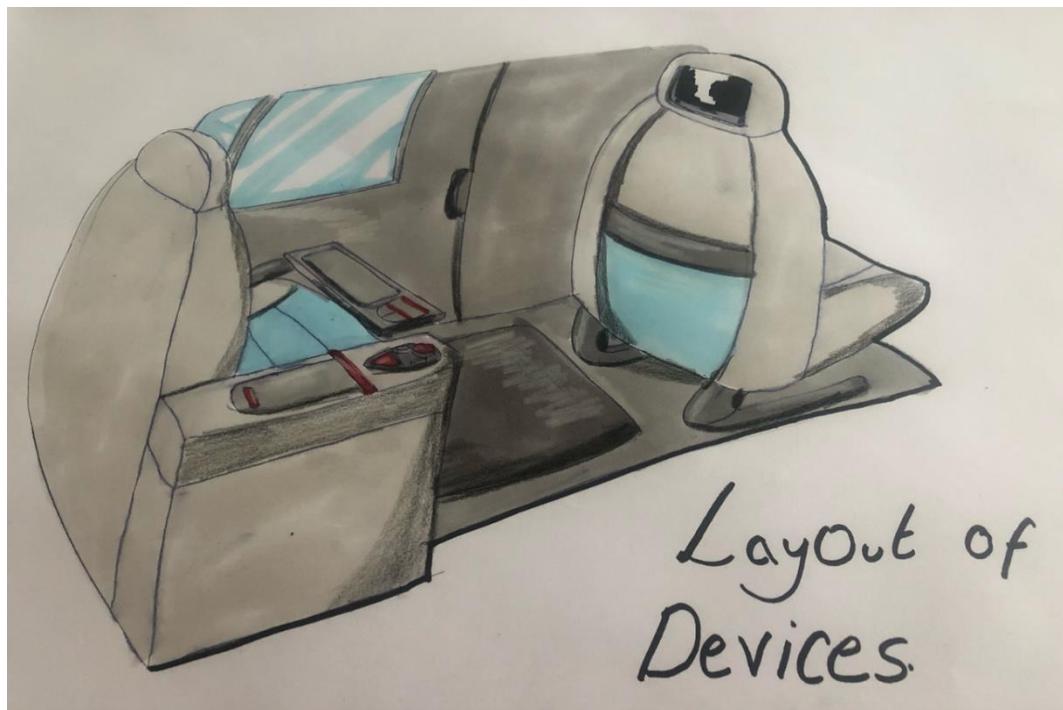




Hardware Prototype Sketches

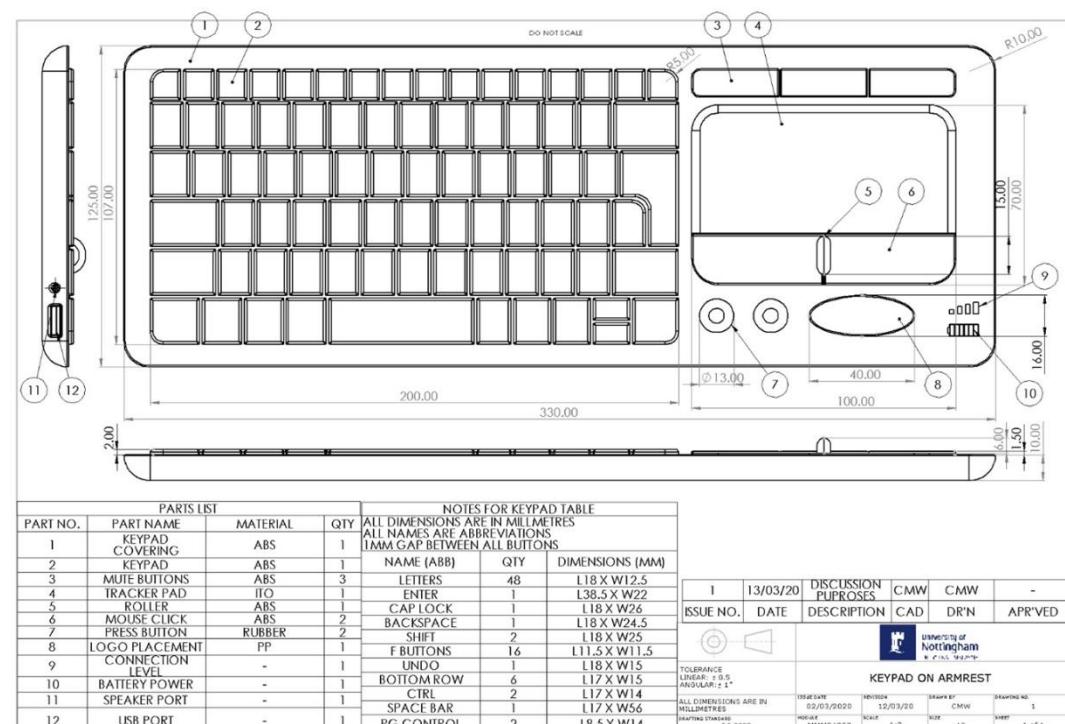
Layout of Devices

This is the intended layout of the devices for the back of the vehicle. The screen will sit in the back of the headrest. The control dial will sit in the middle of the two backs on the arm rest for maximum comfort during use. The keypad will be pulled out from the side nearest the door whenever its needed.



Keypad Dimensions

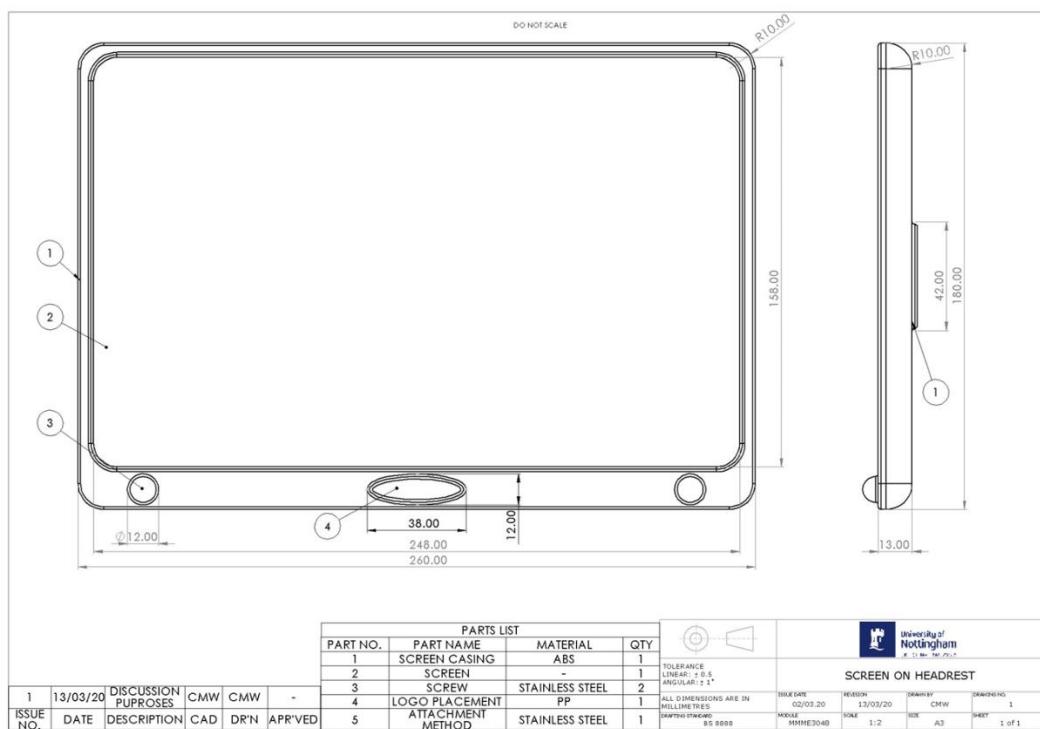
This drawing shows the intended dimensions of the keypad, as well as the other buttons and features it will contain. These were planned to be 3D printed for our user trial, but this could not happen due to the Covid-19 circumstances.



Hardware Prototype Sketches

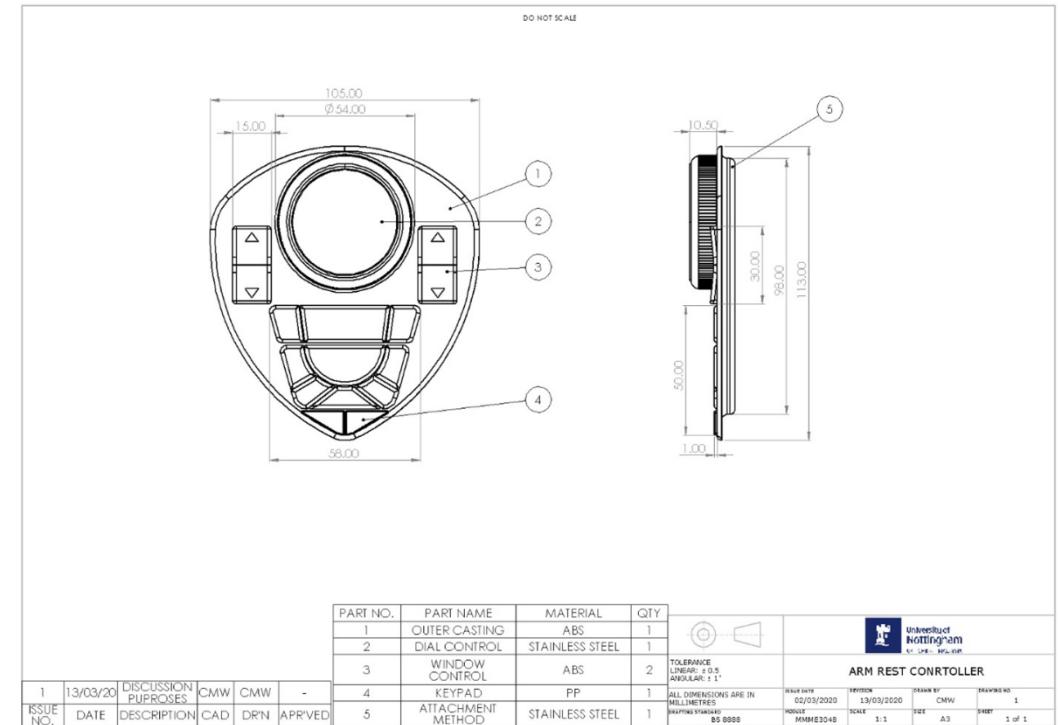
Screen Dimensions

This shows the intended dimensions for the screen and shows the component layout. Again, this was planned to be 3D printed for our user trial.



Control Dial Dimensions

This shows the intended dimensions of our control dial, allowing people to see and have an understanding of button sizes. This was also planned to be 3D printed for our user trial experiment.





Task 2: Lo-fi Interface Prototypes



Interface Designs - Dashboard



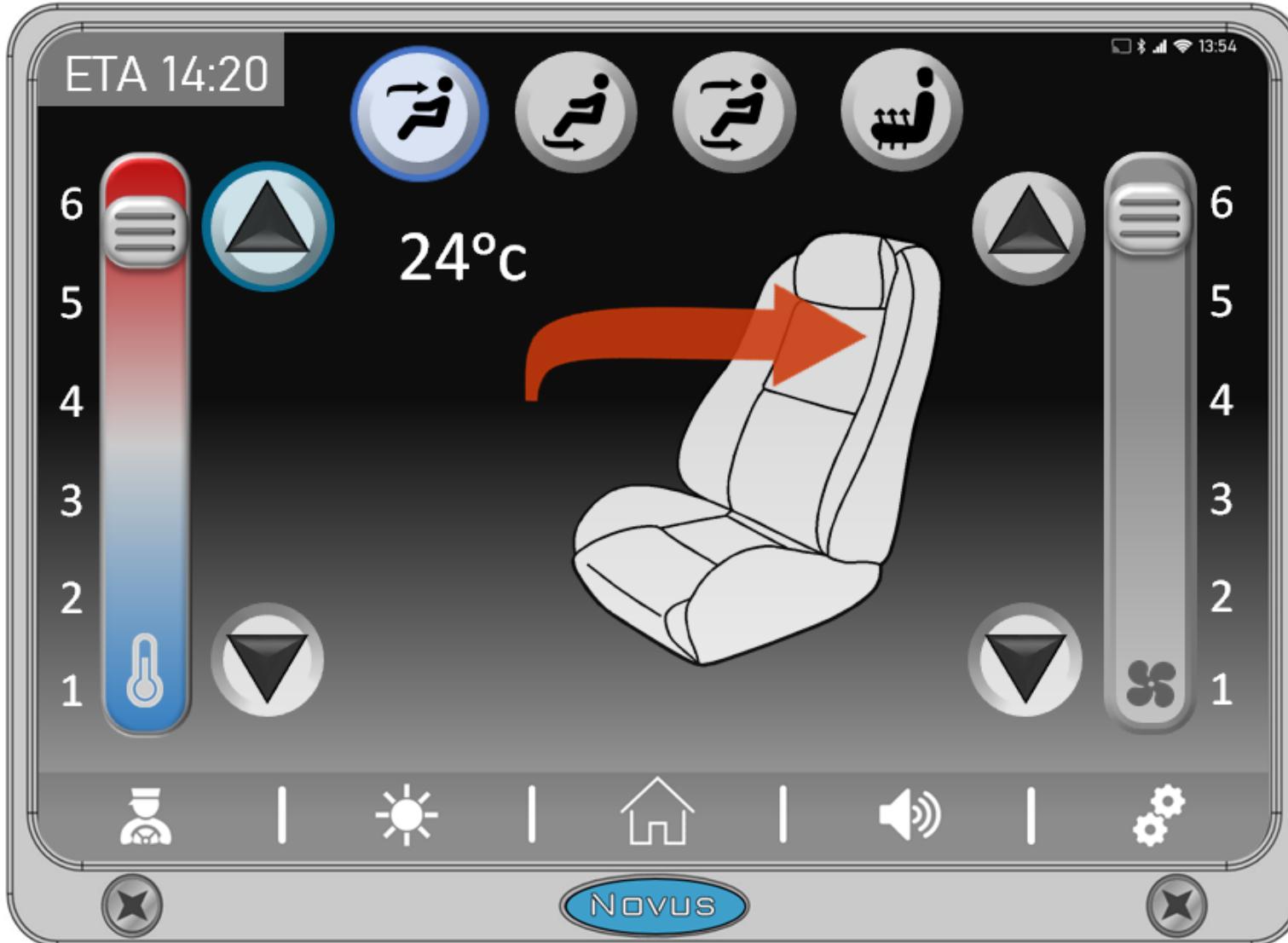
Dashboard

This was the final agreed upon design for the home screen. We wanted the branding to be large and use the same range of colours. We liked the idea of the bottom bar which has the buttons to take the user back to the home screen, contact the driver, control the brightness, control the audio and the settings. We also decided on the nine apps that would be most important to the user, as well as a search bar to find information quicker.

The three apps on the side contain important information that the user will always want to see. These include their current destination and arrival time, the stock market and their calendar. These can all be accessed by clicking the app. The screen also shows the user the time and date as well as the current weather conditions. The screen is designed to be easy to navigate but also have all the information the user may need.

The home screens meets all the requirements in some form as it allows access to all information within the device and allows the user to personalise the experience depending on their needs.

Interface Designs - Climate Control



Climate Control Screen

The climate control interface directly tackles requirement #7 (Climate Control) and how the user will use the touch screen (requirement #10) to manipulate their in-car environment. Ease of remembering (requirement #17), efficiency of use (requirement #18) and feedback (requirement #19) were key non-functional requirements that were considered in the development of this interface. These requirements were met through the use of affordances, skeuomorphs, functional grouping, redundant colour coding and cultural conventions.

Interface Designs - Climate Control



On the left hand-side is the temperature gauge which allows the user to change the temperature. Both the thermometer skeuomorph and cultural colour conventions of hot and cold indicate to the user that this area is for changing the temperature. The shape of the element and the button with “grip” lines affords the action of sliding the button up and down in order to change the temperature. The large buttons next to the slider can also be used to change the temperature and this is conveyed through the functional grouping of the elements. These large buttons offer users another way to change the temperature, as it may be difficult to slide buttons on certain journeys or if the user lacks the required dexterity. Importantly, feedback is given the user when these larger buttons are pressed with the “Novus blue” highlighting the button on press. The scale to the left of the gauge serves two main purposes. Firstly, it allows users to more easily remember the setting they prefer and secondly through the use of redundant colour coding, it allows those with colour vision deficiency to still understand the direction in which to move the slider if they wish to increase or decrease the temperature of the vehicle. On the right hand-side a similar gauge and accompanying controls convey the current airflow speed and the required interactions to manipulate it. Whilst the temperature gauge is more explicit in the intended outcome of interaction due to colour coding, it is hoped that the noise due to an increase in air flow and the affect on the graphical arrows provides adequate feedback to the user.

Interface Designs - Climate Control



Climate Control Screen

In the centre of the interface lies the representation of the user's chair, an arrow indicating the strength, position and temperature of the air flow and an easily readable accurate temperature value which can be displayed in Celsius or Fahrenheit. In the development of the climate control screen, multiple designers created their own designs which can be seen in appendix f. These designs were discussed in team meetings and elements of each were used in this final design. One such element is that of the airflow arrow and how it indicates the direction of airflow. This arrow design was then further improved using colour coding to indicate the selected temperature and arrow width to indicate the selected air flow speed, with updates occurring as the arrow changes are made by the user. By illustrating the chair along with the arrow, a more understandable mental model of how user input affects the outcome can be ascertained.

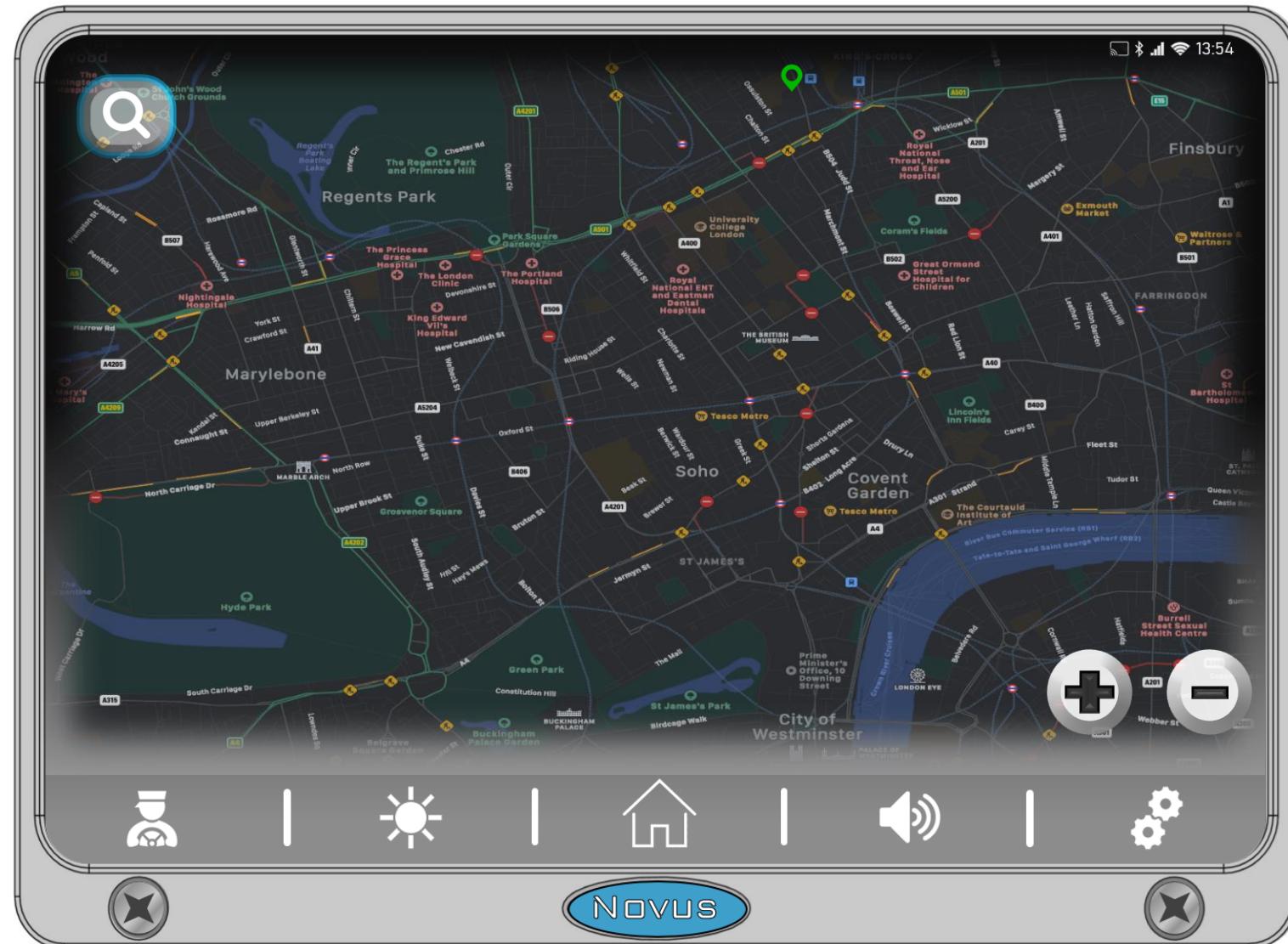
Interface Designs - Climate Control



Climate Control Screen

At the top of the interface are the different modes the user can select when changing the airflow or seat heating. When pressed these buttons highlight and remain highlighted to indicate to the user which mode they are currently in. This is also indicated by the arrows discussed earlier. The symbols used on the mode buttons are commonplace in climate controls and convey their meaning tacitly. Therefore, the user is unlikely to need to learn what their uses are. At the top left of the interface is the users' current estimated time of arrival. The main use of the device is during journeys to selected destinations in the maps application (see page 33) and so through group discussion it was deemed important that this information be displayed the user no matter screen they are in.

Interface Designs - Journey Related Information



Maps Home Screen

This is the home screen for the Journey Related Info App. Users can navigate the map by swiping in all directions and see different parts of the map as well as zoom in and out using the buttons at the bottom right part of the screen or by pinching the screen directly. We decided to use a dark mode display both to match the overall theme of our design as well as because it has been suggested that dark mode UIs are more relaxing for the user (Kulkarni, 2020).

The maps interfaces directly address user requirement #6 (GPS and Journey Information) as well as # 10 (Touch Screen Display), #19 Feedback and #25 (Low Mental Workload).

Interface Designs - Journey Related Information



Searching and Inputting Journey Information

Selecting the search icon (magnifying glass at the top left corner of the screen) reveals a new section on the left side of the screen where users can input the starting point and destination of their journey. After the evaluation phase we also added an icon showing the current position on the map.

Interface Designs - Journey Related Information



Journey Information and Alternative Routes

After inputting all the necessary information, different routes (fastest, alternative, simplest) will be displayed on the left side of the screen based on various information such as traffic, roadwork, etc. At the same time, these routes will be displayed on the main map with the selected route being in bright blue colour.

In case the destination is already known to the driver, upon opening the maps app users will be directed straight to this screen while they will still have the option to select an alternative route or create a new journey, all of which will be automatically synced with the driver's screen.

The layout throughout these screens is based on Google and Apple Maps. Both these apps own almost 90% of the navigation app market share, making them the default option for a journey related interface (Panko, 2018) as well as an option that users are familiar with.

Interface Designs - Journey Related Information



Navigation

When the car starts moving, the navigation screen will be displayed to users. On the left side of the screen, users can see an actual representation of the car and its position on the road, its speed, the current road they are on, as well as the current weather (evaluation suggestion). There is also the option to end the navigation, which will return them to the Maps Home Screen (page 33).

On the right side of the screen, users can see a zoomed-in part of the map with the selected route being highlighted in blue colour as well as their position displayed by the miniature car. On the top right corner, the estimated time of arrival is displayed. Users have several other options. Selecting the magnifying glass returns them to page 34. If the users have zoomed in or out of the map, they can select the arrow on the bottom left corner to re-centre the entire map. If participants want an overview of the selected route, they can select the GPS icon (see next page).

The overall navigation screen is designed based on the UI found in TESLA cars. Users, which in our case are backseat passengers, can see their location on the map at all times as well as an actual image of the car and its surroundings providing a sense of awareness that the car driver has. During the interviews, participants also suggested that they would prefer the navigation system to be similar to existing ones (cars, plane trackers).

Interface Designs - Journey Related Information



Route Overview
within Navigation

Interface Designs - Journey Related Information



Landmark Info within Navigation

Important landmarks throughout the map have an information icon next to them. By selecting the information icon, the left side of the screen will display information about the selected landmark.

Since our users will be backseat passengers, we discussed during our meetings that offering them the option of accessing information about important landmarks found during their journey will be a useful feature

Interface Designs - Journey Related Information



Landmark Info within Navigation

Pressing the ETA button at the top right corner provides users with information about their destination, in this case, the Buckingham Palace.

Interface Designs - Works App



Works Login

When selecting the Works app in the dashboard, users will be directed to the login screen where they will need to enter their credentials in order to access the app. Since this application contains important business information and security is a theme that came up throughout our user requirements research (interviews, personas) we decided it will be essential to include a login screen before accessing the app.

The works interfaces directly address user requirement #3 (Document Management), #4 (Access to Financial & Market Information), #5 (Access to Shared Business Files) as well as #10 (Touch Screen Display), #17 (Ease of Remembering), #18 (Efficiency of Use) and #22 (Software Security).



Interface Designs - Works App



Works Home Screen

This is the home screen of the Works app. We decided on these 4 applications based on our user requirements and the interviews on what kind of work and productivity related apps people need during their work trips.

Interface Designs - Works App

ETA:14:20

13:54

Home Insert Draw Page Layout Formulas Data Review View Tell me

Calibri (Body) 12 A⁺ A⁻ Wrap Text General Conditional Formatting as Table Merge & Centre Normal Bad Good Neutral Calculation Check Cell Insert Delete Format Auto-sum Filter Sort & Filter Find & Select Ideas Sensitivity Share Comments

A B C D E F G H I J K L M N O P Q R S T U V

1 Fixed Costs per Month Variable Costs per Batch

2 Plant Rental Treacle £ 20

3 Electricity Aspirin £ 10

4 Wages £ 5,000

5 Total FC £ 7,650 TOTAL VC £ 30

6 Retail Price £ 285

7 QUANTITY QC TC REV PROFIT

10 £ 7,650 £ 300 £ 7,950 £ 2,850 £ (5,100)

15 £ 7,650 £ 600 £ 8,250 £ 5,700 £ (2,550)

20 £ 7,650 £ 900 £ 8,550 £ 8,550 £

25 £ 7,650 £ 1,200 £ 8,850 £ 11,400 £ 2,550

30 £ 7,650 £ 1,500 £ 9,150 £ 14,250 £ 5,100

35 Brake-Even Chart

36 Revenue (£) 16,000

37 14,000

38 12,000

39 10,000

40 8,000

41 6,000

42 4,000

43 2,000

44 £-

45 Quantity 10 20 30 40 50

46 TC REV

47

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59

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Sheet1

Novus

Works: Data, Markets & Present

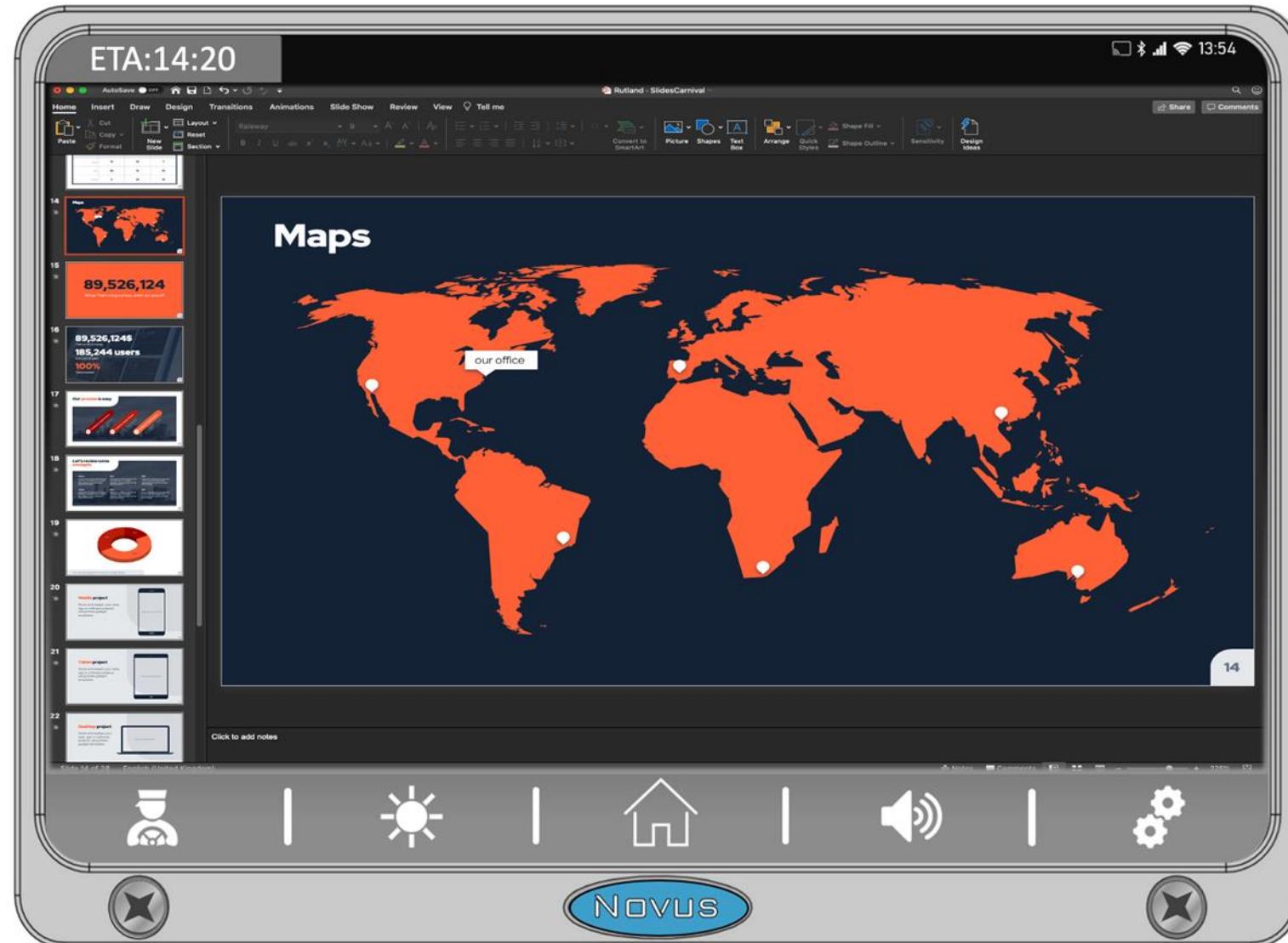
Interface Designs - Works App



Works: Data, Markets & Present



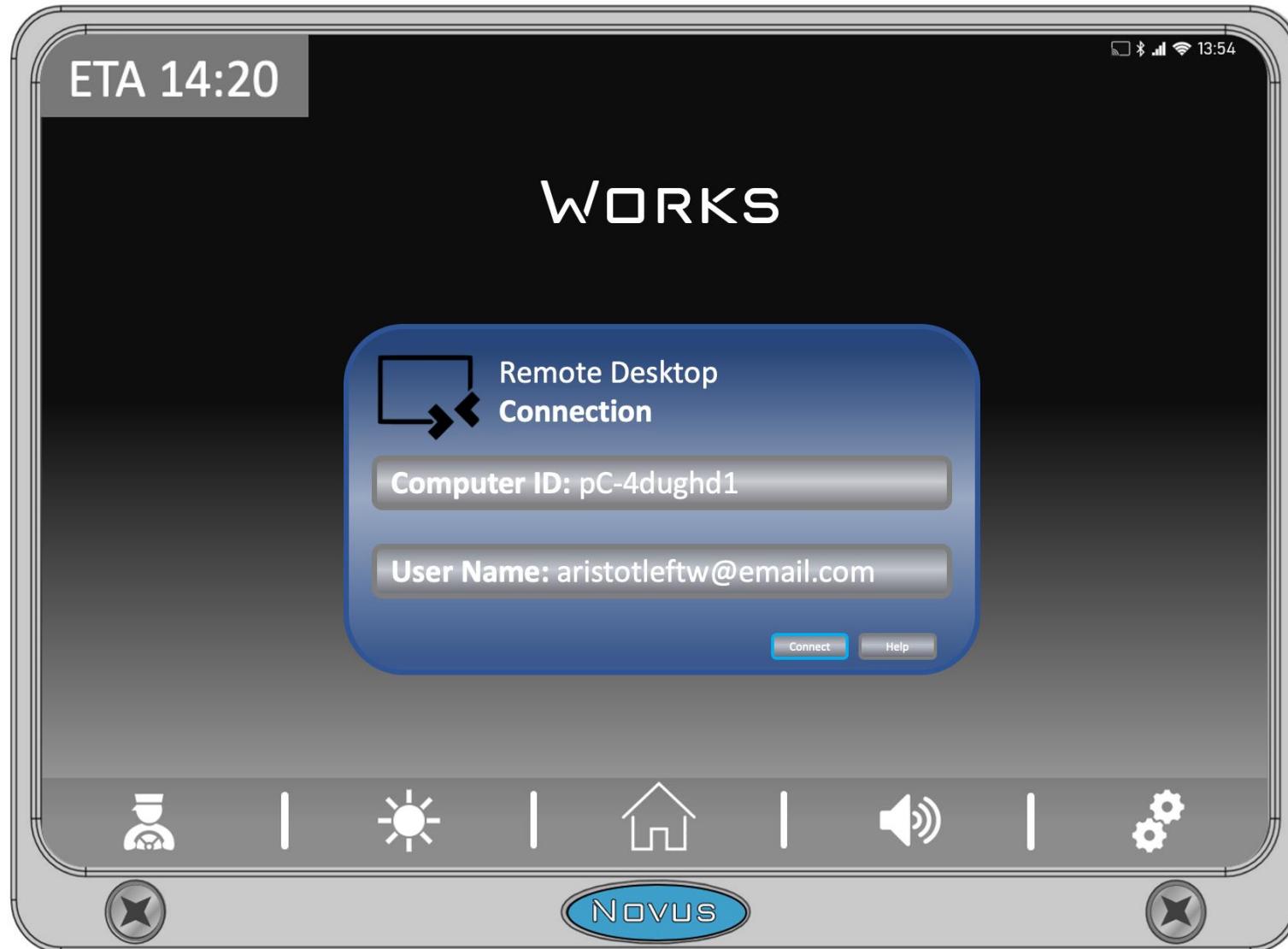
Interface Designs - Works App



Works: Data, Markets & Present

For all these apps, we used existing interfaces, namely, Excel, cTrader, and PowerPoint. We decided to use existing apps because users will be familiar with them and building our version from scratch, would have required a considerable amount of time.

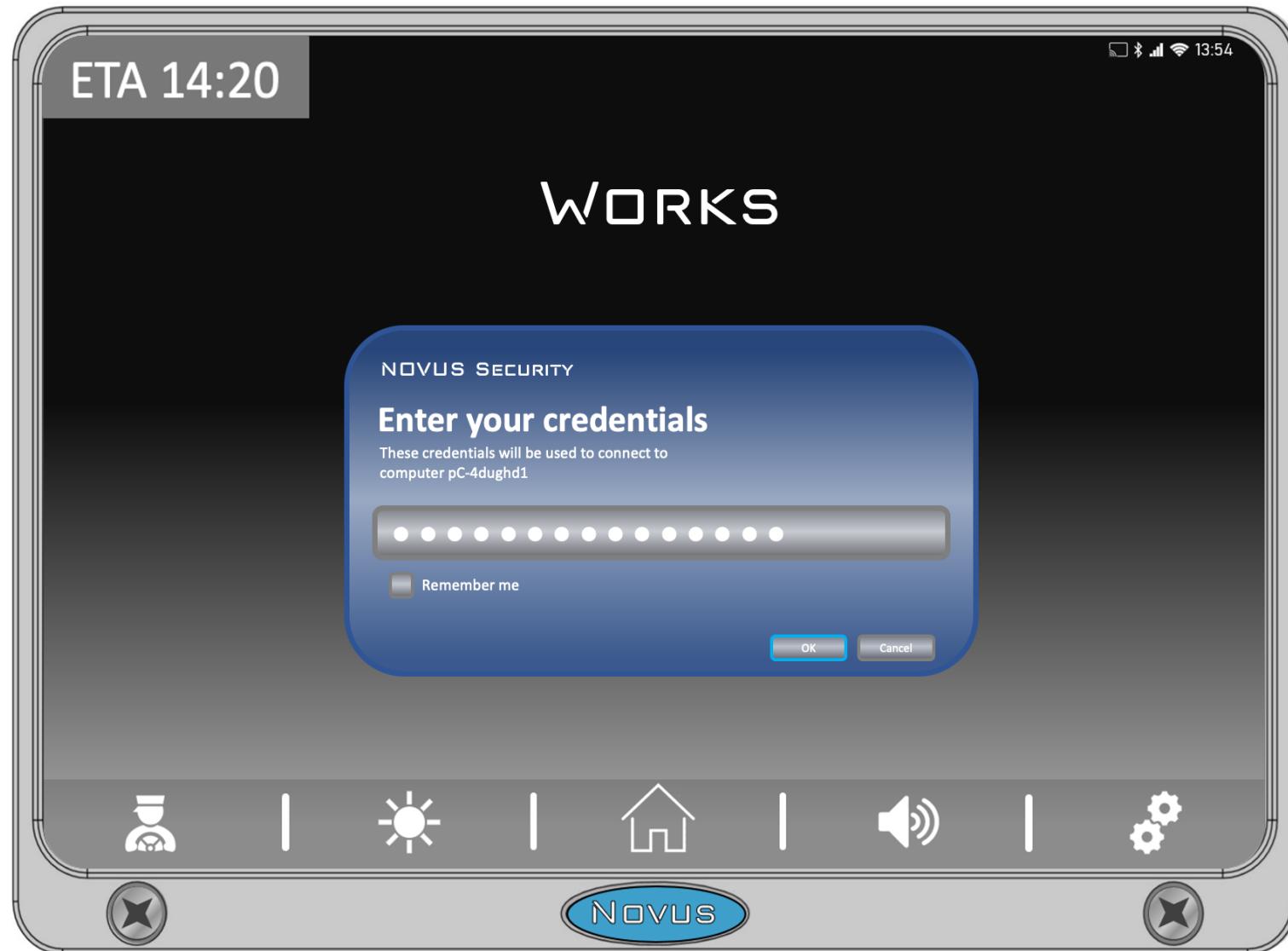
Interface Designs - Works App



Works: Remote Desktop



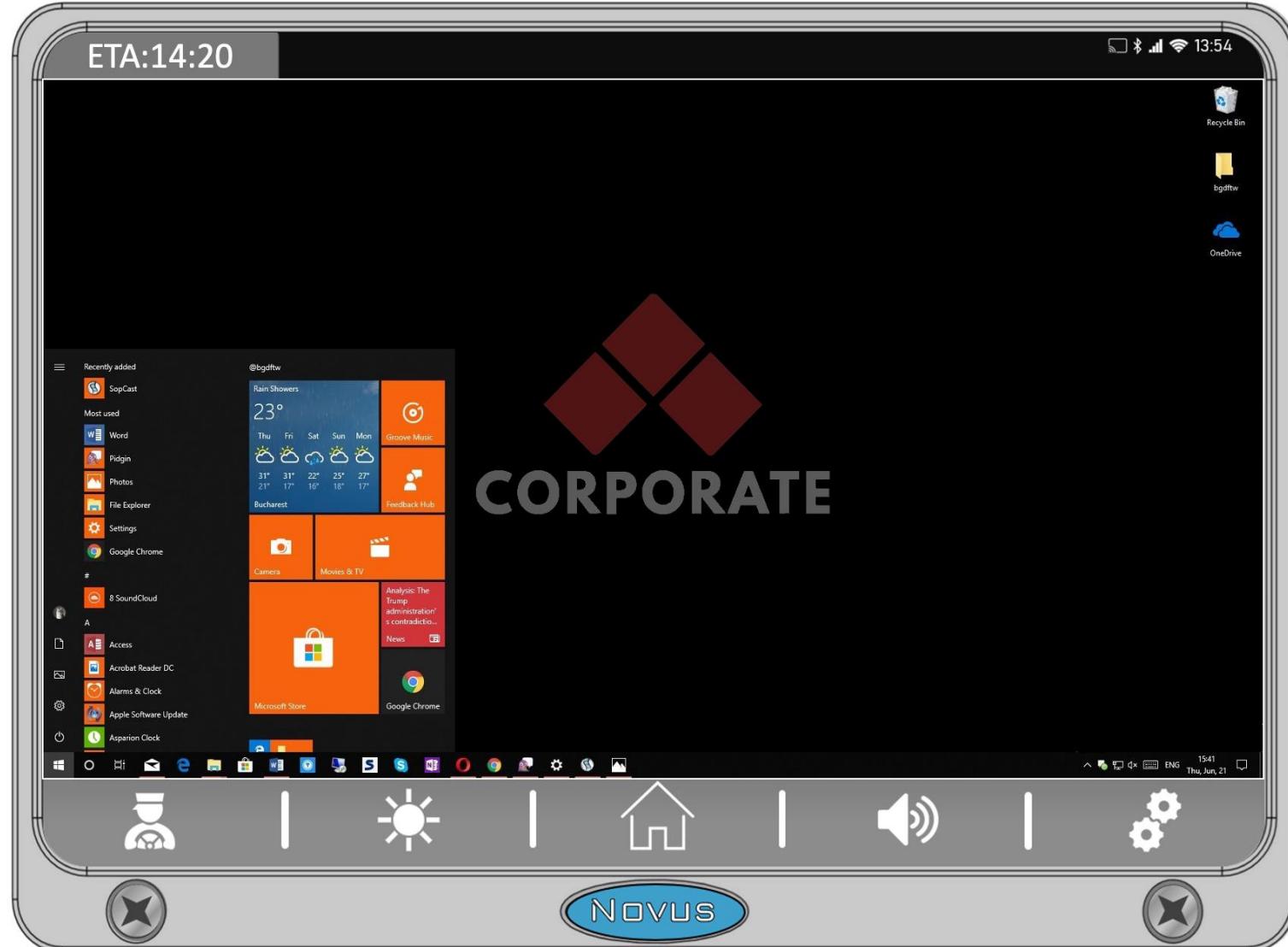
Interface Designs - Works App



Works: Remote Desktop



Interface Designs - Works App



Works: Remote Desktop

Since the remote desktop functionality allows users to access their work computer at the office, we decided to add an extra layer of security. Participants will first need to add their Computer ID and Username and then their credentials before accessing their desktop. The reason for breaking down the connecting to remote desktop task in two steps/screens is to make sure that even if someone else managed to login into the works app he will not be able to access the work computer (in line with 2-step verification many companies use).





Task 3: Non-User Evaluation



Introduction and Rationale

Our evaluation process was adapted to the lockdown response in the COVID-19 pandemic. Our evaluators conducted non-user evaluation of the prototypes; there was no user testing with participants.

This section deals with the evaluation of the usability of the prototypes. We begin with an explanation of our non-user trial methods, continue with discussion of the key results and finish with recommendations for the user requirement specifications and the design. Our product brand-name is Novus (Latin for ‘new’, coined by our Design Manager).

Note that points relating to a specific evaluation or prototype are correlated between the Method, Results and Recommendations sections by the use of clear subheadings and in-sentence enumeration. This maintains the convention of clarity in scientific reporting.





Our Method

We delegated the evaluation process to three members of the team. Initially, we used heuristic evaluation, cognitive walkthrough, hierarchical task analysis (HTA), error prediction (SHERPA), GOMS and keystroke level modelling and layout analysis. We found heuristic evaluation and cognitive walkthrough to be the most fruitful, so it is these we have included in our report (others are in Appendices G-I). Frequent, effective meetings led to early iterations of prototypes, but the main evaluation is described below. Tests were run on three applications: the climate control app, the journey app and the Works app.

First, the design team ran an internal competition wherein each produced a version of a Novus climate control application. The design manager then selected one of the designs as a base for all future applications and produced a home screen that acted as a style and branding guide for all subsequent screens. Our formal evaluation process was applied during the next stage. Throughout the evaluation we used ISO 9241-210 as a point of reference to ensure we sought recognised standards in user-centred design. To focus on usability, we consulted ISO 9241-11.

Heuristic Evaluation Technique

Heuristics are natural phenomena of human mental life that have been studied in depth in the Cognitive Psychology since the 1970s, by Tversky and Kahneman above all (Halpern 2015: 27). A heuristic is a ‘rule of thumb’ or shortcut method humans use when confronted with large problem spaces, as coined by Newell and Simon (Evans 2017: 26-7).

In HCI and UI design, for example, heuristics have been exploited both to design interfaces and to assess how users cope with them. Our evaluator used Nielsen’s 10 General Principles for Interaction Design, along with his proposed severity rating scale (Nielsen 1993); these measures have become a standard procedure in HCI (head of each analysis they are tabulated with summary comments). The method was applied to all the main applications and the home screen design. The evaluator derived a qualitative description of each application’s success in meeting each of Nielsen’s heuristics, and a severity rating between 0 (no problem) and 4 (a catastrophic problem). Each conclusion was accompanied by a written justification for the result.



Cognitive Walkthrough Technique



We wanted to include a method alternative to heuristic evaluation, and cognitive walkthrough meets this requirement because it focuses in greater detail on the steps users take to complete desired tasks (Preece et al., 2015: 512). This method better accounts for user expectations and browse and search behaviour because it is based upon theory rather than the trial-and-error more typical of heuristics-based methods (Benyon 2019: 248). Cognitive walkthroughs are also suitable for us because they focus on ease of use (Preece, p.511).

Cognitive walkthrough requires an examination of each step in a task. Many of our prototypes benefitted from this evaluation because it accounts for sense-making in the use of the system without the distraction of other concerns, such as graphic design. Because our system is relatively simple and consistent, the tasks we examined were closely representative of the whole system.

The evaluator stepped through the cognitive tasks used in interacting with the technology and asked four questions from the user's perspective, which are cited in each of the relevant results below.

- [1] Will users understand how to start the task?
- [2] Are the controls conspicuous?
- [3] Will the user associate the correct action with the outcome they expect to achieve?
- [4] If the correct action is performed, will the user see that progress is being made towards their intended outcome?

Understanding how easy the system is for new or infrequent users is another advantage of cognitive walkthrough. Since experience is subjective, it is important to structure how an evaluator documents it so that all walkthroughs use the same criteria.

Heuristic Evaluation- The Home Screen

The evaluation yielded three problems. First, absence of prompt or feedback when a function was chosen diminished the visibility of the system's status and error prevention. The evaluator thought that there was little-to-no indication to the user that icons could or had been used. Second, the screen violated the 'recognition rather than recall' heuristic because there is no option to display users' operational history or favourites for short-cut navigation. So, there is no efficient way to return to previous work. Third, an uneven distribution and density of interface items violated the 'aesthetic and minimalist design' and 'error prevention' heuristics. The grouping of icons to the extreme left and right columns of the screen - whilst the centre is left empty - is too busy and raises the probability that a user would select the wrong item. This would increase task-execution time.



Ten Heuristics	Description	Severity rating
Visibility of system status	When the user successfully selects a function, there is no obvious feedback.	3
Match between system and the real world	There are many metaphors used in icon, such as the Video the Weather icon and so on which are easy to understand.	0
User control and freedom	Users can exit the operation process at any time and navigation is very clear and convenient.	0
Consistency and standards	The icons are of the same style, layout, operation method.	0
Error prevention	1. There is no prompt indicating that the user can select this icon. 2. The icons are too crowded to select	3
Recognition rather than recall	The Home does not show the user's recently used features.	2
Flexibility and efficiency of use	User operation is simple and easy to understand.	0
Aesthetic and minimalist design	Uneven density distribution of interface elements.	1
Help users recognize, diagnose, and recover from errors	There is no general description of incorrect input in the search box.	2
Help and documentation	The interface is simple to operate, no help documents are needed, and users can easily select functions	0

Heuristic Evaluation- Climate Control

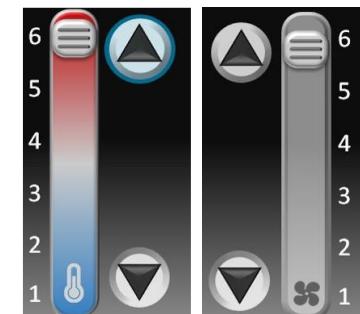
The climate control application yielded four problems. First, ‘consistency and standards’ are violated by the presence of four different hues of blue across various functional and illustrative items. There is no need for this difference because an item’s design shows its purpose.



Second, the screens are overcrowded, which prevents the design being ‘aesthetic or minimalist’. The controls are too large and crowd the feedback illustration of the chair; meanwhile, the temperature control is duplicated in both a slider and arrow buttons.



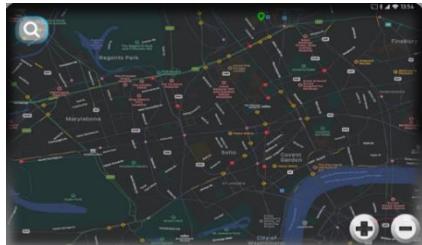
Third, recall is required rather than recognition because not all climate conditions are shown in one screen. Rather, four screens must be cycled through. Fourth, ‘flexibility and efficiency of use’ is degraded by each fan group requiring separate temperature and airflow control. This is too much adjustment for a busy user.



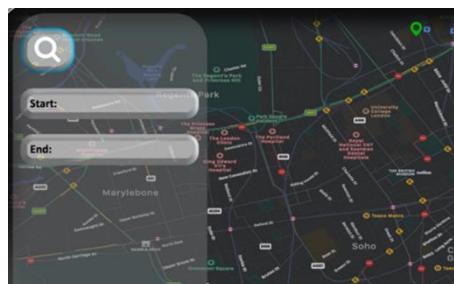
Ten Heuristics	Description	Severity rating
Visibility of system status	Users can clearly see the current temperature status of each wind.	0
Match between system and the real world	The icons on the top clearly show the location of each wind, and the icons of temperature and wind direction allow users to help understand.	0
User control and freedom	Temperature adjustment is reversible.	0
Consistency and standards	There are 4 kinds of blue on the interface.	1
Error prevention	The icon will change colour to remind the user that it is operable, and the digital label clearly reminds the user to adjust the size.	0
Recognition rather than recall	The system does not provide users with all the wind temperature conditions at the same time.	3
Flexibility and efficiency of use	The user needs to adjust the temperature and wind from four wind direction, there is no shortcut.	2
Aesthetic and minimalist design	Overcrowded on the screen.	1
Help users recognize, diagnose, and recover from errors	When the temperature adjustment is out of range, there is no error operation prompt.	1
Help and documentation	The interface is simple to operate, no help documents are needed, and users can easily select functions.	0

Heuristic Evaluation- Journey Information

The journey-planning application presented four problems. First, the lack of any real-time location display worsened the ‘visibility of system status.’ The user will not know their location.



Second, how to exit from the search panel is unclear, leaving the map obscured. This diminishes ‘user control and freedom.’



Third, recall is prioritised over recognition and flexibility and efficiency of use are compromised by complicated location input. Typing the location via keyboard is slow and error-prone.



Fourth, error prevention is reduced by the absence of error messaging. There is no prompt to indicate location entry format (it seems full names are needed), and no feedback to help users solve any errors.

Nielsen's Heuristics	Description	Severity rating
Visibility of system status	There is no obvious location of the vehicle on the big map.	4
Match between system and the real world	The task flow conforms to user habits, and the icons have metaphors to help use	0
User control and freedom	The function of exiting the place search box is not obvious, it is difficult to find.	2
Consistency and standards	Consistent system style	0
Error prevention	When entering information, the user is not told the required format.	1
Recognition rather than recall	Users cannot easily see their current driving position, and the dialog box does not automatically enter the current position.	3
Flexibility and efficiency of use	The system does not provide quick input of the current location.	3
Aesthetic and minimalist design	Simple and beautiful design	0
Help users recognize, diagnose, and recover from errors	Lack of error message	2
Help and documentation	The system is easy to operate and does not require assistance.	0

Heuristic Evaluation- The Works App

The Works application yielded four problems. First, the visibility of the system status is compromised because the user's login status is not displayed. This is a threat to system and work security: many business files contain sensitive commercial information with a high financial value. Second, user control and freedom is restricted because there is no meaning to changes tasks (say, from Markets to Data) and return to the first Works screen. Instead, users are forced to return to the main home screen. This is a major deficiency that wastes a lot of time, and will frustrate the user. Third, 'recognition rather than recall' is violated by the lack of historical work records, which denies the facility of jumping to 'favourite' or frequently visited' files and folders. Fourth, the app lacks flexibility and efficiency without a zoom function. Many of the displays (e.g. Markets) are complex. Without the ability to zoom-in, it is very hard for users to read information from the screen.



Ten Heuristics	Description	Severity rating
Visibility of system status	The login status is not displayed after the user logs in in the work interface.	4
Match between system and the real world	The system conforms to user operation habits.	0
User control and freedom	No user logged out of the system, cancel and back to the previous step.	4
Consistency and standards	The input box format and color are consistent.	0
Error prevention	The input box did not tell the required format when entering.	1
Recognition rather than recall	The system did not provide the previous work.	2
Flexibility and efficiency of use	The system does not provide an interface zoom-in and zoom-out function to help users see clearly where text is dense.	4
Aesthetic and minimalist design	The interface is simple and beautiful.	0
Help users recognize, diagnose, and recover from errors	No error message	1
Help and documentation	Help documents are provided in specific complex functions	0

Cognitive Walkthrough- Climate Control

For the climate control application, we imagine that a new user feels cold and needs to use the app for the first time. To adjust the temperature to the suitable level, three user actions are required: 1) open the app; 2) press seat heating icon; 3) select the icon to raise the temperature. The cognitive walkthrough of these user actions answered the questions in the following way.

User Action 1: open climate control

1. Yes, the user can find the Climate Control icon;
2. Yes, the icon for the Climate Control includes the word “Climate”
3. Yes, according to the user’s experience, he thinks he can get the interface of Climate Control after he uses his finger to click the icon;
4. Yes, after the user clicks the icon, the interface of the Climate Control will be shown on the screen.



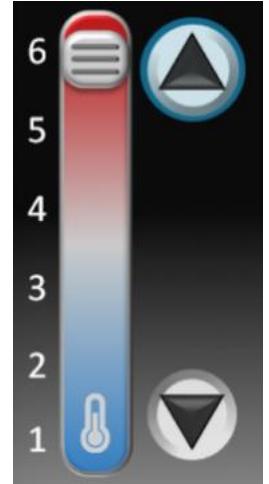
User Action 2: click seat-heating icon:

1. Yes, the user knows he needs to find the seat-heating icon.
2. Perhaps it is conspicuous because there are not too many functions showed to users, and the icon design is conventional and thus easy to recognize. For the users with no experience, they might not understand the use of different icons. This is an acceptable risk.
3. Yes, with a little similar experience, users will intuit how each option affects airflow.
4. Yes, after the user clicks the icon, the colour of the icon will be changed, and the interface of the seat heating will be shown on screen.



User Action 3: click the icon to raise the temperature:

1. Yes, the user knows he needs to find an icon to raise the temperature.
2. Yes, it is conspicuous because there are only 2 functions shown to users. For each function, there have 2 arrows (up and down). It is easy for the user to understand which icon is for increasing the temperature. Besides, for temperature control, there is a thermometer. Any user would recognise this easily.
3. Yes, the user will understand that the numbers of the scale will be increased (if the number is not the largest) and his seat will be warmer after he uses his finger to click the icon.
4. Yes, when the user presses the icon, the colour of the icon will be changed, and the number of the scale will be increased. After a while, the seat warms.



Cognitive Walkthrough- Journey Application

In testing the journey-planning application, our evaluator imagined a user wants to see how far he is from his destination and to check the weather of the destination to see if he needs to bring his coat. At base the task is to use the system to get the journey-related information. The user action sequence is: 1) use search icon; 2) input the destination; 3) select the route.

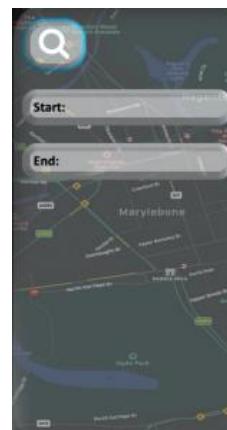
User action 1: Use search icon

1. Yes, the user knows he needs to find the search icon.
2. Yes, there are only a few icons on the interface and the search icon is easy to recognize.
3. Yes, according to the user's experience, he thinks he will get the input box after he uses his finger to click the icon.
4. Yes, after the user clicks the icon, the colour of the icon will be changed, and two input boxes will be shown.



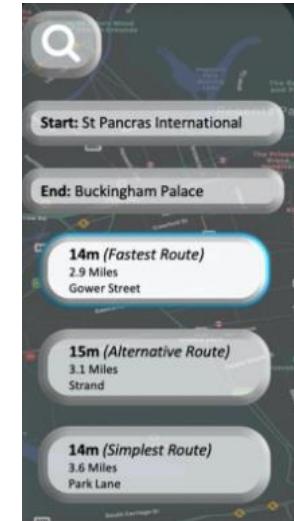
User action 2: Input the destination

1. Yes, the user knows he needs to find the input box of the destination.
2. Yes, the input box of the destination has been labelled "End".
3. Yes, according to the user's experience, he thinks he will get the different routes after he input the destination.
4. Yes, after the user inputs the destination, several different routes will be shown on screen.



Action 3: Select the route:

1. Yes, the user knows he needs to choose the route.
2. Yes, different routes are shown in different areas.
3. Yes, according to the user's experience, he thinks he will get journey-related information (distance, weather etc.) after he selects the route.
4. Maybe, because there is deficiency, after the user clicks the route, the colour of the icon will be changed, and then the journey-related information will be on screen. Although the user can get information about distance and speed etc, he cannot find information about the temperature of the destination. Thus, the outcome does not match his expectation.



Cognitive Walkthrough- The Works App

To evaluate the Works app, our evaluator considered a user - such as Xavier or Genevieve - who wants to view information about the financial markets. The specified task was navigate to such information via the Markets function of the Works app. Here, the user action sequence is: 1) the user signs-in to the Works app; 2) the user clicks the Markets icon; 3) the user selects the information she wants to view.

User action 1: the user signs-in to the Works app

1. Yes, the user knows she needs to input her username and password to log in.
2. Maybe, although the input boxes have been labelled User Name/Password, there is no login button. Perhaps the user knows that she can select the 'enter' button on the keyboard to log in.
3. Yes, according to the user's experience, it seems likely that she would expect to get a new display once she inputs information and selects the 'enter' button on the keyboard.
4. Yes, after the user logs in successfully, the Works app menu display will be shown.



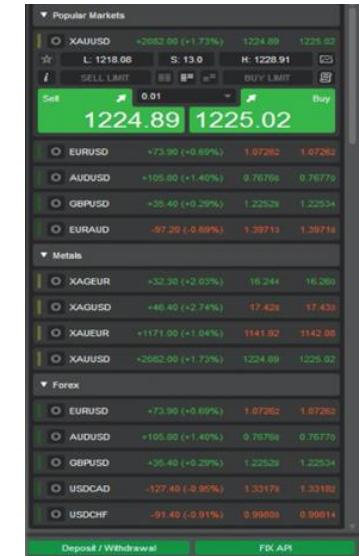
User action 2: the user clicks the Markets icon

1. Yes, the user knows she needs to find Markets function icon.
2. Yes, the icon is easy to recognise, and it is labelled with the text 'Markets'.
3. Yes, according to the user's experience, she will think she will get the Markets interface to open after she presses the icon.
4. Yes, after the user clicks the icon, the interface of the Markets APP will be shown on screen.



User action 3: the user selects the information she wants to view

1. Yes, the user knows she needs to find the information she wants to view.
2. Maybe, although all information is labelled clearly the text size is too small and the information box is also too small for a user to click.
3. Yes, the user will expect the chosen information to be shown on screen, based on her experience.
4. Yes, when the user clicks the information she wants to view, the information will be displayed on the right side of the screen.



Recommendations



The Home Screen

Heuristic evaluation: first, so that the user realises that an icon has been used, it is suggested that that the selected item darkens or thickens at the border. Second, a work or search ‘history’ function would avoid re-navigation of multiple screens when the user knows their goal (satisfying our UR #17). Third, icons could have equal space between them and populate the centre of the screen to avoid overcrowding.

The Climate Control Application

Heuristic evaluation: first, the colours could be made the same blue; they could even use several different colours. Second, retain the control sliders and remove the unnecessary buttons. Also, the chair diagram should be shrunk to leave more space. Third, a small text could sit in each screen to show climate condition other than those in the central display. Fourth, the application should incorporate the option of a one-key master control for temperature and airflow levels across fan groups.

Cognitive walkthrough: A new user is able to finish the task (which satisfies ISO 9241-11 6.6.2). Users might not recognise which icon is for seat heating, but they can try one after another to achieve the task because the other icon of the interface is easy to distinguish, and all operations are simple to perform. The evaluator found that the sequence of temperature and airflow control may not be intuitive to a new user. It is suggested that a tutorial sequence shows users how to operate the app (following UR #25). This is useful because climate control apps are commonplace yet vary. To avoid confusion, the particular control of this system should be demonstrated.

The Journey-Planning Application

Heuristic evaluation: first, this is a catastrophic omission from a large display. The locator must be added as a bold, clear indicator. Second, a cancel key could be placed next to the search icon to return the user to full view of the map. Or, search could be collapsed when the map is touched again. Third, functionality could be clarified and abbreviated if the start point were pre-populated with the current location and the end-point selected by touching a point on the map. Fourth, suggestions for name format and typical location would give users clearer understanding of what they are expected to enter for search (minding UR #18).

Cognitive walkthrough: in summary, all icons are easy to recognise and the task is achieved via clear, simple operation. Yet our evaluator did detect a problem. It was felt that the temperature of the destination should be a point of data in journey-related information. If this is not included, the user will need to use some other source, such as another app. This slows operation and frustrates the user. Our evaluator recommends that temperature be added to the journey app interface in accordance with ISO 9241-11 5.3.2 (“specified circumstance”).

The Works Application

Heuristic evaluation: first, the app should have a persistent status notification, telling the user if they are logged in or out and perhaps their visibility status as well. Second, the app needs a button to cancel work tasks, or switch between them. The ability to switch between control panels in the climate change app would be a good, simple model for this. Third, once logged in to their personal account, users should be allowed to go straight to their personal work records to ensure good productivity. This could be facilitated by cloud computing or via portable flash drive, for example. Fourth, the app must have the function for users to zoom in and out using pinch or spread of the fingers.

Cognitive walkthrough: the user is able to finish the task. However, this is an in-car rear-seat infotainment system. The screen is at distance from the user, so the text size must be large and the icons not too small or too close with each other (after UR #28). Otherwise, it will be hard for the user to read or select items and this would degrade user experience and performance. In addition, users who do not realise they can press ‘enter’ button on the keyboard to log in will be confused because there is no log in button. These problems have a straightforward solution: add a login button to the interface and increase the size of the text across the app (UR #18). This conforms to ISO 9241-11 6.2.2 and, at base, the findings of Fitts’ Law, which relates: “the time required to move to a target as a function of the distance to the target and the size of the target” (Benyon 2019: 30).

Future Directions

The prototypes provide an infotainment system with sound functionality. In the next iteration of design, the team would seek to incorporate all the above suggestions, many of which point to the need to take account of user expectations and the skills of new users. These changes must be structured in such a way that the user experience is enhanced while functionality and simplicity are maintained.



Appendices

- (a) Scenario drafts
- (b) Interviews
- (c) User Requirements Prioritisation
- (d) Context of Use
- (e) Branding ideas
- (f) Lo-fi prototypes
- (g) Hierarchical Task Analysis
- (h) Layout analysis
- (i) KLM
- (j) Meeting Minutes & Meeting Gantt Charts



First Draft Scenario's (a)

Aristotle O'G. Yam-Yam

Time: 10:00 a.m.

Aristotle is travelling from Nottingham to Birmingham to speak at a design conference. Shortly after departing, he gets a call from a colleague, who tells him that he has made some last-minute changes to their presentation slides and wishes to discuss the changes with him.

Because the conference is at noon, there would not be much time for discussion once Aristotle reaches Birmingham. Aristotle and his partner have a remote discussion over Skype while looking through the changes made to the slides.

Time: 7:00 p.m.

After a long day at the conference, Aristotle calls it a day and heads back to his hotel which is about half an hour away. Due to bad weather, the highway back is congested and his ride back is estimated to take at least 2 hours. Having some time to kill, Aristotle decides to update his Twitter account by tweeting about his conference. Following which, he decides to browse through the media saved in the entertainment system before settling to watch a movie. Aristotle loves to “mix and match his inputs” - his way of saying that he likes to take in information from many sources at once. He thinks that working like this is the best way to be inspired and have the kinds of ideas that no one else is having!

Genevieve Forbes-Smythe

Time: 8:00 a.m.

The next day, Genevieve repeats her morning routine again. Since there was not much movement in the financial markets today, she decides to

read up on the latest news and current affairs. She has a spark of inspiration and decides to draw up the plans for re-engineering one of her firm’s divisions.

Time: 7:00 p.m.

Genevieve leaves work after a busy day at Painless Pay but still needs to send a few emails to important clients before tomorrow’s meeting. Having adjusted the temperature inside the chauffeured vehicle to her liking, she composes the emails while listening to music.

(Narrative)

Genevieve is the finance director of the start-up company Painless Pay. She regularly takes chauffeur-driven vehicles to and from work as well as to other important meetings in the heart of London. She often sends emails during these journeys to maximise her work efficiency. If she has spare time when travelling, she likes to keep up to date with the latest developments in the financial world by browsing news sites on the internet, which she currently does using the 4G connection on her mobile phone. She is interested in using new technology to increase both the company’s and her productivity. While it is easy for her to learn new software, she finds it frustrating to use inefficient user interfaces.

Interview with

Prof. Gary

Burnett (b)

Feelings & Choices:-
(With 5 being High priority)

Connectivity: 5

Security: 5

GUIs: 4

Screen layout control: 4

Music and video: 5

Maps etc: 5

Climate control: 4

Voice assistant: 3 [“These are still low-quality” - Prof. Burnett]

Current role: 18 months as full Professor (lecturer since the year 2000).

Work-related car journeys: 2-4 hours; usually to Heathrow airport for conferences and consultancy projects; once every 2 months, approximately.

Experience of working on a car journey: uses email; makes calls; makes notes about scheduling, tasks-to-do and presentations (on paper); notes that too much intense work leads to sickness, so preferred working method consists of light project work, short interactions with people or screens, watching films and YouTube content related to work.

How do you think you might use the kind of in-car infotainment system we are proposing?

- Navigation interface - similar to the trackers found in commercial airlines - would be useful, particularly if the passenger is cut off from the driver by a screen, distance or both.
- Climate control: it would be useful if this is separate from the driver's system, especially if the driver is separated.
- A link to the user's phone, Wi-Fi and headphones (or some other form of privacy) for music are desirable.
- He asks us to consider how these facilities are affected if there is more than one passenger.
- Generally, it is good to be able to interleave work and entertainment tasks.

Good and bad experiences: flight entertainment systems often have poor, slow touchscreens.

Preferred connection types: likes both USB (for Apple devices) and Bluetooth (for other phones).

The feelings and emotions experienced in these situations: Stress, over being late for appointments, plane flights etc. Therefore, mitigating delay via the phone or in-car platform would be good - to include flight updates, traffic information, for example.

Touchscreens: Hygiene should be considered.

Screen size: both personal experience and research suggest that sickness and screen size are related, perhaps in proportion: the larger the screen, the greater the feeling of sickness.

Conventional screen controls for colours, contrast, brightness etc. Yes, these would be useful.

Final comments: develop a model for informative maps, with a range of features. Note that distraction is not an issue when working in the back of a car: users will find ways to become absorbed in their activities, perhaps unconsciously.

Interview with

Dr. Rowland

Travis(b)

Feelings & Choices:-

(With 5 being High priority)

- **Connectivity** - 4 (Useful, not essential)
- **Security** - 4 (Student information. Hiring Information.)
- **GUI** - 3 (If not easy to use would not use it)
- **Screen Layout** - 2 (Depends on programs available)
- **Media** - 3 (Noise cancelling headphones)
- **Maps Etc** - 4 (Uses on phone already. Driver's sat nav used. Would use it too if it were available to see rerouting/journey issues.)
- **Climate Control** - 3 (Driver asks the passenger how they want it. Has been too cold, so it would be nice to have control.)
- **Voice Assistant** - 2 (Driver necessary, maybe not as a passenger)
- **Clicks** - 5
- **Pinch** - 4
- **Swipe** - 4
- **Rocker-Switches** - 4 (Fine)
- **Dials** - 4 (Volume Control)
- **Dial with clicks** - 5 (More feedback given)
- **Joystick** - 1 (Never used)
- **Buttons** - 4 (Volume on steering wheel is used by him)
- **Simple Switches** - 4

Current Role - Associate Professor (8 months)

Time Spent In Role Per Week - 40-60 hours

Average Duration Of Work Related Car Journeys - (2-4) hours.

Experience of Work Day when Car Travel is Required - Motorway/Laptop Used.

How Might You Use An In-car Infotainment System - Currently downloads stuff before taking a journey. Sends emails etc after journey is finished. No branded devices used. iPad used to watch rugby matches. Uses 4 door car high end Mercedes/VW Passat.

Can You Tell Us About a Particular Experience You Have Had With in-car technology -

Talkative drivers - distracting from work. Not always wanting to work in the car. Likes continuity of service/provider. Uses the same provider. Will pay more for something you know is good.

How do you prefer to connect between devices? - Wireless. No cables.

What is important to you when working on the move and why? - Not to be disturbed. Smooth car motion. Only works on motorway as a general rule due to motion sickness. Phone calls anytime - often lots of phone calls during these journeys.

How do you 'feel' in these situations and what emotions you might experience - "Work Mode". Sad to be leaving my family. Happy to come back. Always feels stressed - productive stressed.

What are you aiming to achieve when working in the car in a situation like the ones we have discussed? - Complete work. Use the time usefully. Emails are often done here. Motion makes high mental workload tasks difficult. Allows space to say thank you to people/see things fresh. Need all of these things to interact efficiently. Adequate feedback to UI is really needed on a digital screen.

Screen Size Preference - Tablet or bigger. Struggles to see text on a phone. Text size options?

Would you value conventional screen controls (colour, brightness, contrast etc.) and would you like them on screen or as hard buttons? - Yes and HARD BUTTONS but can see trend is to have less buttons.

Hard Button Interface - Ease of use. QWERTY Keyboard (Useful if folded out) Doesn't want more clutter/cables. Awkward to use a tablet but doesn't want extra stuff.

Mouse - Touch screen instead? Laptop tray would be useful - then he would use a keyboard and mouse. Less clutter better

User Requirements Prioritisation - MoSCoW (c)

Must Have	Should Have
Email (ID #1)	Access to Financial & Market Information (ID #4)
Phone Calling (ID #2)	Access to Shared Business Files (ID #5)
Document Management (ID #3)	Screen-Mirroring (ID #12)
GPS and Journey Information (ID #6)	Automatic Brightness Adjustment (ID #15)
Climate Control (ID #7)	Premium Appearance (ID #16)
Web Access (ID #8)	Ease of Remembering (ID #17)
External Device Connectivity (ID #9)	Efficiency of Use (ID #18)
Touch Screen Display (ID #10)	Personalisation (ID #20)
Audio Output (ID #11)	Low Response Time (ID #21)
Data Storage (ID #14)	Reliability (ID #24)
Feedback (ID #19)	Low Mental Workload (ID #25)
Software Security (ID #22)	Reduced Motion Sickness (ID #26)
Safety (ID #23)	
Device Placement (ID #28)	

Could Have	Won't Have
Voice Control (ID #13)	
Matching Exterior and Interior (ID #27)	

Must Have – Must have this attribute or feature in order for the solution to be considered a success.

Should Have – Should have this attribute or feature. High priority that should be included in the solution if possible.

Could Have – Could have this attribute or feature; less critical, “nice to have”.

Won't Have – Won't have; least critical, lowest value, or “would like to have in the future”.

Context of Use- Users (d)

Primary Users

- Business Executives

Secondary Users

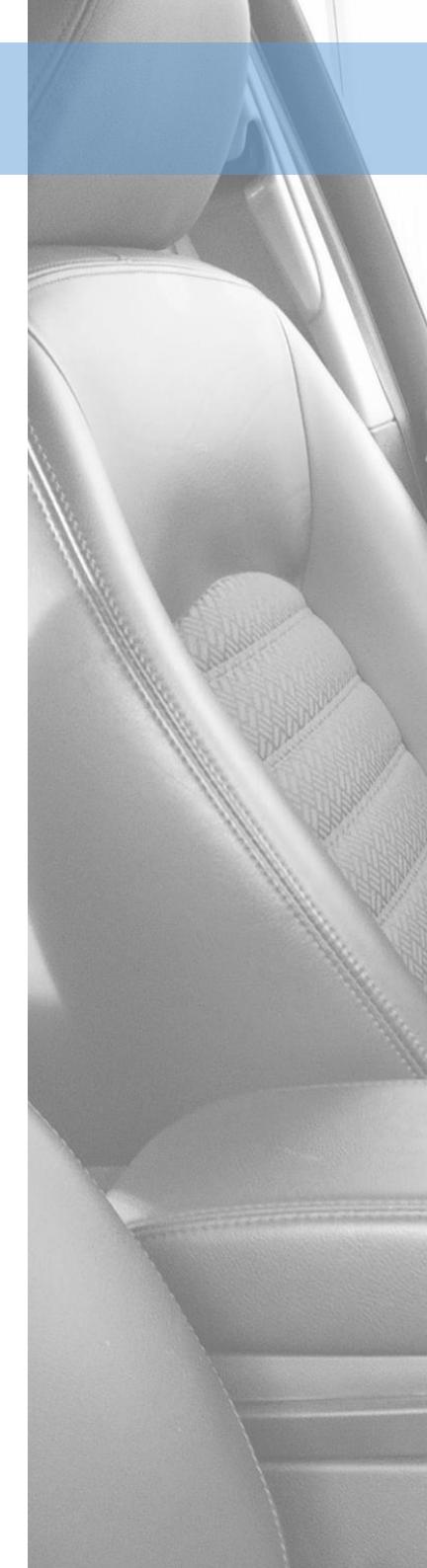
- Passengers
- PA Assistant
- IT Personnel

Other Stakeholders

- N/A

Users and main task goals

Primary users	Main task goals
Business Executives	<ul style="list-style-type: none">➤ Access to communication (email etc)➤ Media consumption➤ Journey related information➤ In car climate control and comfort➤ Work related tools (office suite etc)
Secondary users	Main task goals
PA Executive	<ul style="list-style-type: none">➤ Workflow management➤ Maintaining Information accuracy➤ Troubleshooting➤ Scheduling
IT Support	<ul style="list-style-type: none">➤ Troubleshooting➤ Project management➤ On call



Context of Use- Users (d)

Context of Use	Affects Usability?	User Requirements	Test conditions
USERS			
User type			
Name of type Business Executive	Maybe Medium	-	<i>Use business executives to evaluate the system</i>
User role <i>Interact with the car's infotainment system in an meaningful (work) and engaging (luxury) way</i>	Yes High	-	<i>Specify tasks that the system should perform and rate the overall satisfaction when using it (user-driven)</i>
Experience with system <i>It varies from minimal/occasional to extended or everyday use</i>	Maybe Medium	-	Comment <i>(The system should be clear enough to use and navigate even for noobs)</i>
Experience with similar systems <i>Some users might have used similar infotainment systems (The use of a infotainment plane system might be considered; Gary's suggestion)</i>	Yes Medium	<i>Try to make the system in line with both industry standards for infotainment systems as well as with ISO HCI standards. (Maybe provide some form of introductory content for new users)</i>	<i>Check how much time participants need to familiarize and comfortably use the system</i>
Task knowledge <i>Most probably all users will be experienced in interacting with a multi-touch multimedia screen (although type software might play a role).</i>	Yes Medium	<i>Examine similar infotainment systems and what types of functionality they provide</i>	<i>Include users with limited experience/knowledge of how these systems work</i>



Context of Use- Users (d)

USERS - Experience / Knowledge (continued)

Organisational knowledge <i>Does not apply</i>	-	-	-
Level of training <i>None. Although some users might receive a short briefing when using it for the first time</i>	Yes Low	-	<i>There is no need for any test.</i>
Input device training <i>Users will interact with the system via a touchscreen, some physical hard buttons as well as an input devices (keyboard, trackpad, etc) but there is no need for specific training.</i>	Yes Low	<i>Maybe consider a speech user interface for users with impairments</i>	-
Qualifications <i>Users might have various levels of qualifications although the majority of business executives will hold a university degree. (source)</i>	Yes Low	<i>Make sure that the device is usable regardless of qualifications</i>	<i>Maybe include some users with no/few qualifications</i>
Language skills <i>English will be the main language of the system. The system, nevertheless, should have options for other languages to accommodate visiting executives.</i>	Maybe Medium	<i>Apart from English, use 6-8 other languages for the system.</i>	<i>Include some users for whom English is not the first language</i>



Context of Use- Users (d)

USERS (continued)

Personal attributes

Age The average age of a CEO or C-Suite is around 50 with the youngest ones being 30 and the oldest being 65 or over (source)	Yes Medium	Maybe accommodate the needs of older users	Include different age groups when testing the system. (30-39/ 40-40/ 50-59/ 60+)
Gender Despite the numbers suggesting that 25% of senior executive positions are being held by women (source) the system should be designed regardless of gender/sex.	Maybe Low	-	Make sure we get an even balance of males and females
Physical capabilities and limitations Users with visual, hearing, speech impairments might use the system	Yes High	Include in the system accessibility options (Check iOS and macOS from Apple)	Make sure we include users with physical impairments in testing
Cognitive capabilities Users with cognitive impairments are less likely to use this system (although possible)	Maybe Low	Include in the system accessibility options (Check iOS and macOS from Apple)	Possibly include users with cognitive impairments in testing
Attitude and motivation Users will most probably be motivated to use and interact with the system	No Low	-	-



Context of Use- Tasks (d)

Context of Use	Affects Usability?	User Requirements	Test conditions
TASKS			
Task characteristics			
Task name <i>Access journey related information</i>	-	-	-
Task goal or output <i>To access journey related information such as maps with a start and a destination mark, journey time, weather and traffic info, and/or other info of interest (sites etc)</i>	Yes High	-	Create a basis for checking this task
Task breakdown <i>Step 1: Screen activates when rear passenger sits Step 2: Select the maps icon (either by pressing the screen or voice command) Step 3: Journey information will be displayed on the screen based on the driver's input Step 4: User has the ability to navigate through the apps map by swiping and access other information such as weather, traffic and important sites Step 5: User also has the ability to input a different routes in the maps app Step 6: Upon arrival user doesn't have to exit the application. It will happen automatically.</i>	Yes High	<ul style="list-style-type: none"> -Range of multi touch functions (pinch, zoom, swipe etc) -Different ways to display the maps (satellite, terrain etc) -Important sites in the route -Speed indication -Weather indication -Live traffic information -Live journey duration 	User testing



Context of Use- Tasks (d)

TASKS - Task characteristics (continued)			
Task frequency <i>Variable. Depends on user</i>	No	-	-
Task duration <i>Variable. Depends on users intentions of accessing journey related information, but it's unlikely to be more than a few minutes</i>	Maybe Medium	-	Maybe check its usage for an extended period of time
Task flexibility	-	-	-
Task dependencies <i>Reliable internet connection (WLAN) with the main board on the car and active GPS</i>	Yes High	-	Some routes/maps can be stored locally to allow partial functionality of the system
Physical / Cognitive demands <i>There are no particular Physical / Cognitive demands</i>	-	-	-
Risk resulting from error <i>Not establishing an internet connection or GPS signal might cause issues</i>	Yes Medium	-	Download maps on device
Safety critical demands <i>There are no particular hazards or risks to safety</i>	-	-	-



Context of Use- Tasks (d)

Context of Use	Affects Usability?	User Requirements	Test conditions
TASKS			
Task characteristics			
Task name <i>Web access</i>	-	-	-
Task goal or output <i>Accessing the web using a browser application (existing or proprietary)</i>	Yes High	-	<i>Create a basis for checking this task</i>
Task breakdown <i>Step 1: Screen activates when rear passenger sits Step 2: Select the browser icon (either by pressing the screen or voice command) Step 3: User can enter his credential upon first time using the system and log in to view bookmarks or other saved websites. Step 4: User has the ability to navigate through the browser by using the multitouch screen or a handheld device Step 5: User also has the ability to input information by using the multitouch screen or a handheld device Step 6: Upon arrival user doesn't have to exit the application. It will happen automatically. - Browser can be an established one (Chrome, Safari etc) or a proprietary developed specifically for the system</i>	Yes High	<ul style="list-style-type: none">-Range of multi touch functions (pinch, zoom, swipe etc)-Access the web<ul style="list-style-type: none">-Saving login credentials-Saving bookmarks and websites-Multi-tab functionality-Security functions (deactivate trackers etc)-Download manager-Ability to add extensions	<i>User testing</i>



Context of Use- Tasks (d)

TASKS - Task characteristics (continued)			
Task frequency <i>Variable. Depends on user</i>	No	-	-
Task duration <i>Variable. It can range from a few minutes to the entire journey</i>	Maybe Medium	-	-
Task flexibility	-	-	-
Task dependencies <i>Reliable internet connection (WLAN) with the main board on the car</i>	Yes High		<i>Use mobile data instead</i>
Physical / Cognitive demands <i>There are no particular Physical / Cognitive demands</i>	-	-	-
Risk resulting from error <i>Not establishing an internet connection.</i>	Yes Medium		<i>Use mobile data</i>
Safety critical demands <i>There are no particular hazards or risks to safety</i>	-	-	-



Context of Use- Tasks (d)

Context of Use	Affects Usability?	User Requirements	Test conditions
TASKS			
Task characteristics			
Task name <i>Climate Control</i>	-	-	-
Task goal or output <i>Accessing and adjusting in car climate control for rear passengers</i>	Yes High	-	<i>Create a basis for checking this task</i>
Task breakdown <i>Step 1: Screen activates when rear passenger sits Step 2: Select the climate control icon (either by pressing the screen or voice command) Step 3: Climate control interface allows for related adjustments regarding temperature, air source, air delivery as well as save settings and automatic mode Step 4: User has the ability to navigate through the climate app by using the multitouch screen or a handheld device Step 5: User also has the ability to input information by using the multitouch screen or a handheld device Step 6: Upon arrival user doesn't have to exit the application. It will happen automatically.</i>	Yes High	<ul style="list-style-type: none"> -Range of multi touch functions (pinch, zoom, swipe etc) -Control via handheld device -Presents and auto mode -Seat specific settings -Controlling rear windows -Controlling rear lights 	<i>User testing</i>



Context of Use- Tasks (d)

TASKS - Task characteristics (continued)			
Task frequency <i>Variable. Depends on user</i>	No	-	-
Task duration <i>Variable. It can range from none (auto mode) to a few minutes.</i>	Maybe Medium	-	-
Task flexibility	-	-	-
Task dependencies <i>Key fob needs to be inserted</i>	Yes High		<i>Make sure key fob is inserted!</i>
Physical / Cognitive demands <i>There are no particular Physical / Cognitive demands</i>	-	-	-
Risk resulting from error	-	-	-
Safety critical demands <i>There are no particular hazards or risks to safety</i>	-	-	-



Context of Use- Physical Environment

(d)

Context of Use	Affects Usability?	User Requirements	Test conditions
PHYSICAL ENVIRONMENT			
Workplace conditions			
Atmospheric conditions <i>In car environment</i>	-	-	-
Auditory environment <i>In car environment. Outside noise cancelation should be adequate</i>	-	-	-
Thermal environment <i>In car environment. Fully adjustable</i>	-	-	-
Visual environment <i>In car environment</i>	-	-	-
Environmental instability None	-	-	-



Context of Use- Physical Environment

(d)

Context of Use	Affects Usability?	User Requirements	Test conditions
PHYSICAL ENVIRONMENT			
Workplace design			
Safety critical demands <i>There are no particular hazards or risks to safety</i>	-	-	-
User posture <i>User will either be seated on the back and interacting via a handheld device or bending forward to interact with the touchscreen</i>	Yes / High	-	<i>System should be equally function with touchscreen as well as with handheld device</i>
Location <i>City Road - Motorway</i>			
Health and Safety			
Health hazards <i>None</i>	-	-	-
Protective clothing and equipment <i>None</i>	-	-	-



Context of Use- Physical Environment

(d)

Context of Use	Affects Usability?	User Requirements	Test conditions
ORGANISATIONAL / SOCIAL ENVIRONMENT			
Structure Group working <i>Rear passengers might want to interact with the systems</i>	Yes High	-	<i>Allow for screen sharing or split screen functionality</i>
Assistance <i>Possible assistance from company IT</i>	Yes Medium	-	<i>Check trouble shooting with no assistance</i>
Interruptions <i>None</i>	-	-	-
Communications structure	-	-	-
Pacing <i>Of interactions, due to time pressures?</i>	-	-	-
Discretion <i>Connectivity for use of external devices such as headphones.</i>	Yes Medium	<i>Allow rear screens to be used separately</i>	-



Branding Ideas (e)

Brand Name Ideas

- Novus- Latin for innovation
- Spark
- Spectrum
- Gusto
- Shoreline
- Utopiz

Font Ideas

NOVUS novus

NOVUS novus

NOVUS novus

NOVUS novus

NOVUS novus

NOVUS novus

NOVUS NOVUS

NOVUS NOVUS

NOVUS NOVUS

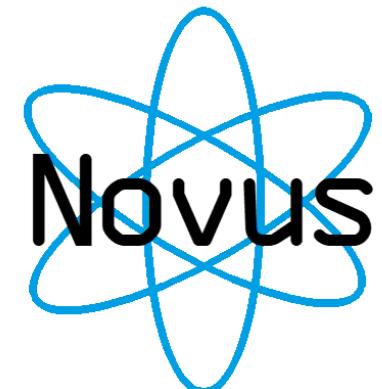
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Logo Ideas

NOVUS



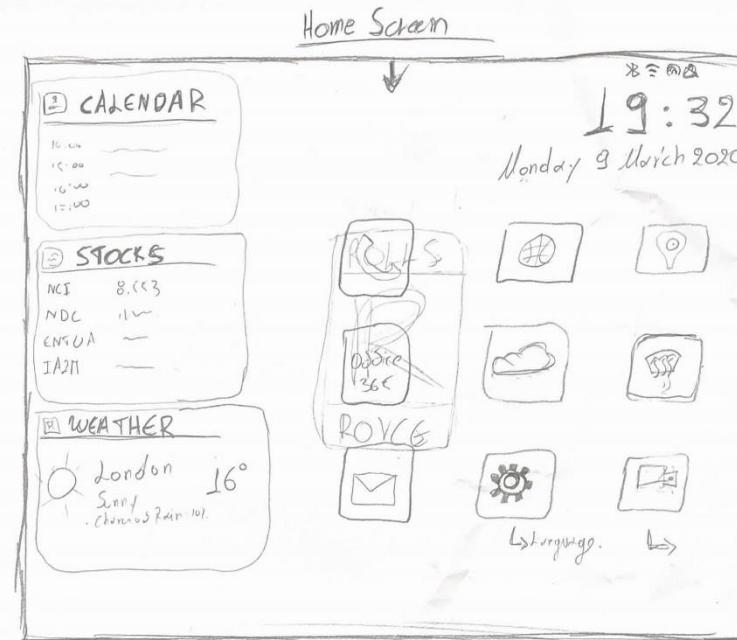
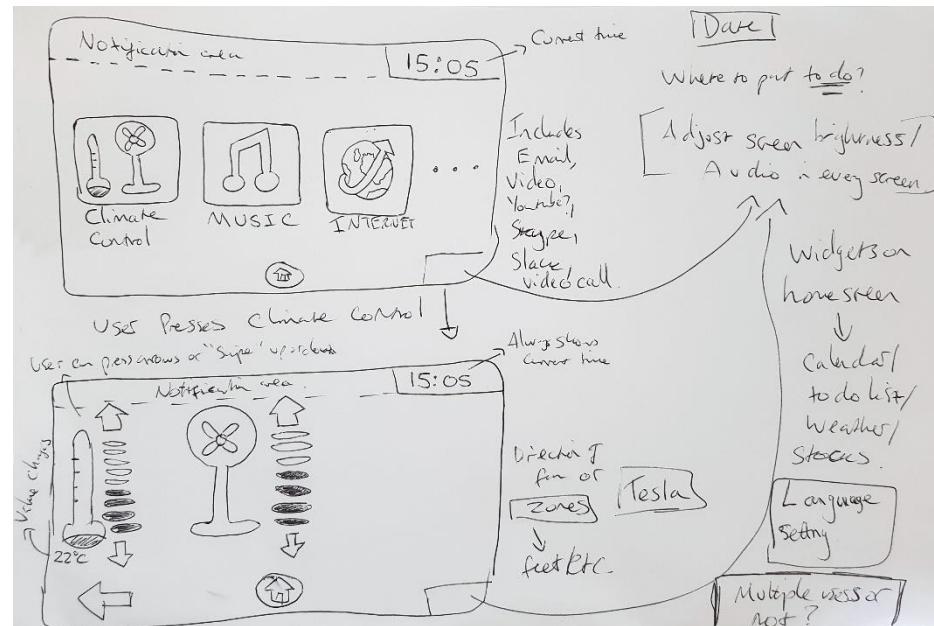
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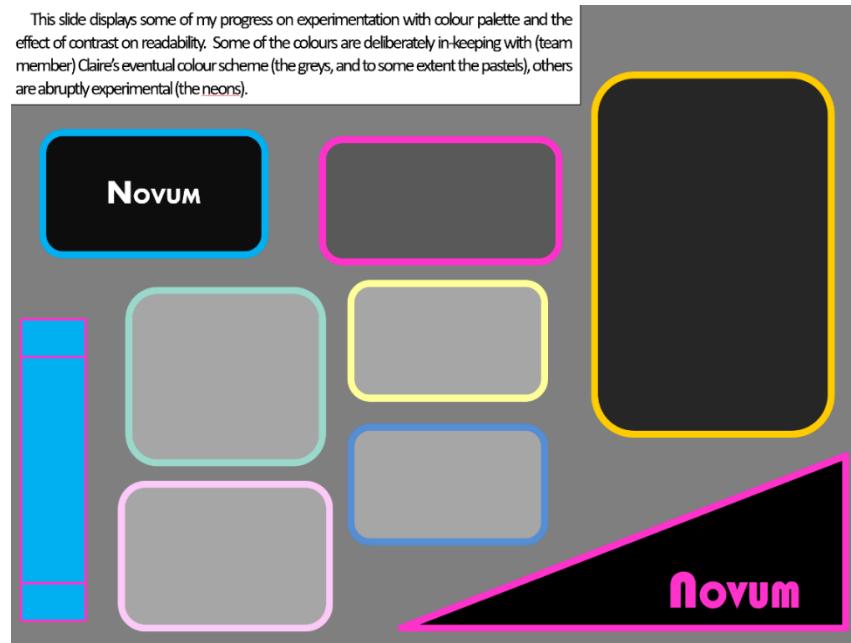


Lo-Fi Interface Prototyping- Experimentation (f)

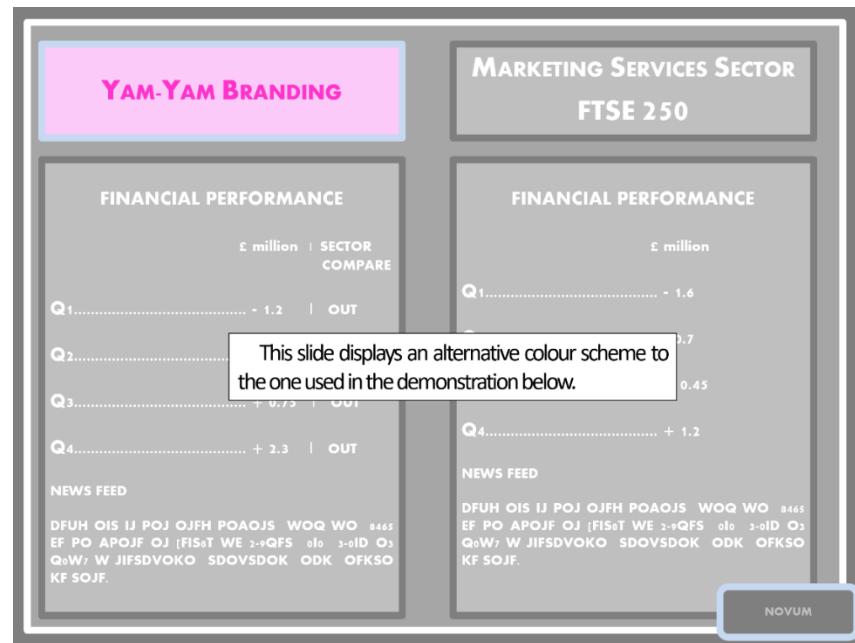
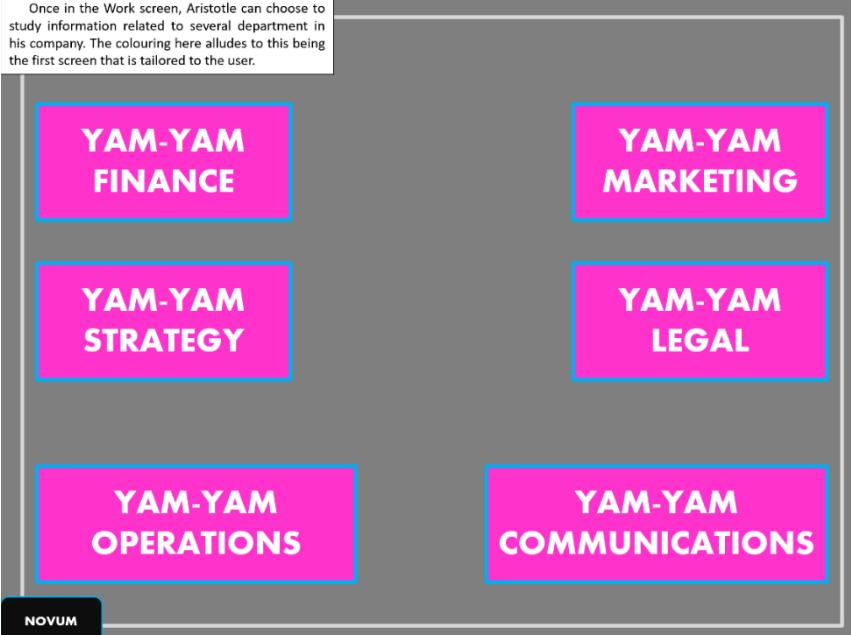


Lo-Fi Interface Prototyping- Experimentation (f)

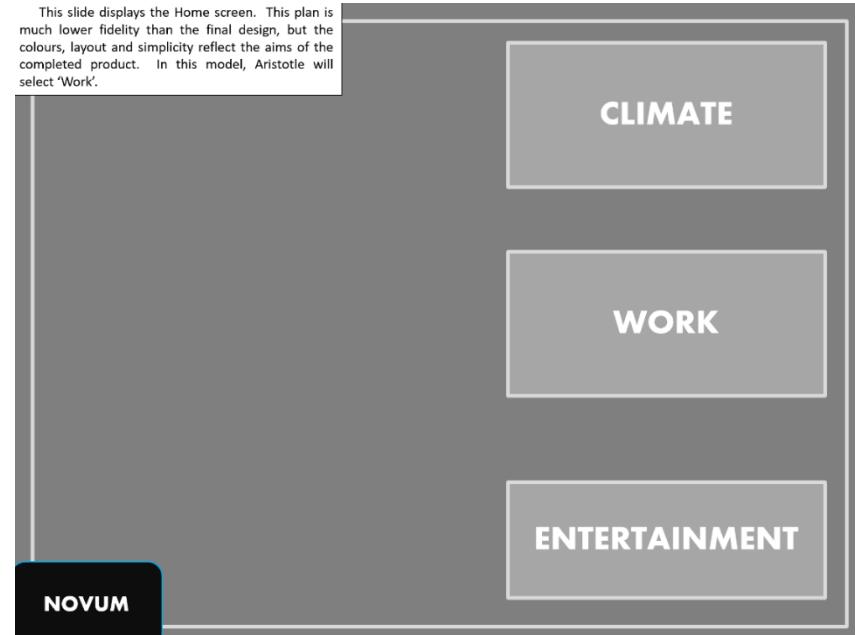
This slide displays some of my progress on experimentation with colour palette and the effect of contrast on readability. Some of the colours are deliberately in-keeping with (team member) Claire's eventual colour scheme (the greys, and to some extent the pastels), others are abruptly experimental (the neons).



Once in the Work screen, Aristotle can choose to study information related to several department in his company. The colouring here alludes to this being the first screen that is tailored to the user.

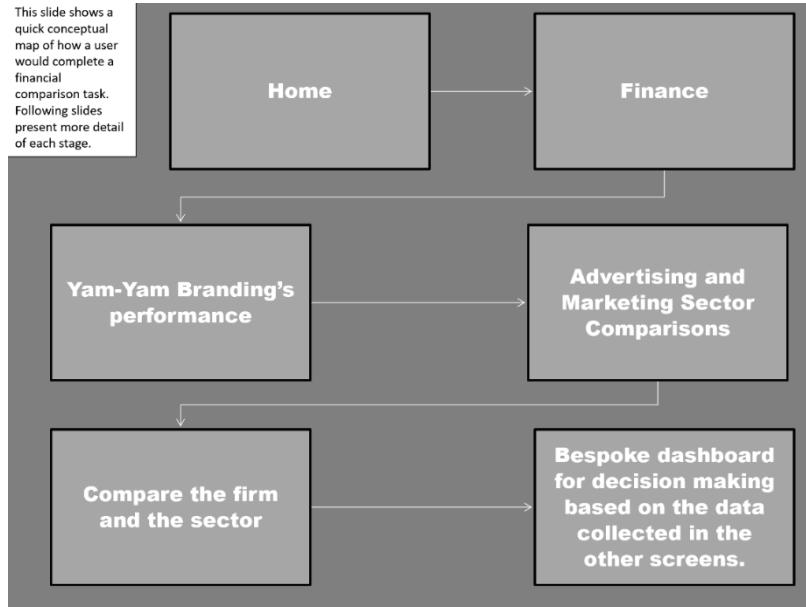


This slide displays the Home screen. This plan is much lower fidelity than the final design, but the colours, layout and simplicity reflect the aims of the completed product. In this model, Aristotle will select 'Work'.



Lo-Fi Interface Prototyping- Experimentation (f)

This slide shows a quick conceptual map of how a user would complete a financial comparison task. Following slides present more detail of each stage.



YAM-YAM BRANDING'S FINANCES

CITY'S PROJECTIONS

BarCap.....	££££
Goldman.....	££££

QUARTERLY RESULTS

£ million | SECTOR COMPARE

Q1.....	- 1.2	OUTPERF
Q2.....	- 0.5	OUTPERF
Q3.....	+ 0.75	OUTPERF
Q4.....	+ 2.3	OUTPERF

NEWS FEED

- REUTERS | Yam-Yam Branding today published sector-leading results that pleased The City...
- CITY AM | Yam-Yam Says "Yum-Yum" to a New Dawn in Image and Communications...
- FT | Ringing the opening bell at the NYSE yesterday, controversial 'digital prophet' Aristotle Yam-Yam boldly predicted his firm's coming control of...
- WALL STREET JOURNAL | Aristotle's New Logic Defies Classification...

Having selected Yam-Yam Finance, Aristotle can examine the latest reporting from the firm or its representatives in The City of London. There is also a News Feed to inform him of how industry and commerce are reacting to his company's performance.

Novum

MARKETING SERVICES SECTOR | FTSE 250

SECTOR FINANCIAL PERFORMANCE

£ million Year-on-year

Q1.....	- 1.6	+ 3%
Q2.....	- 0.7	- 4%
Q3.....	+ 0.45	- 1.5%
Q4.....	+ 1.2	- 0.6%

NEWS FEED

- REUTERS | Global marketing budgets continue to...
- CITY AM | Bunker-busting ad campaigns are no salve for the rip tide of...
- FT | All Fail The Emperor's New Clothe...
- WALL STREET JOURNAL | 'Safe' Consumer Goods Protect US Ad Spend...

Alternatively, Aristotle can examine the progress of the sector in which his firm sits.

Novum

YAM-YAM BRANDING

MARKETING SERVICES SECTOR FTSE 250

FINANCIAL PERFORMANCE

£ million | SECTOR COMPARE

Q1.....	- 1.2	OUT
Q2.....	- 0.5	OUT
Q3.....	+ 0.75	OUT
Q4.....	+ 2.3	OUT

NEWS FEED

- REUTERS | Yam-Yam Branding today published sector-leading results that pleased The City...
- CITY AM | Yam-Yam Says "Yum-Yum" to a New Dawn in Image and Communications...
- FT | Ringing the opening bell at the NYSE yesterday, controversial 'digital prophet' Aristotle Yam-Yam boldly predicted his firm's coming control of...
- WALL STREET JOURNAL | Aristotle's New Logic Defies Classification...

Aristotle can then choose the kind of data he wishes to use to compare his company with the rest of the sector. He can use this information to make a decision.

Novum



Lo-Fi Interface Prototyping- Experimentation (f)

Email

To: firstname.lastname@example.com

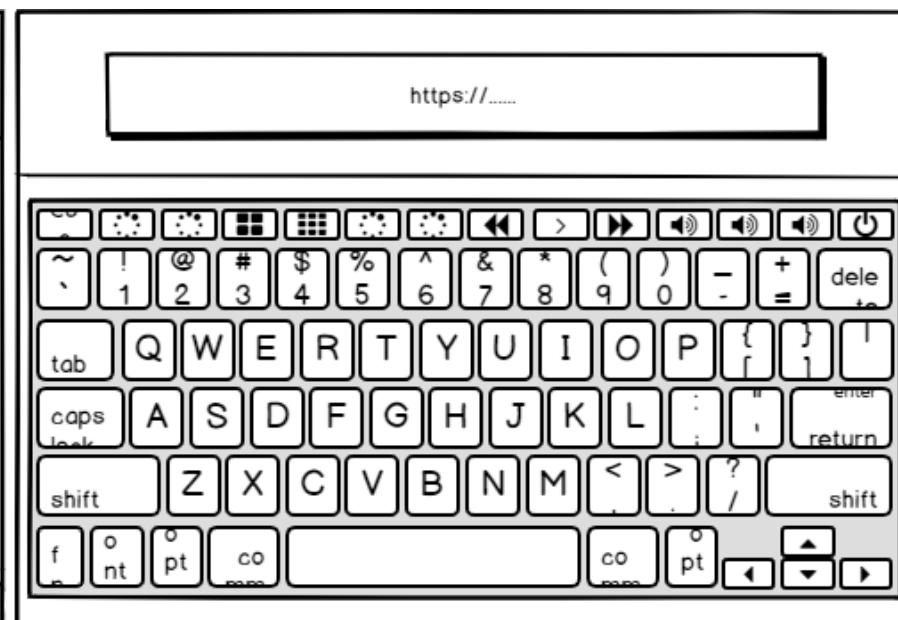
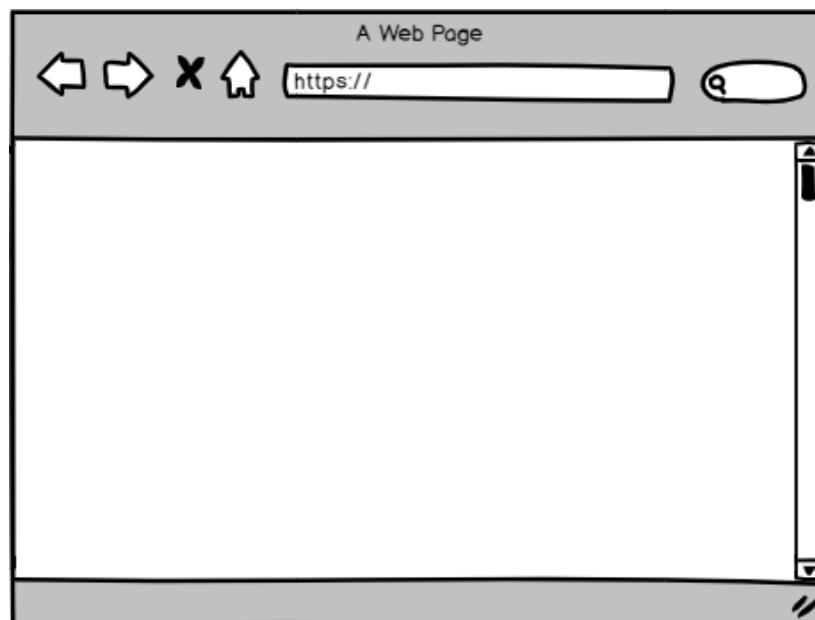
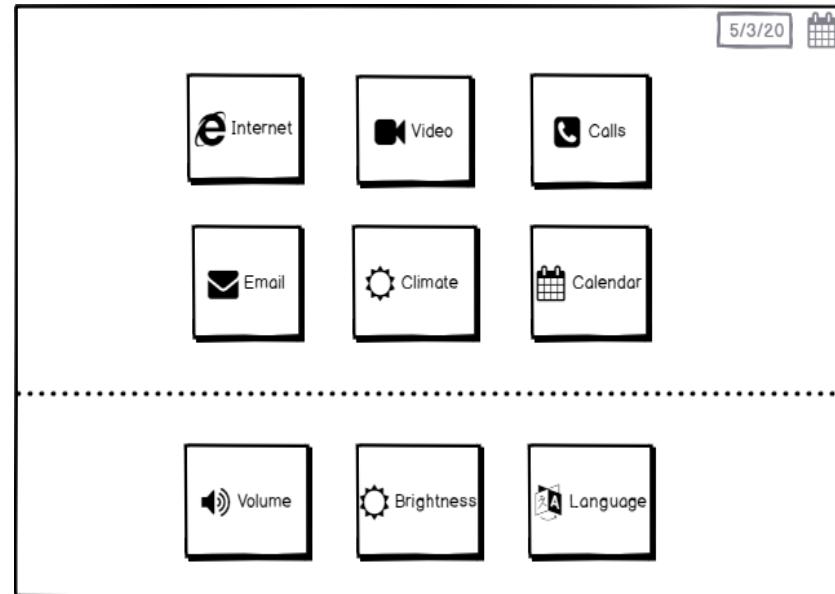
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BCC:

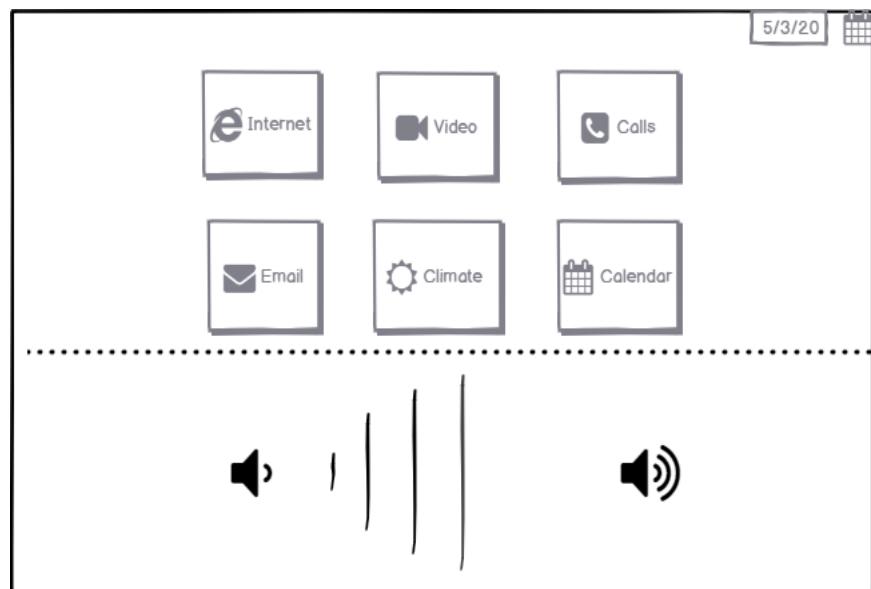
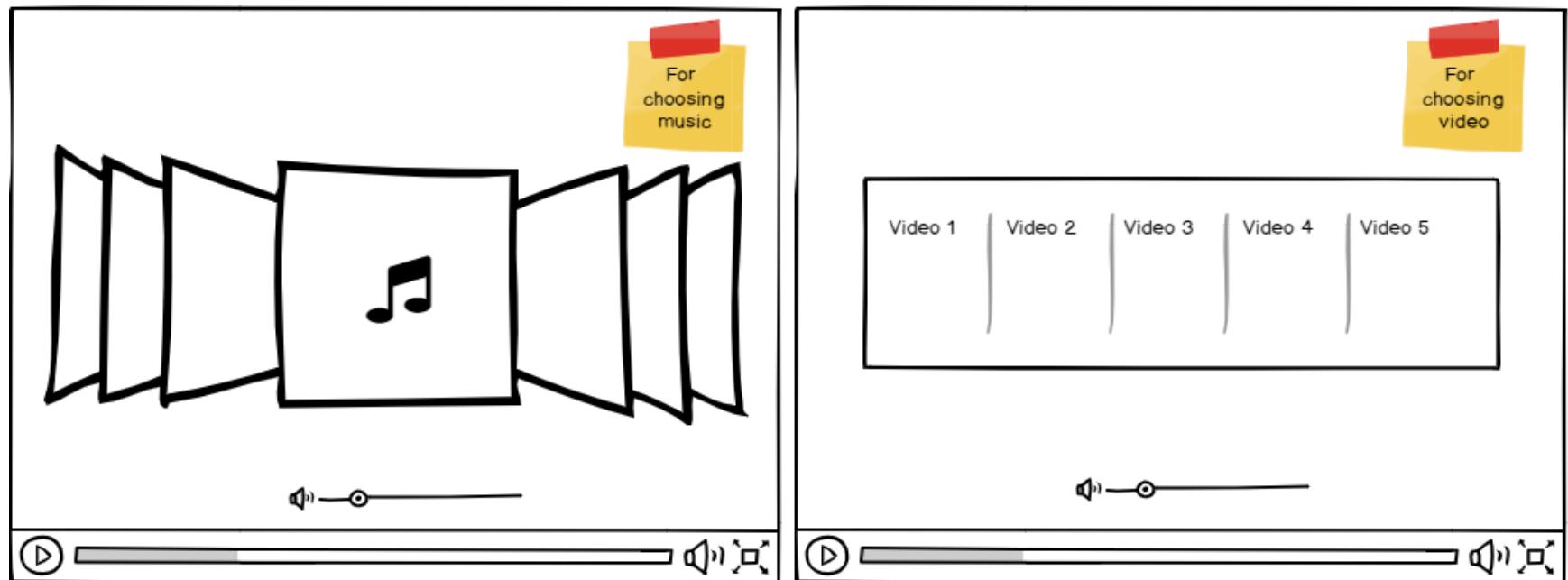
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I

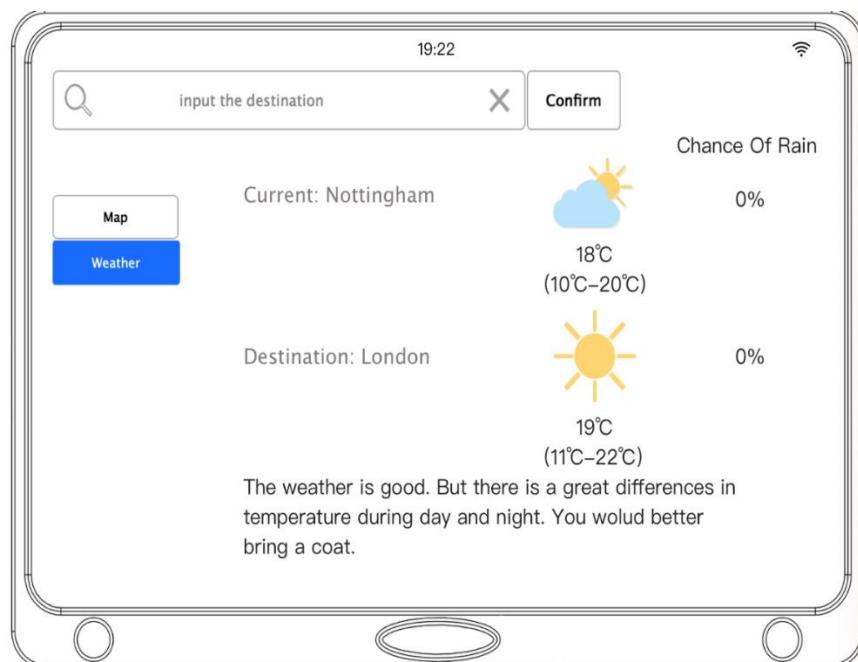
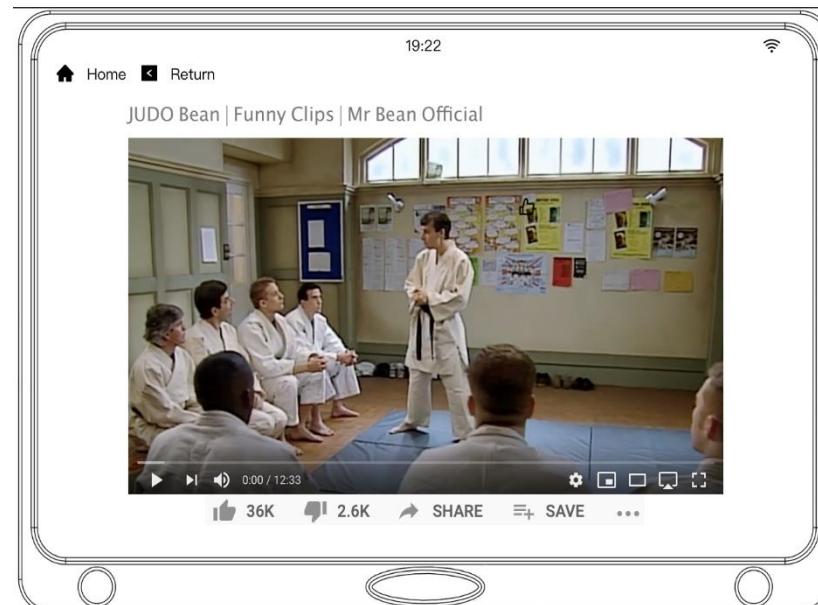
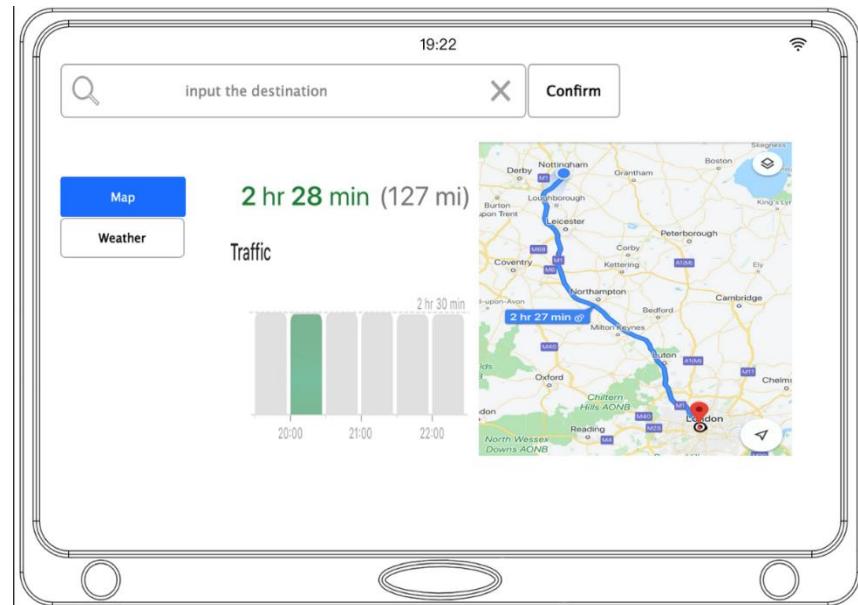
Text area for message content.



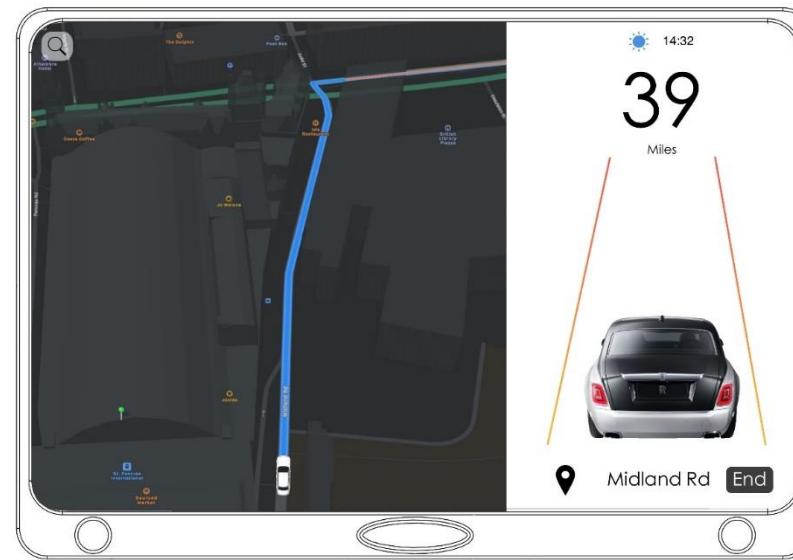
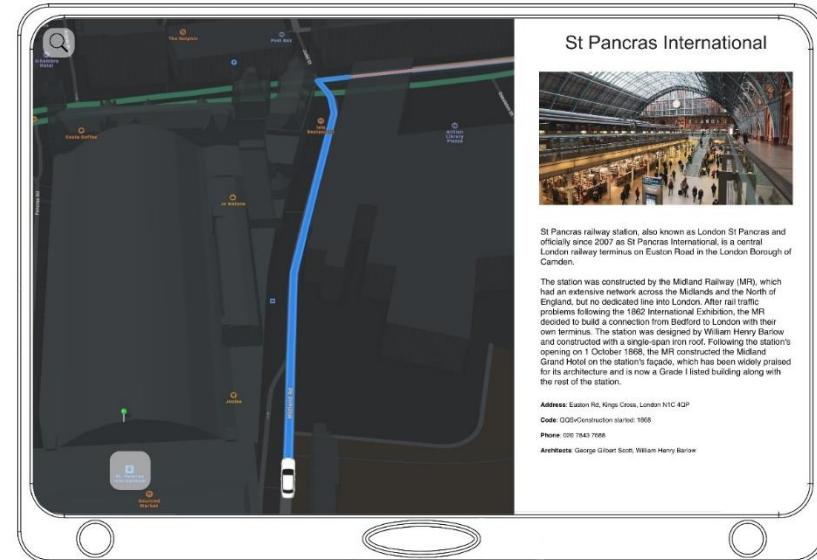
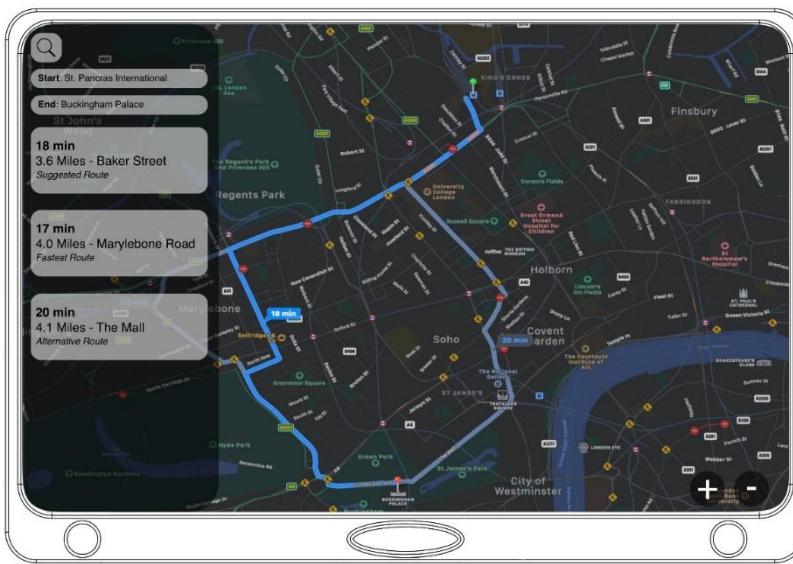
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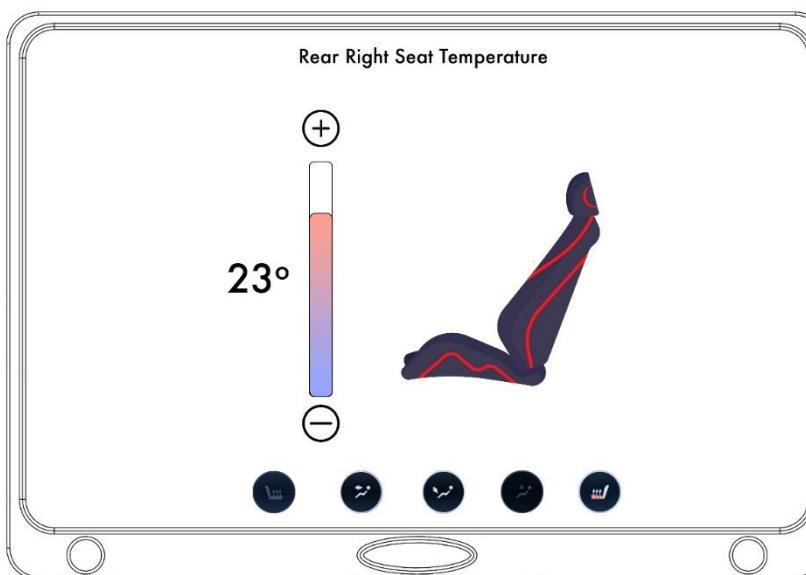
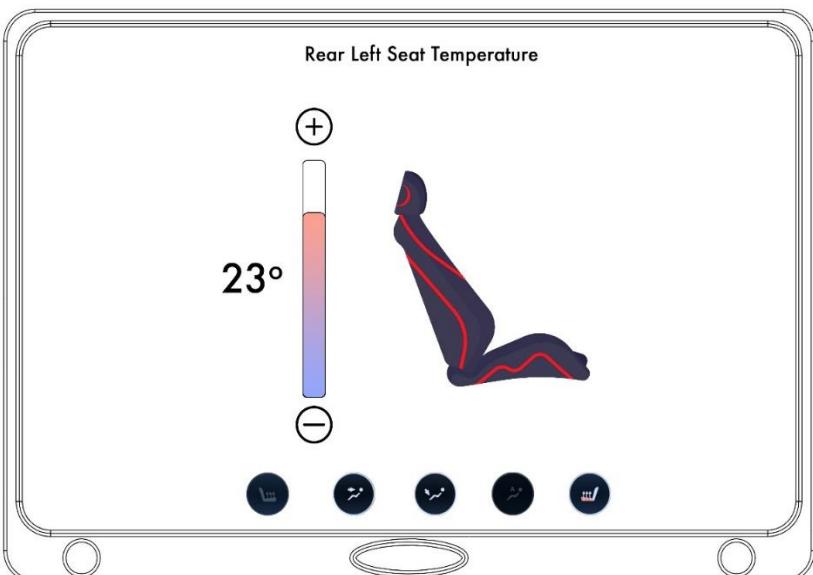
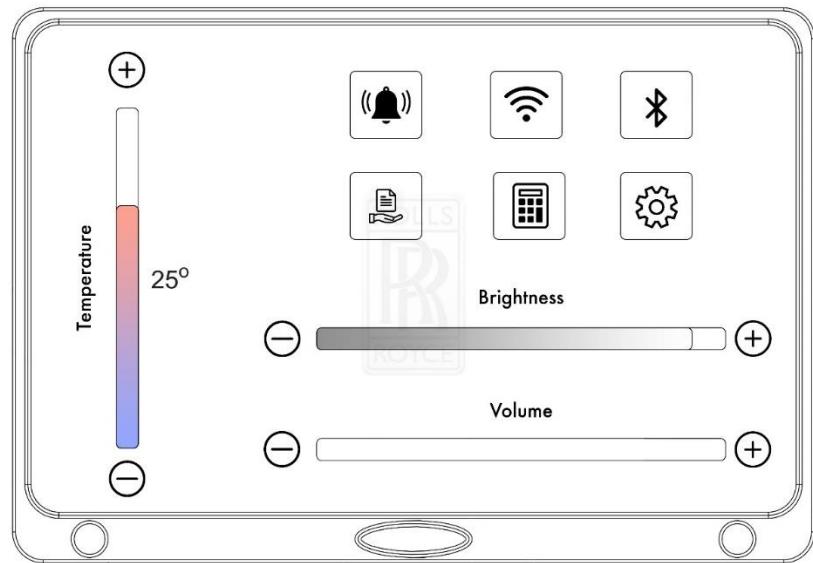
Lo-Fi Interface Prototyping- Experimentation (f)



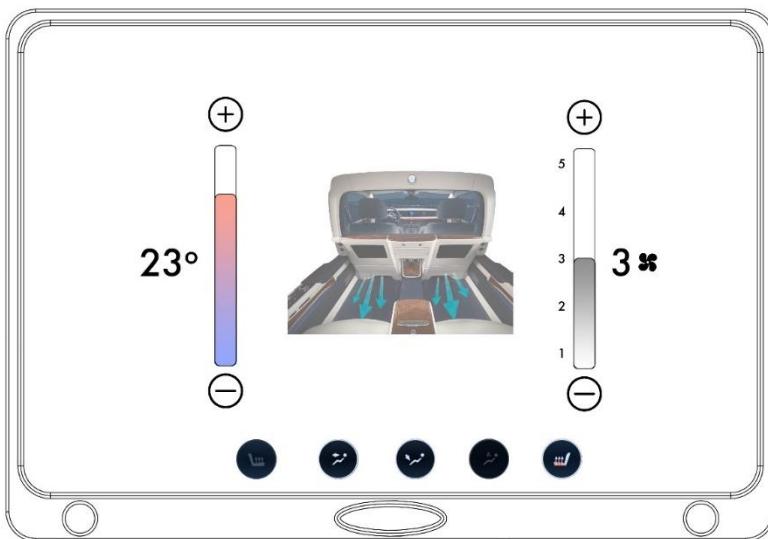
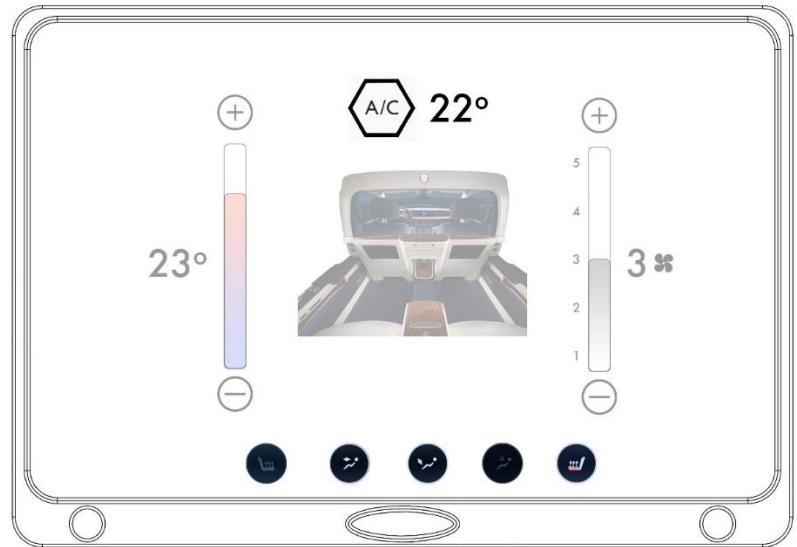
Lo-Fi Interface Prototyping- Experimentation (f)



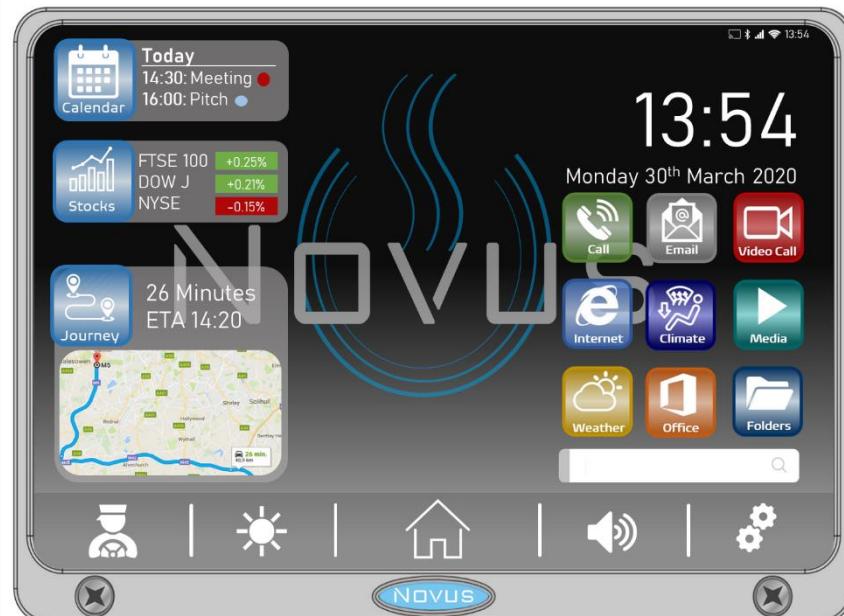
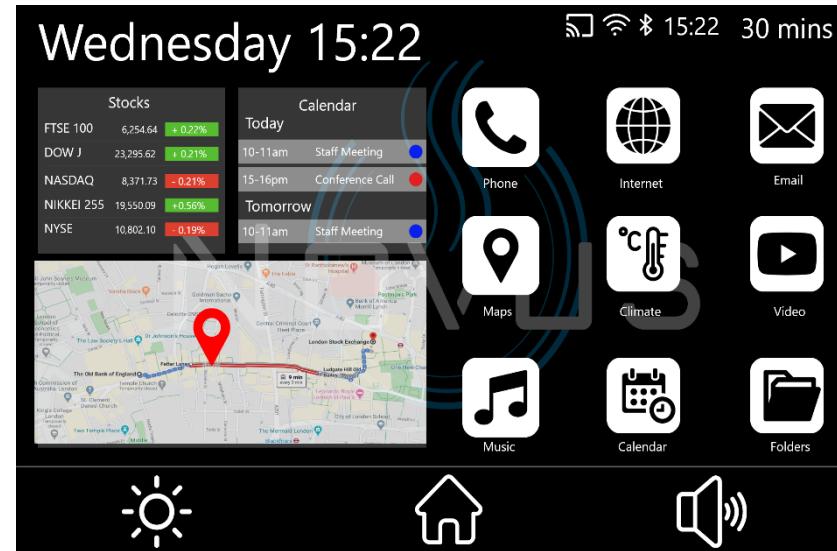
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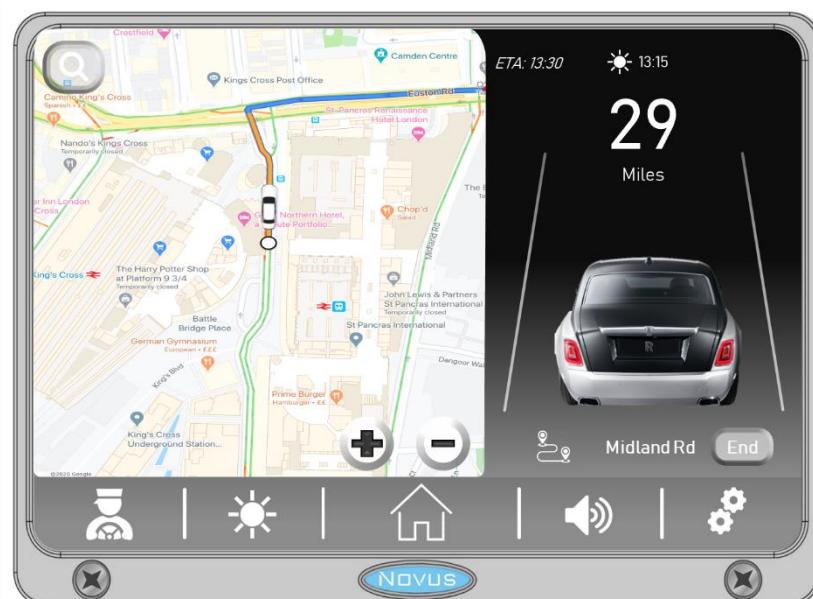
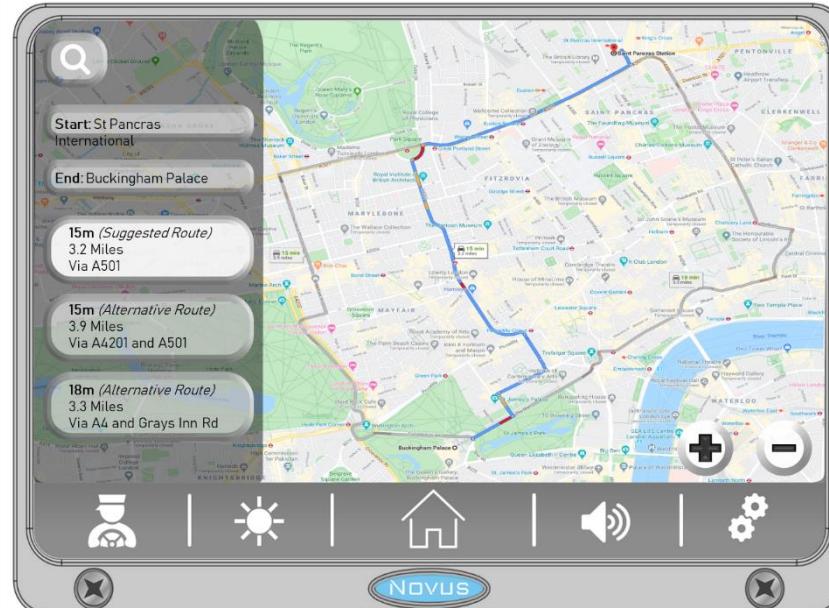
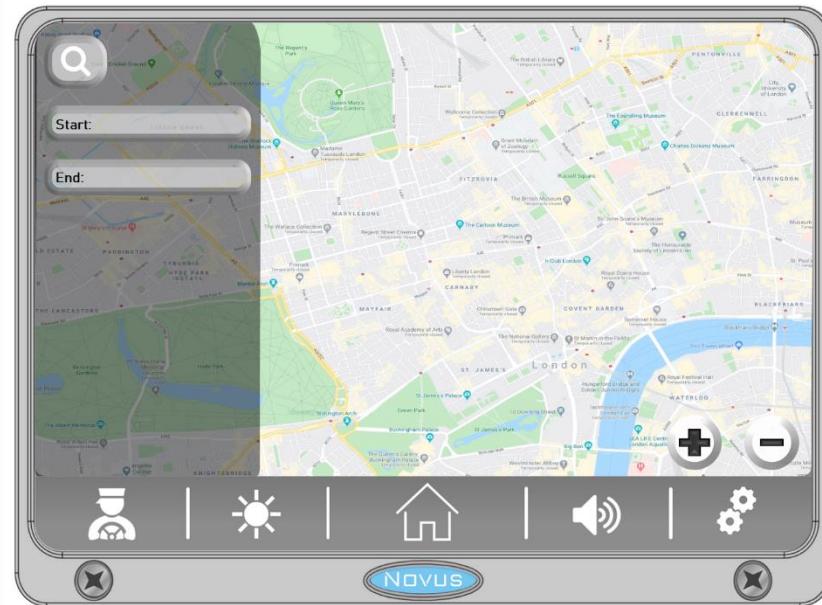
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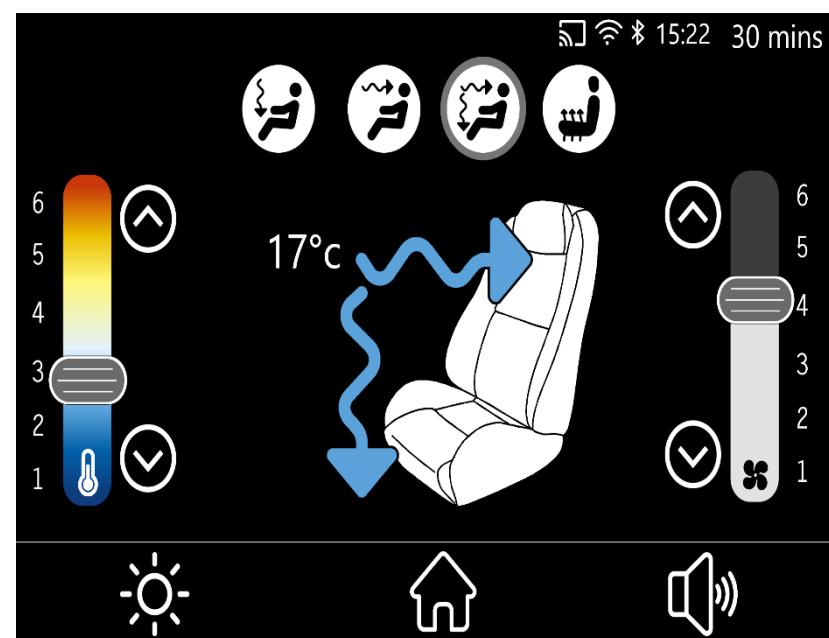
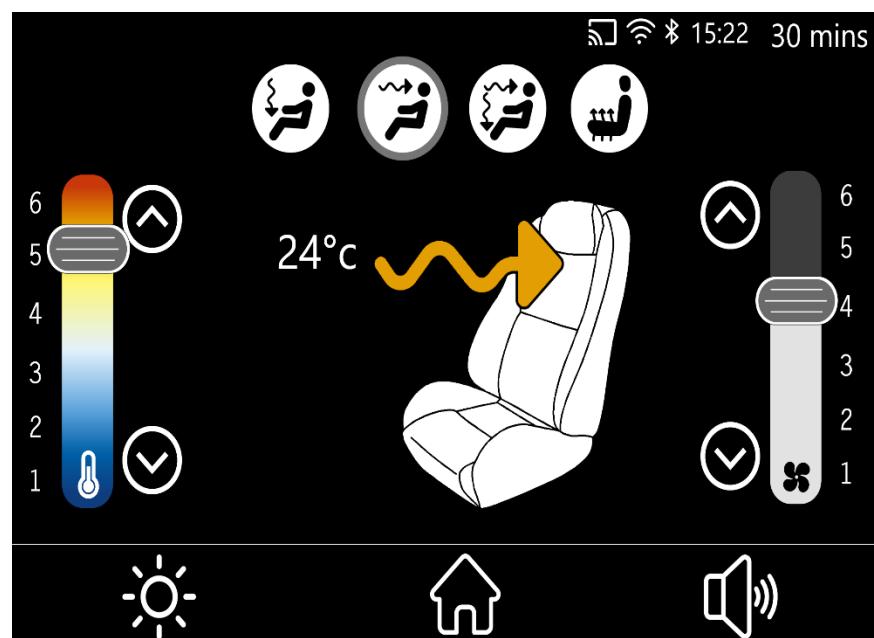
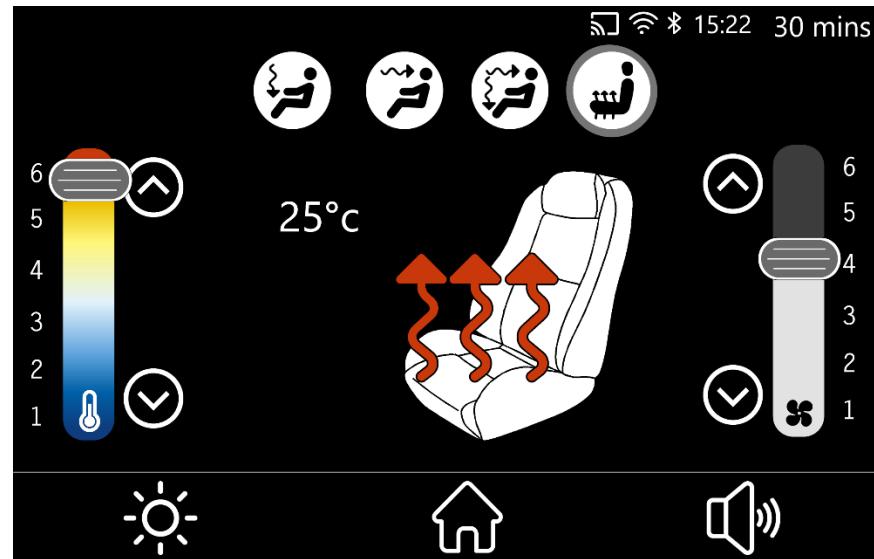
Lo-Fi Interface Prototyping- Experimentation (f)



Lo-Fi Interface Prototyping- Experimentation (f)



Lo-Fi Interface Prototyping- Experimentation (f)



Lo-Fi Interface Prototyping- Experimentation (f)



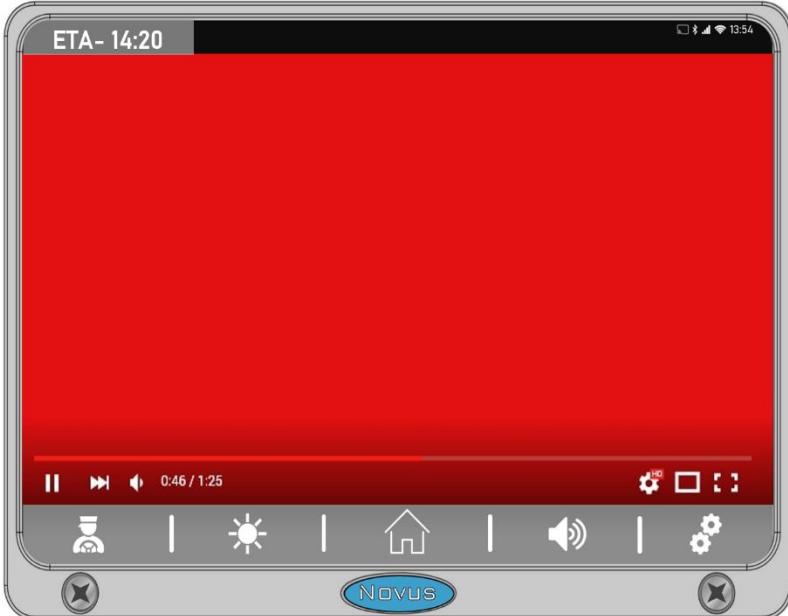
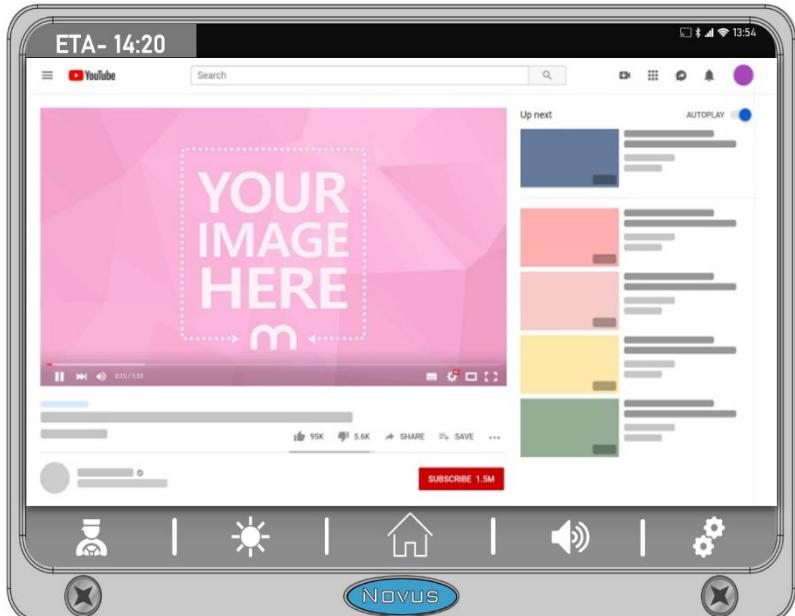
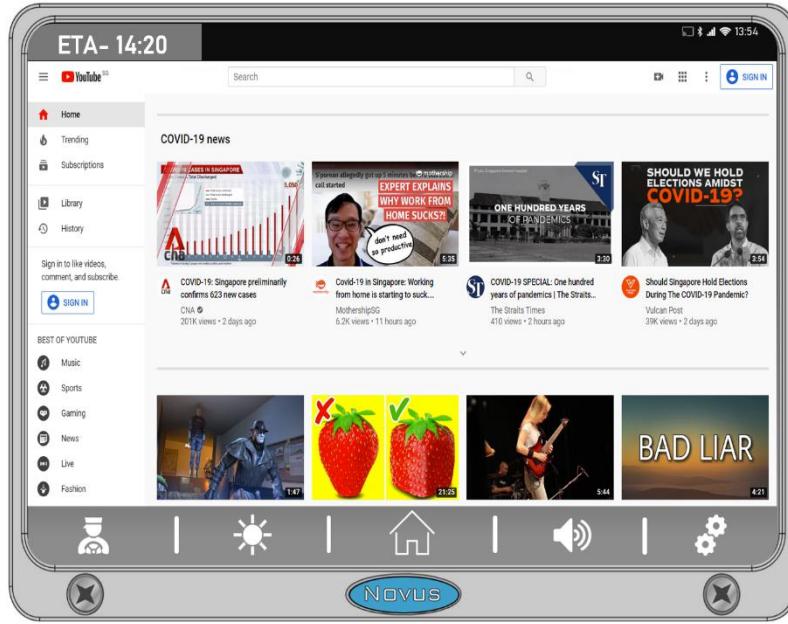
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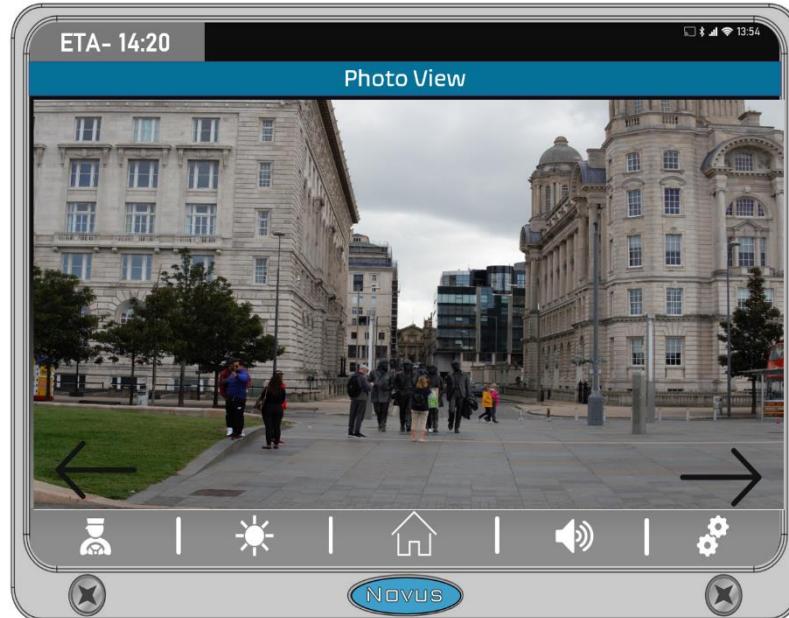
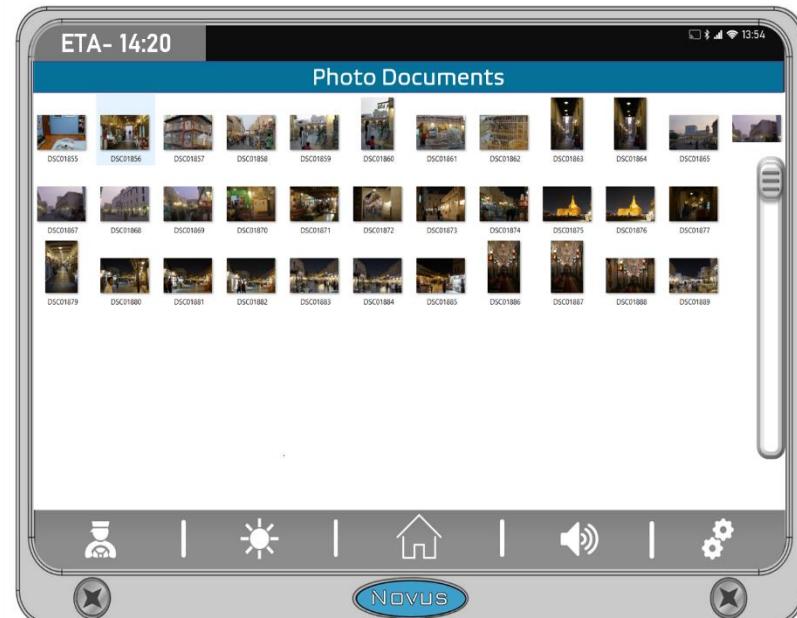
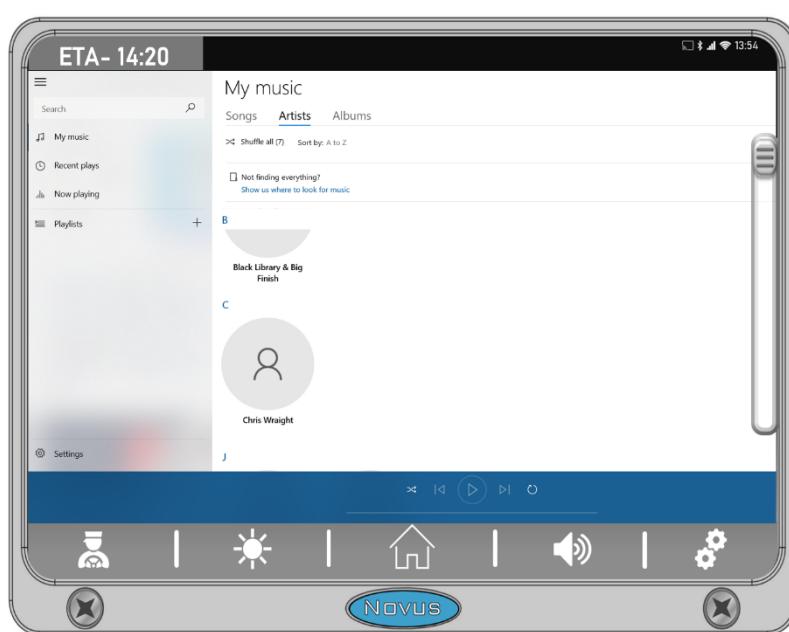
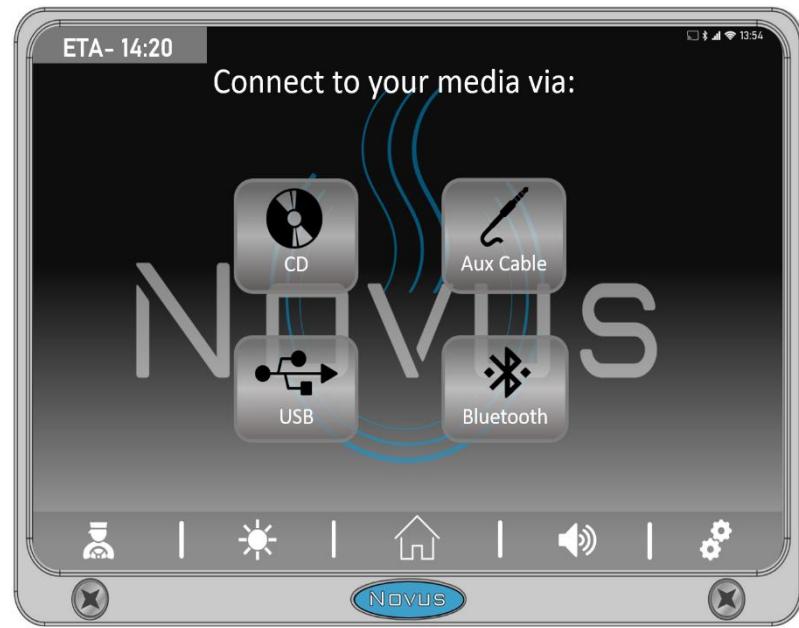
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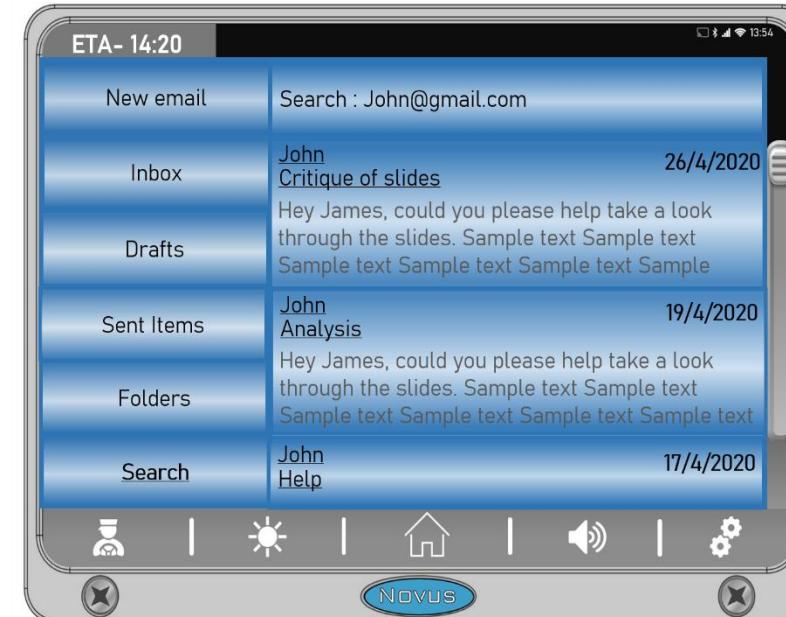
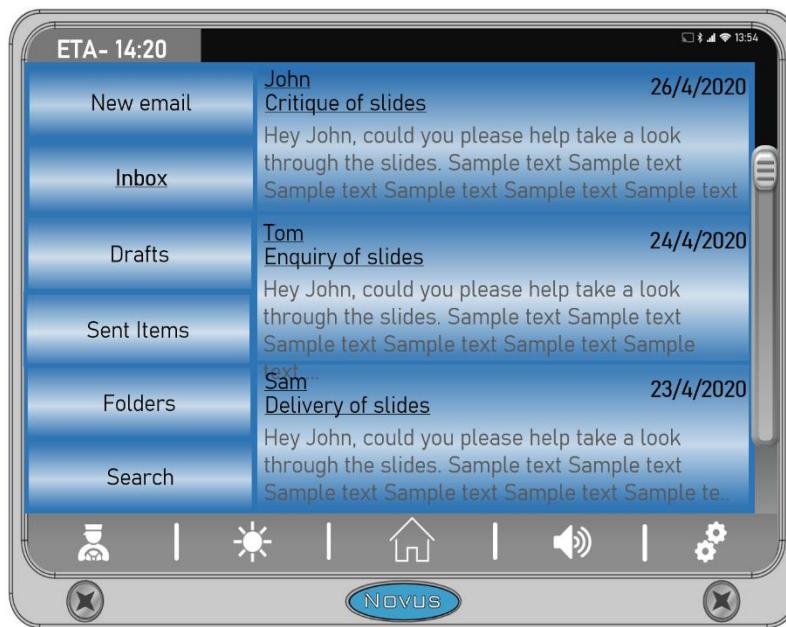
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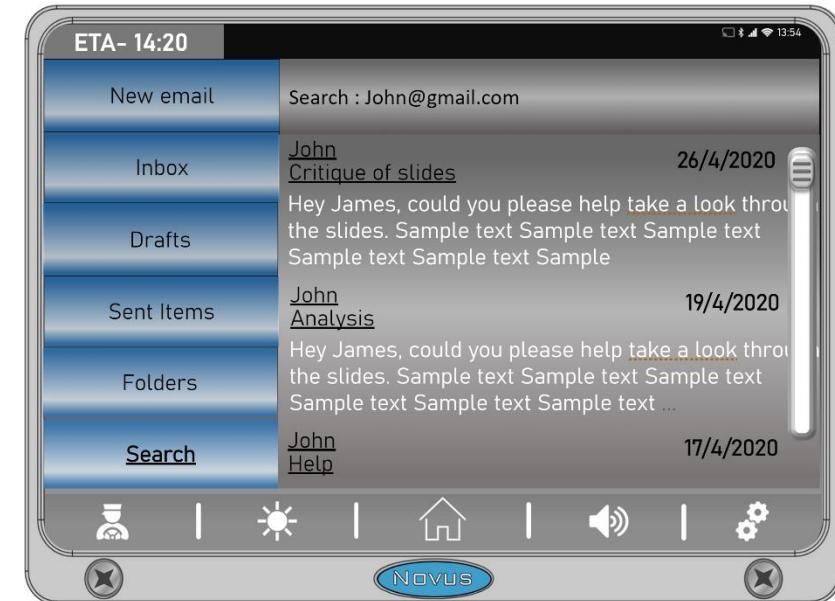
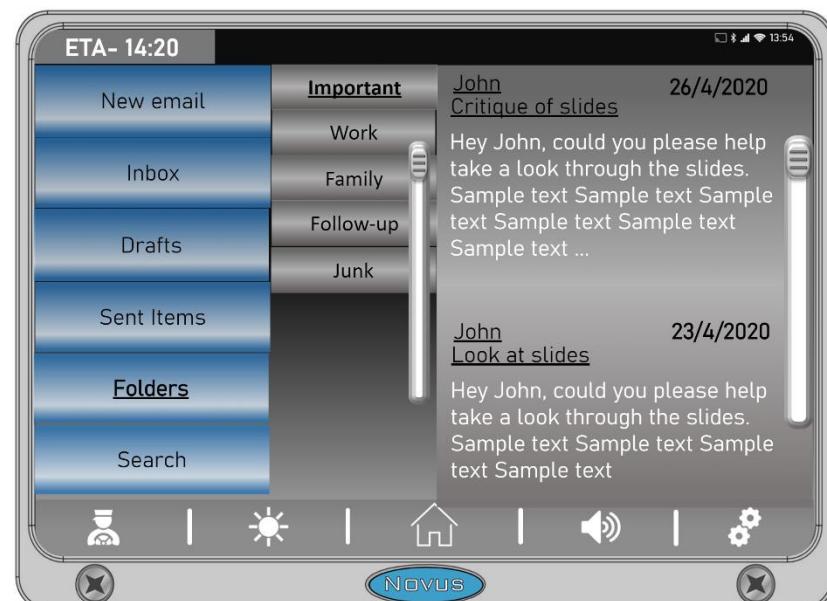
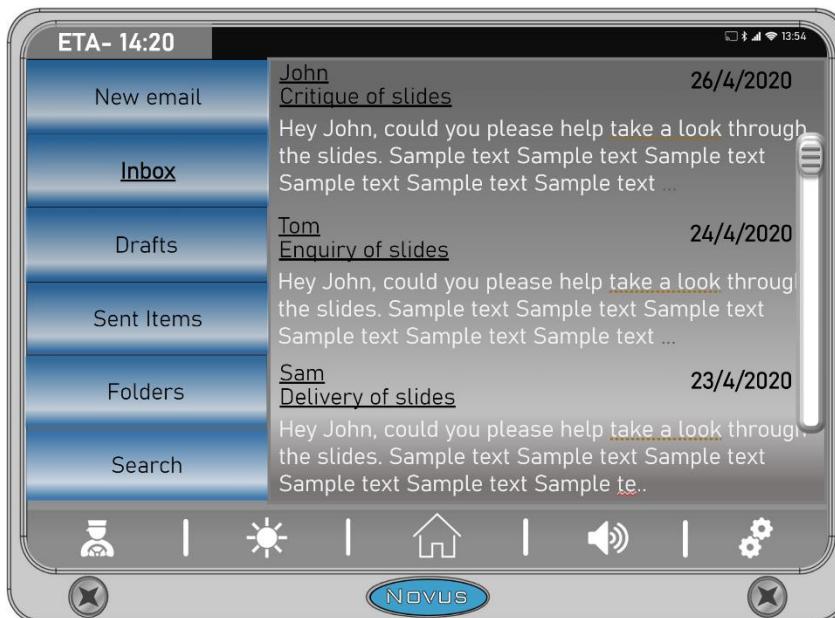
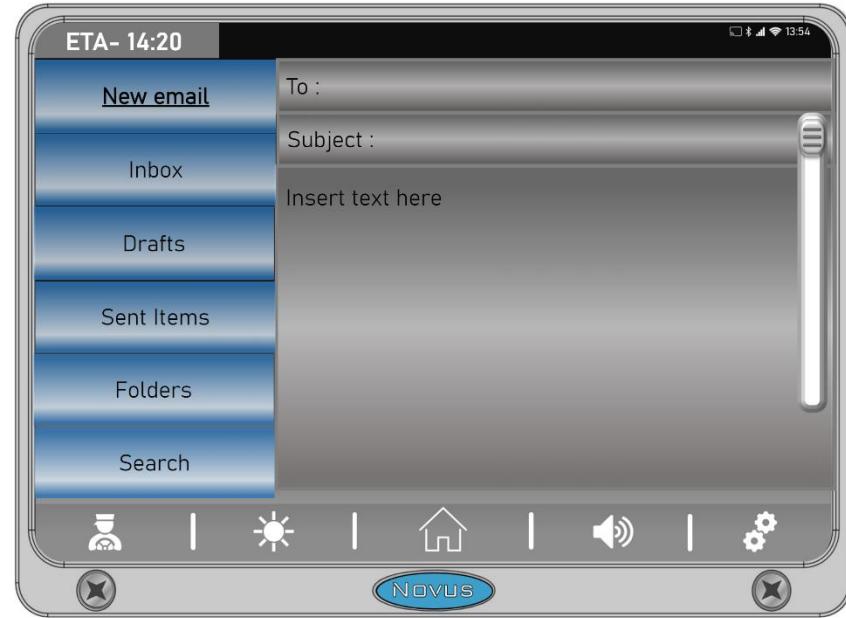
Lo-Fi Interface Prototyping- Experimentation (f)



Lo-Fi Interface Prototyping- Experimentation (f)



Lo-Fi Interface Prototyping- Experimentation (f)



Hierarchical Task Analysis (g)

We were able to make good use of HTA as a supplement to cognitive walkthrough since they both examine the requirements for each step in the execution of a task, while HTA concentrates on the physical interaction between user and system. Our HCI members were well-placed to complete this evaluation. We found this of help when deciding how many steps or screens should be used to complete a given task.

Hierarchical task analysis

Hierarchical task analysis (HTA) is a widely used type of Task analysis where a high-level task is decomposed into a hierarchy of subtasks. It consists of a hierarchy of tasks, sub-tasks and actions together with plans that describe the ordering and conditions of task performance. The plan is enabling the analyst to describe sequential, conditional, and iterative tasks.

HTA Pros:

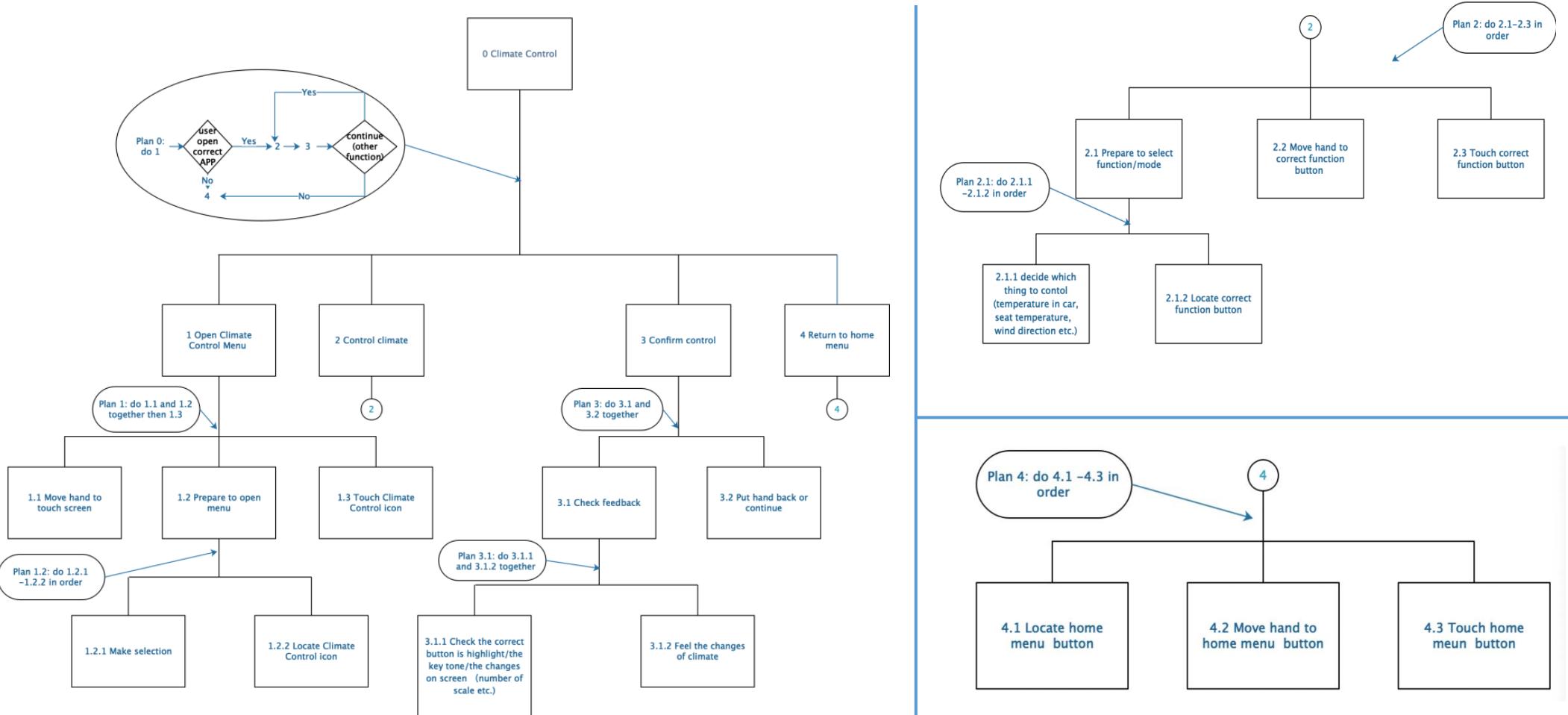
1. Easily implemented, once concepts understood
2. HTA provides extensive information about a task (goals, plans, operations), can be highly detailed.
3. Because it is a way of analyzing the process of tasks, it can be used for subsequent non-user evaluation methods such as Heuristic Evaluation.

HTA Cons:

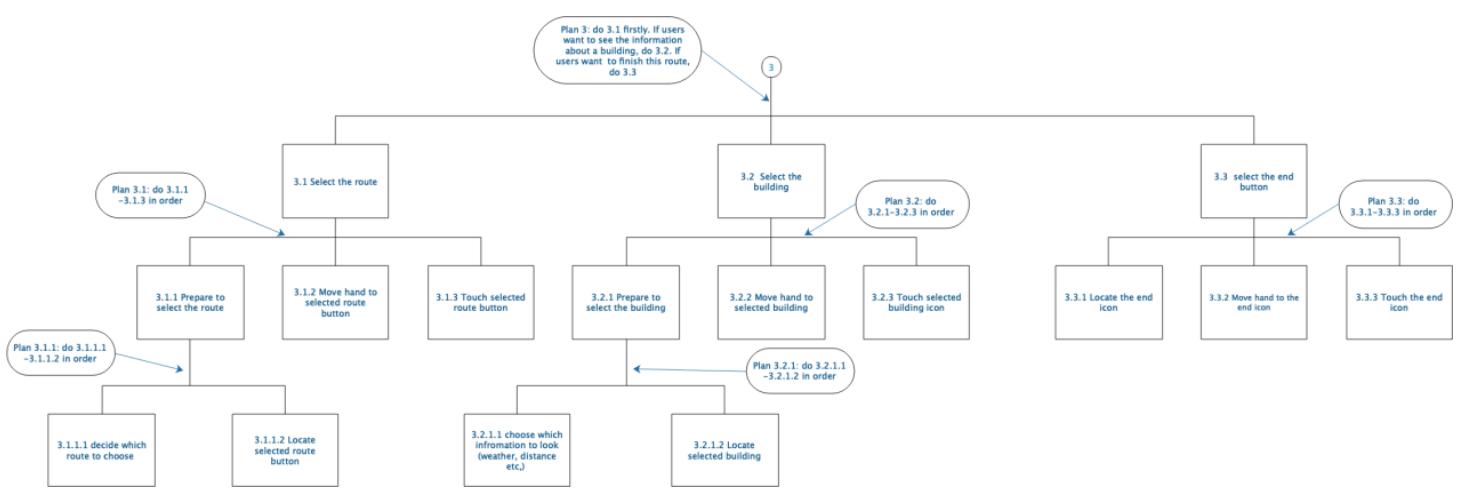
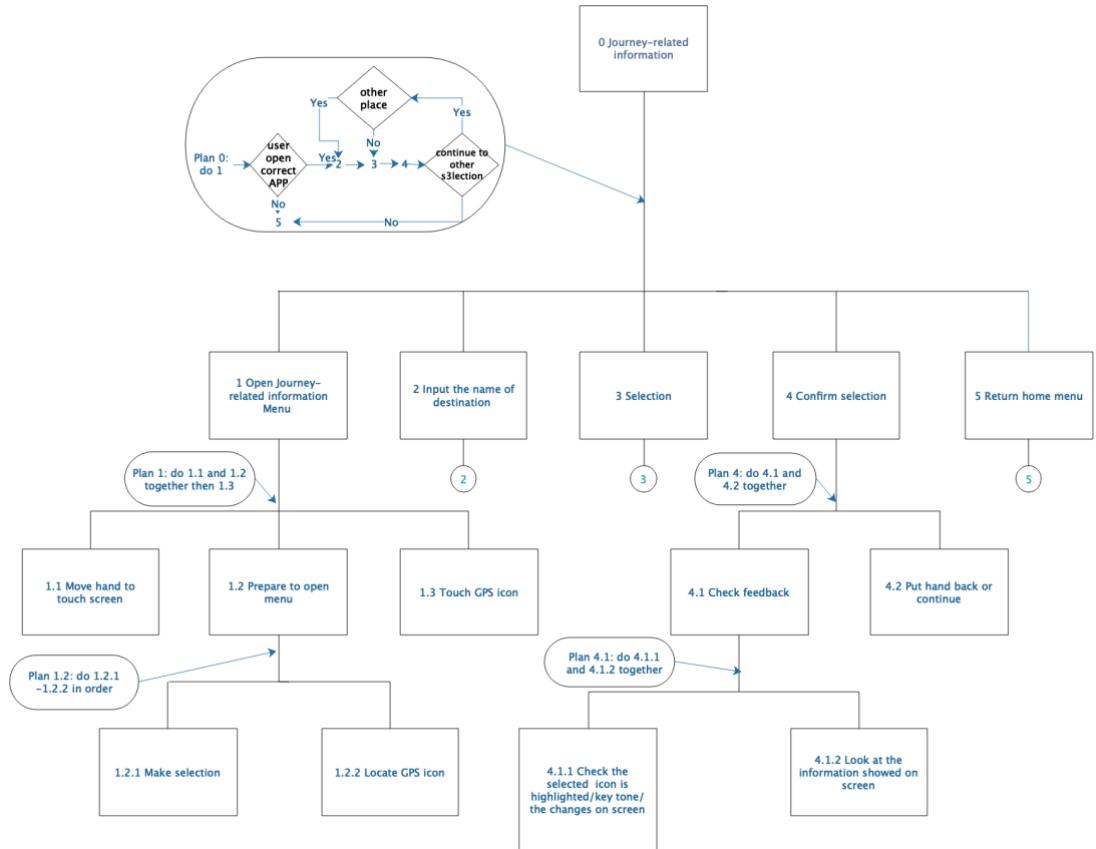
1. More descriptive than analytical; no direct design solutions, have to infer; does not handle cognitive components of a task
2. Not easy to model parallel operations
3. Does not scale very well, quickly becoming unwieldy and can be time and resource intensive, and not all tasks require the level of granularity that an HTA provides.

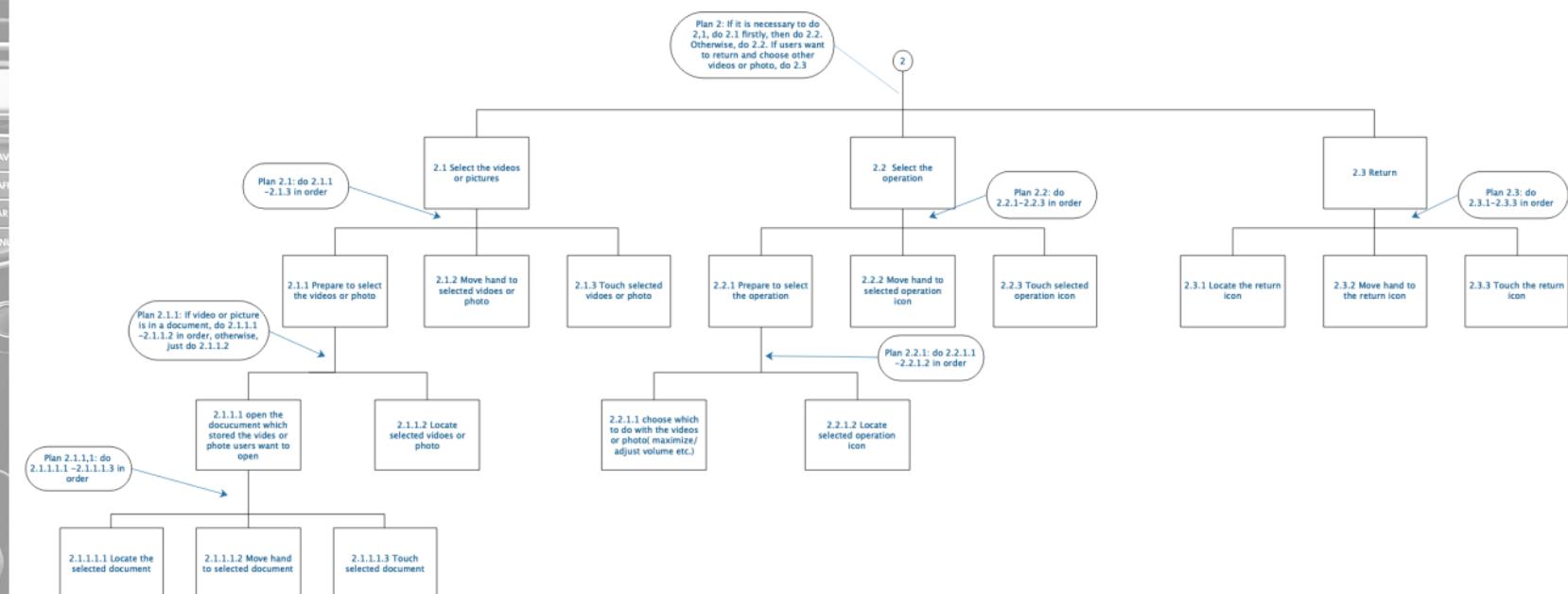
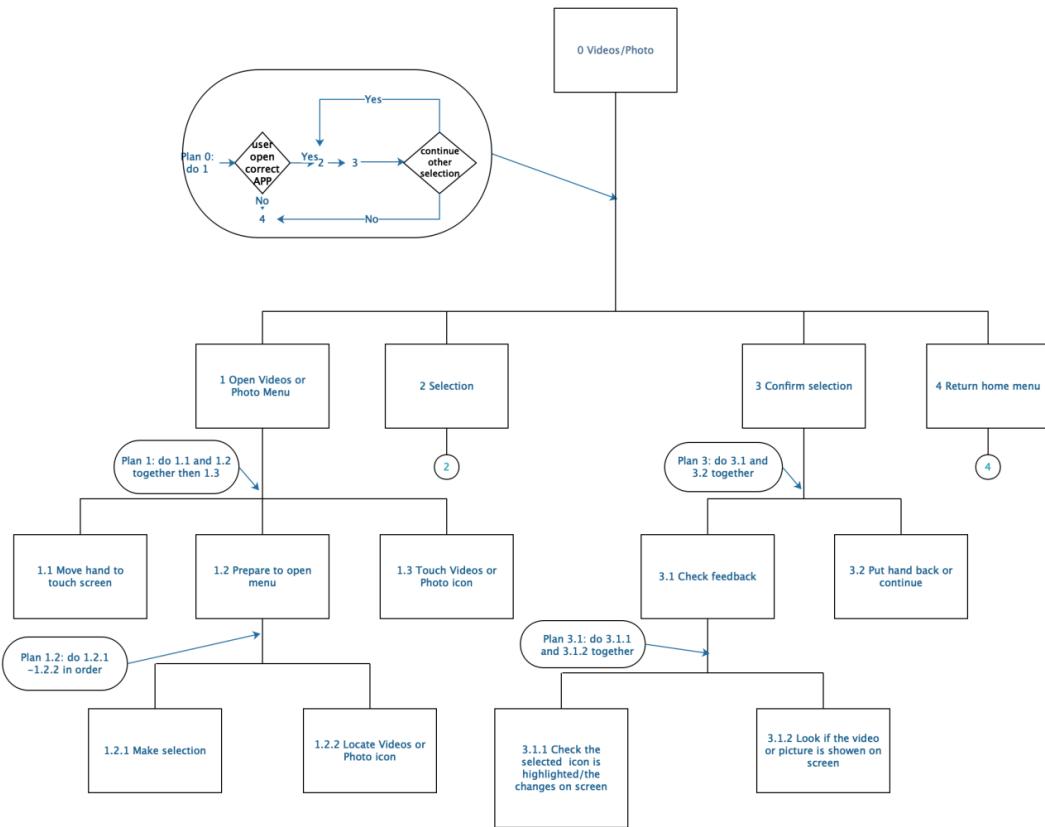


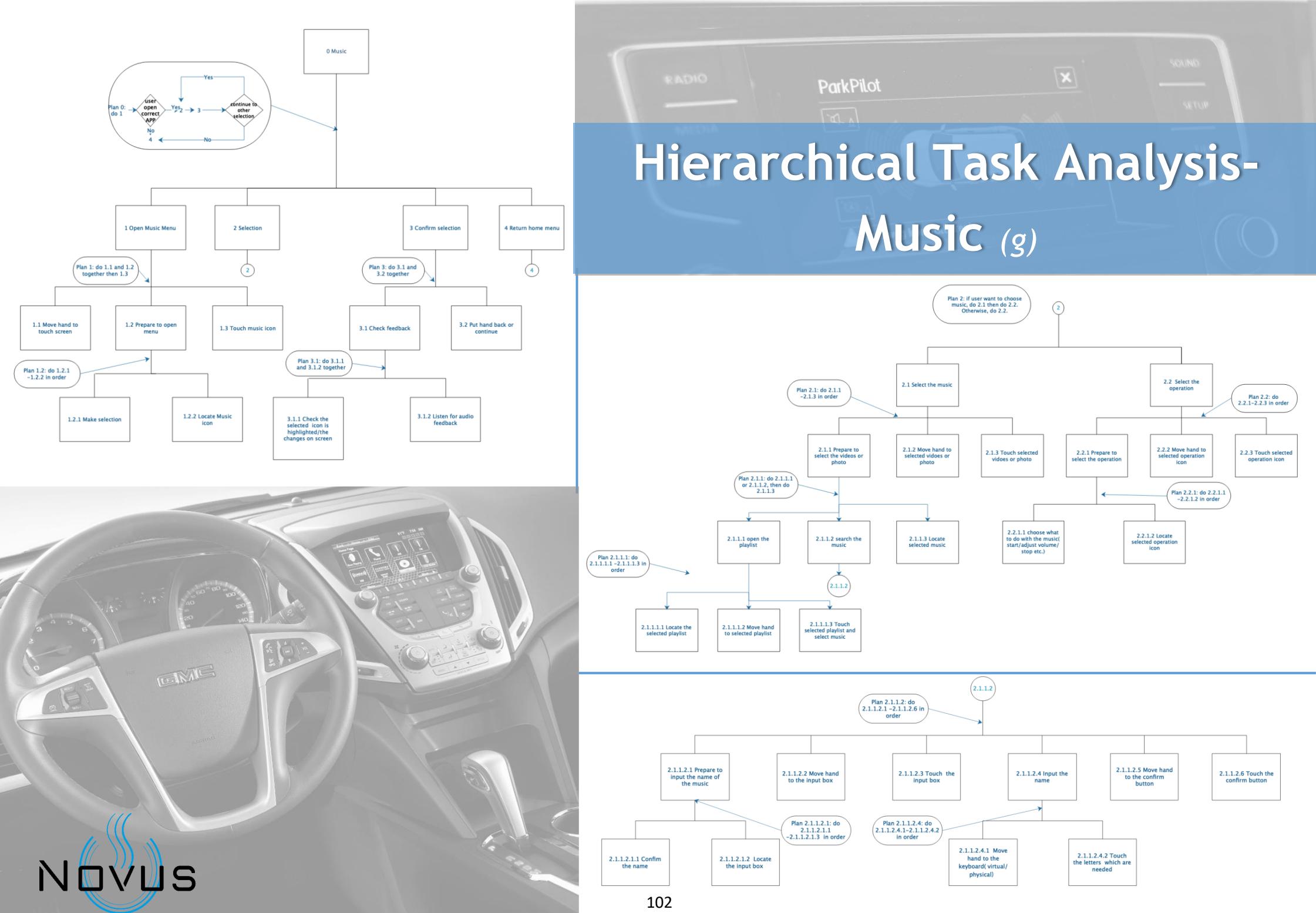
Hierarchical Task Analysis- Climate Control (g)



Hierarchical Task Analysis- Journey Information (g)







Layout Analysis (h)

As a counter to the more technical methods of evaluation, layout analysis was a useful, broad approach to testing that facilitates quick iteration of design that had intuitive resonance with our team members. This helped us to communicate ideas by graphic demonstration at distance over MS Teams and email, where verbal description would have been too imprecise, ambiguous and time-consuming.

Layout analysis occurs more as a practical than as an academic method; it is used in ‘fully-physical’ environments, such as power station control rooms, surgical theatres and submarine control rooms, to derive the optimal design for clear and timely decision making under conditions that include uncertainty or stress (Mallam & Lundh, 2013; Peer et al., 2004).

The Journey app

In the first iteration, the great majority of this application had an intuitive layout. However, we found that the latter slides changed layout without justification. To begin with maps were placed on the right and other information on the left. Once the journey began, this was switched so that the map was on the left. We were concerned that this would confuse users. We also suggested that the information panel at the start of a journey should describe the destination, rather than the current location.

The Media app

This app did not use much of the style that the home screen set, which made it incongruous. Users' expectations would not have been met. The menus were consistent, yet the following screens were of an independent style. We were concerned that this would slow users' operation of the app and delay their enjoyment.

The Climate Control app

We found this app to be very intuitive. The most positive point was that it was easy to navigate between the different option screens. And back to home.

The Home Screen

The home screen set the tone and style for the product. The particular strength of this was that the layout was bold and simple. The left and right domains made clear which functions and apps were available. This screen was retained with only minor changes.



GOMS & keystroke-level modelling (KLM) (i)



The GOMS (Goals, Operators, Methods, Selection rules) techniques of evaluation model the completion of expert tasks by dividing them into steps, which are timed.

The KLM technique is one of the GOMS methods relevant to this project because it is directed towards the evaluation of computer system use. KLM produces objective, empirical data from an atomistic analysis of users' actions. This has a real but limited value: the method is well-suited to assessing definable human actions required to complete a task in the system, and as recorded by the clicks, scrolls and other interface actions. Yet we are interested in the user's whole experience. Our product is designed for and marketed and sold upon the idea that users are flexible, fast and open to abductive reasoning, oblique inspiration and lateral thought. However, KLM does provide good data that enable us to choose between different routes through the interface to accomplish a goal.

It is difficult to trial the product directly in this case because we won't be doing live testing. We will have to use, instead, stock data from Pannafino (2019). This gives us comparators that are similar to laboratory experiments and therefore lose ecological validity.

In the first iteration (approximately 17th April) of prototype user interface designs, our designers modelled a climate control task. *Prima facie*, the steps taken in the first two completed design were equivalent, but the Journey app required a step more than the climate control app. However, the difference between these action-routes is so slight as to be negligible. Once the designs are settled we may be able to use KLM on the single, final design to refine any slow action-routes.

The next phase of analysis will consider the replacement of a media app with an executive work tool.

Meeting Minutes and Gantt Charts (j)

[Gantt Schedule for Group Lima Final Project Phases: \(Thursday, 9th April, onwards\)](#)

Nota Bene

1. All members must look for problems, ask questions and offer solutions. (As often as needed.)
2. We seem to have moved to MS Teams well. We might use the Teams chat function or retain Trello, but we have used Trello less and less since lockdown.
3. We should adopt a 'no blame' culture for the final phase, so that everyone feels happy about offering their ideas. Critique should be accompanied by alternative solutions.
4. If you are stressed about other work, please let us know! ☺
5. Cath's feedback was very positive!

Below, the underlined names are the task leaders.

	PHASE 1	PHASE 2	PHASE 3	PHASE 4
<u>Deadline</u>	Monday, 13 th April; Friday 17 th April.	Friday, 24 th April	Friday, 1 st May	Thursday, 14 th May, 3pm [TBC by Cath]
<u>Item 1</u>	<p><u>Prototyping the UI; Claire to select from competing designs by 13th April (the rest to the appendices).</u></p> <p><u>Prototypes, in winner's style to be completed by 17th April.</u></p> <p><u>Claire;</u> <u>Gabriel (designs),</u> <u>Symeon (designs),</u> <u>Ben (designs)</u></p>	<p><u>User requirements reiteration and finalisation (portrait orientation may be needed - CW).</u></p> <p><u>Methods of prioritisation ('high-low bar') to be discussed in advance.</u></p> <p><u>Symeon, Ben, Gabriel</u> <u>(each member may review their own)</u></p>	<p><u>Executive summary: all section discussions / commentaries to be written (to cohere the project document in line with Cath's request)</u></p> <p><u>Symeon;</u> <u>Simon</u></p>	<p><u>Reiteration and redrafting of ar project elemen as required.</u></p> <p><u>Symeon;</u> <u>all</u></p>
<u>Item 2</u>	<p><u>Prospective review and selection of non-user evaluation methods selection</u></p> <p><u>Simon; Yu, Zhenghao</u></p>	<p><u>Non-user evaluation & testing</u></p> <p><u>Simon; Yu, Zhenghao</u></p>	<p><u>Task 3 write-up</u></p> <p><u>Symeon; all, as delegated</u></p>	X
<u>Item 3</u>	<p><u>Scenario review -integration of narrative and analytical methods</u></p>	<p><u>Final, submit-able project design; contents page; cover</u></p>	<p><u>Maintenance, reiteration & adjustment of project and document design</u></p>	X

Group Lima Key Minutes from Thursday, 9th April, 2020

AGENDA

- [1] Discussion of Cath's feedback.
- [2] Discussion of the Gantt chart schedule and responsibilities.
- [3] Any Other Business

MINUTES

[1]

SD - Cath says to show our thinking/working in all parts of the document. So, we shall include a commentary before or after each section. This need only be a paragraph because we have already exceeded the word count.

BW - the URs will benefit substantially from the use of Moscow or a similar method of framing.

CW - the word count of the report, including the context of use and scenarios is 5,295. The personas equal 1,493 words. The user requirements equal 2,983 words. So, the grand total for the document is 9,726 words.

BW - The scenarios would benefit from elaborating more on task analysis, to complement the narrative style that Cath appreciated.

BW - the URs need their priority measures reformed. Discussion and method selection shall follow in the coming weeks.

[2]

SW - the prototyping should continue, from now, with a few days' development of one primary function by SD, BW, GC (and CW, also, if she would like) in isolation from one another to ensure independent visions. CW will finalise the product design from these offerings, or an amalgam of parts from more than one. For Friday, 17th April, SD, BW and GY will complete one prototype each in the new, common style.

Meeting Minutes and Gantt Charts (j)

SD - has set a meeting to discuss the designs amongst the whole group.

CW - the most important principle of this type of design is usability/legibility: new users must be able to achieve a walk-up understanding of the system. See Apple's UIs as a good example.

SW - GY's may currently represent the most intelligible, simplest UI design that we have. Perhaps a dark, cool palette would say "professionalism."

BW - we must email Cath to check the final deadline. (SW actioned this.)

SD - Discussion of each section will be added to the report during phase 3.

CW - all prototype slides must include embedded commentary boxes that justify design choices.

SW - outlined the rest of the schedule contents.

[3]

BW - let's get a sense of how much time people have: what are our individual commitments to other coursework and examinations in light of the lockdown?

SD - Next meeting: Monday, 13th April, at 2pm on MS Teams.

[ENDS]

Group Lima Key Minutes from Monday, 13th April, 2020

Attending - SD, GC, ZH, BW, SW, CW

Apologies - YT

AGENDA

- [1] Matters arising from the last meeting and minutes.
- [2] Update on the progress in prototyping: SD, GY, BW; CW.
- [3] Matters arising from the Gantt chart schedule.
- [4] Matters arising from Cath's feedback of Monday, 6th April.
- [5] AOB.

MINUTES

[1]

[No matters arising.]

[2]

CW - the diagram of the screen measures 248mm x 158mm, in answer to BW's enquiry.

Discussion of SD's UI designs

SD - there is a mixture of influences at work here: my first drafts, Apple and Android (the latter is seen most in the function icons on the home screen).

BW - How does the user return to the home screen from the other screens?

SD - Good point! I will add this.

SW - are icons too similar to commercial ones, and does this matter?

SD - Happy with that; design from scratch would take a long time.

BW - Plans to use fewer colours, as a good differentiation from SD's designs.

CW - the dark tones work well. Perhaps a dark blue or dark grey would be better than black. Consider that using the product in a car - especially in daylight - may make very dark colours hard to see.

BW - perhaps use blank wallpaper, so that the logo does not obscure icons.

Meeting Minutes and Gantt Charts (j)

SD - Okay, but background logos are already used, successfully, by similar products on the market.

CW - The design is very easy and intuitive to understand. Good! The red directional arrows, in particular, are excellent.

BW - Could the scale bars, in climate control (for temperature, air flow etc), have a horizontal indicator/controller bar to show how they are used by the user's finger?

SD - My third draft includes +/- signs.

BW - the controls' large size is a good quality.

CW - Everything is easy to see, read and use. The meaning of each icon is unambiguous.

SD - has already tested the scheme on the iPad, which should be included in the Task 3 write-up (BW).

Discussion of GY's UI designs

GY - all controls are deliberately touch-activated. None use sliders.

SW - the simple, minimalist aesthetic is reminiscent of early Macs or the Amazon Kindle. The soft lines and cartoonish illustration is restful and pleasant to experience.

CW - liked the return-to-home button. The scheme is easy to understand. All the buttons are labelled with words, rather than icons - good. Icons could be included as watermarks. Include a clock.

GY - is against users having to drag or slide a UI; it might be difficult in a moving vehicle.

BW - the press-only design choice is effective.

Discussion of BW's UI designs

BW - these will be ready in a couple of days, as implied before the Easter weekend, for personal reasons. Aims to use *Adobe XD*, after self-tutoring!

CW - Adobe's *InDesign* and *Illustrator* packages are excellent. *XD* is also good. *Illustrator* is known to be good for branding design, so may work well because we are not making working prototypes.

Several - style guides are used in-house at design agencies to maintain consistency of design on a product, website etc.

CW - will take this role, as supervisor, in the absence of a formal code. (A style guide would take a long time to write, and won't be needed for this project.)

SD - we need only aim for 60-70% completion of the prototype because it will then be subjected to non-user evaluation and improved in a second iteration. We will record this process in the report.

[3]

CW - The UI prototype deadline will remain Friday, 17th April (at the 11 a.m. meeting).

CW - Let's assume the final deadline remains at, Thursday, 14th May, which is a safer action.

[4]

BW - Should text and image be presented on the same page in the report? This would be better.

SW - Certainly, and the commentary that SD identified in Cath's feedback can be placed before or after each section in the report. It would look good if the formatting and style was consistent throughout. Currently, the text and images are very well harmonised, with neither component being lost or dominated by the other.

CW - with notice, any of these options are available. Text and imagery look good together.

[5]

SD - Everyone should upload all their early designs, including hand-drawn items. These will be included in our appendices to demonstrate our progress and iteration throughout the project.

CW - Next meeting: Friday, 17th April, at 11 a.m. on MS Teams.

[ENDS]

Meeting Minutes and Gantt Charts (j)

Group Lima Key Minutes from Friday, 17th April, 2020 at 11 a.m.

Attending - SD, GC, ZH, BW, SW, CW, YT

Apologies - N/A

AGENDA

[1] Update on the progress in prototyping, including CW on design choices, discussion and next steps for CW, SD, BW and GY.

[2] Introduction to non-user evaluation methods - SW, ZH, YT.

[3] Matters arising from the scenarios - SW.

[4] AOB.

MINUTES

[1] Prototype progress...

BW's Designs

BW - led the walkthrough of his design for the climate control function. The time indicator in the top right of each screen refers to "Estimated Time of Arrival," or the equivalent. During design an ever-present *speak-to-chauffeur* button was suggested by BW's father, who had such a service during his business career. (Everyone liked this.) The colour palette was kept to simple black and white, in the main. The airflow indicator arrows are to change colour with the chosen temperature.

CW - The background should be a colour other than black. The home screen *Novus* logo should be lighter or less bold. In the home screen the ETA value should be below the tracker map; in the other screens it should be in a cell of its own in the top left corner. The chauffeur button should be at the bottom the screens, amongst the items GY originally put as controllers.

SW - Perhaps the overall composition is too congested. To remedy this, perhaps the seat icon could remain or be larger while the other items could be shrunk and spaced out further?

SD - are there any other action/task routed created by BW, or is each choice a two-to-three-step process from home to climate control?

Planning Ahead

CW - Will produce a home screen in PowerPoint that takes aspects of SD's, BW's and GY's designs. From there, the function designs will be owned as follows: BW - climate control function, GY - media/entertainment function, SD - journey planning function.

CW - Will include notes and a design tools slide that features an array of screen furniture (sliders, icons, buttons) as a style guide and design base. These items can be adapted by GY, BW and SD to suit their function.

SW - If everyone uses the same application (*PowerPoint*), then the risk of product inconsistency is reduced. It is better that CW sets the standard and style so that any deviation is deliberate to the function at hand, rather than through error or incompatibility of software package. This is not the right time for individual experimentation. We need to establish that corporate *Novus* identity and branding!

SD - Let's talk deadlines.

CW - Happy to produce the base slides by close of play today. The first prototypes iteration is to be completed by Tuesday, 21st April, at 3 p.m.

[2] Non-user evaluation...

SW - With YT and ZH, I am exploring the six methods that Cath discussed in the final on-campus lecture. We will continue this process until the prototypes are ready, when we will test them formally. There are two broad styles to the methods: analytic and experiential. We will likely use a combination. Due to word count constraints, we will not be able to use all six methods. Some of them have little genuine application here anyway. ZH has been producing some excellent HTAs, so they won't go to waste!

[3] Scenarios...

Meeting Minutes and Gantt Charts (j)

GY - Since Cath was broadly happy with these, they could now do with having a commentary.

SW & GY - will work on that in the next week.

[4] AOB...

BW - When will the URs and priorities get another iteration?

SW - Will update the schedule as required. URs etc are currently to be done in the week beginning Friday, 17th April.

SW - Will begin to produce some terms and definitions (an ontology) relating to events in the Novus environment. Some of the non-user methods provide useful models for these terms.

SD - Everyone is encouraged to think of and make note of any new or revised URs while the UI prototypes are in development.

YT - Has suggestions about automatic settings buttons, which she will incorporate into her first non-user evaluation round.

SD - Next meeting: on MS Teams at 3 p.m. on Tuesday, 21st April 2020.

[ENDS]

Gantt Schedule for NOVUS Final Project Phases (From Tuesday, 21st April)

Nota Bene

1. All members must look for problems, ask questions and offer solutions. (As often as needed.)
2. We seem to have moved to MS Teams well. We might use the Teams chat function or retain Trello, but we have used Trello less and less since lockdown.
3. We should adopt a 'no blame' culture for the final phase, so that everyone feels happy about offering their ideas. Critique should be accompanied by alternative solutions.
4. If you are stressed about other work, please let us know! ☺
5. Cath's feedback was very positive!

Below, the underlined names are the task leaders.

<u>Dead-line</u>	<u>PHASE 1</u>	<u>PHASE 2</u>	<u>PHASE 3</u>	<u>PHASE 4</u>
	Friday, 17 th April; Tuesday, 21 st April. [TBC]	Friday, 24 th April	Friday, 1 st May	Thursday, 14 th May, 3 p.m.
<u>Item 1</u>	<p><i>Prototyping the UI; Claire to select from competing designs by 17th April (the rest to the appendices).</i></p> <p><i>Prototypes, in winner's style to be completed by Tuesday, 21st April.</i></p> <p><u>Claire;</u> Gabriel (designs), Symeon (designs), Ben (designs)</p>	<p><i>User requirements reiteration and finalisation (portrait orientation may be needed - CW).</i></p> <p><i>Methods of prioritisation ('high-low bar') to be discussed in advance.</i></p> <p><u>Symeon, Ben, Gabriel</u> (each member may review their own)</p>	<p><i>Executive summary; all section discussions / commentaries to be written (to cohere the project document in line with Cath's request)</i></p> <p><u>Symeon;</u> Simon</p>	<p><i>Reiteration and redrafting of ar project elemen as required.</i></p> <p><u>Symeon;</u> all</p>
<u>Item 2</u>	<p><i>Prospective review and selection of non-user evaluation methods selection</i></p> <p><u>Simon; Yu, Zhenghao</u></p>	<p><i>Non-user evaluation & testing</i></p> <p><u>Simon; Yu, Zhenghao</u></p>	<p><i>Task 3 write-up</i></p> <p><u>Symeon; all, as delegated</u></p>	
<u>Item 3</u>	<p><i>Scenario review -integration of narrative and analytical methods; commentary from 21st April...</i></p> <p><u>Simon; Gabriel</u></p>	<p><i>Final, submit-able project design; contents page; cover</i></p>	<p><i>Maintenance, reiteration & adjustment of project and document design</i></p> <p><u>Claire</u></p>	

Meeting Minutes and Gantt Charts (j)

NOVUS Minutes: Tuesday, 21st April, 2020 at 3 p.m., via MS Teams

Attending - SD, GC, ZH, BW, SW, CW, YT

Apologies - N/A

AGENDA

- [1] Discussion of the completed first iteration of the UI prototypes - CW *et alibi*.
- [2] Scheduling of work and deadlines - SW; all.
- [3] Discussion of and questions about our non-user evaluation methods - SW; all.
- [4] AOB.

MINUTES

[1] Discussion of the completed first iteration of the UI prototypes - CW *et alibi*.

BW, SD and GY discussed their designs in turn.

CW completed live editing of her home screen design at the beginning of the meeting. Changes are to include alignment, layout of the icons and ETA information and the prominence of the NOVUS logo.

SW - the search bar should include a label to indicate purpose, such as "files" in feint type.

BW & SW suggested non-proprietary logos for the icons on the home screen: BW - globe instead of the Internet Explorer sign; SW - replace the Office logo with an anvil and call the function Works.

CW - the apps will retain both icons and words, rather than choosing between them.

BW's design - climate control

The design is largely settled. There was some discussion of the best icon types to inform users about climate control: fan strength arrow, numbers and fan-clusters were all reviewed. The heat bar might be clearer, as in current automobile applications, if temperature were represented by graded horizontal bars because merging the colour from red to blue gives purple, which has resonance in this application (SW).

CW - the NOVUS logo could be included on all screens. The ETA information needs to be included in a box of its own.

SD's design - journey information

SD - to keep more with the project's style, the maps can be set on night mode.

SW - the content could be shrunk to show the style of the background and give consistency with the rest of the document.

SD - There are still decisions to be made about what information to include that the user will find interesting.

SW - a scenario approach could be used.

CW - Good, large layout, which matches the home screen. Add blue selection indicator around the 'search' button.

GY's design - entertainment

SD - a good range of connectivity here.

BW - are picture needed as a main category of data? SW - will they be used for slideshows?

GY - there will be some reformatting of the screens to make the content smaller and keep the project style.

CW - the overall size of the content that has been added to the template needs to be reduced. Does the My Music section need to be changed to Spotify, or is the Windows version okay?

CW - The Video Documents and Video Player screens need to be shrunk to give a wider border.

Meeting Minutes and Gantt Charts (j)

CW - add an ETA box.

CW - Well done designers. Thank you.

[2] Scheduling of work and deadlines - SW; all.

SW discussed the schedule and suggested keeping to the deadlines, even if the first draft has several changes to be made. Thereby, we will have a fortnight at the end of the project period to really refine the document and reiterate where needed.

SW will derive some terms and definitions from the evaluation process.

BW will use these to make the parts of the project consistent later.

[3] Discussion of and questions about our non-user evaluation methods - SW; all.

N/A: the first iteration of the UI prototypes will be completed on Wednesday, 22nd April. Progress on the evaluations will be discussed at the next meeting.

[4] AOB.

SD - Next meeting: Friday, 24th April at 2 p.m. on MS Teams.

[ENDS]

Gantt Schedule for NOVUS Final Project Phases (From Tuesday, 28th April, 2020)

Nota Bene

1. All members must look for problems, ask questions and offer solutions. (As often as needed.)
2. We seem to have moved to MS Teams well. We might use the Teams chat function or retain Trello, but we have used Trello less and less since lockdown.
3. We should adopt a 'no blame' culture for the final phase, so that everyone feels happy about offering their ideas. Critique should be accompanied by alternative solutions.
4. If you are stressed about other work, please let us know! ☺
5. Cath's feedback was very positive!

Below, the underlined names refer to the task leaders.

<u>Dead-line</u>	<u>PHASE 1</u>	<u>PHASE 2 to 3</u>	<u>PHASE 3</u>	<u>PHASE 4</u>
	Friday, 17 th April; Tuesday, 21 st April.	Friday, 1 st May, 3 p.m.	Friday, 1 st May 3 p.m.	Thursday, 14 th May, 3 p.m.
<u>Item 1</u>	<p><i>Prototyping the UI; Claire to select from competing designs by 17th April (the rest to the appendices).</i></p> <p><i>Prototypes, in winner's style to be completed by Tuesday, 21st April.</i></p> <p><u>Claire:</u> Gabriel (designs), Symeon (designs), Ben (designs)</p>	<p><i>Finalisation of the User Requirements;</i></p> <p><i>Prioritisation</i></p>	<p><i>[All leading to a passable, first, full draft]</i></p> <p><i>Executive summary;</i></p> <p><i>Section Commentaries</i></p> <p><u>Symeon; delegates</u></p>	<p><i>Reiteration and redrafting of all project elements as required.</i></p>
<u>Item 2</u>	<p><i>Prospective review and selection of non-user evaluation methods selection</i></p> <p><u>Simon; Yu, Zhenghao</u></p>	<p><i>Initial non-user evaluation & testing</i></p> <p><u>Simon; Yu, Zhenghao</u></p>	<p><i>Task 3 write-up</i></p> <p><u>Symeon; Simon; delegates</u></p>	X

Meeting Minutes and Gantt Charts (j)

NOVUS Minutes: Tuesday, 28th April, 2020 at 2 p.m., via MS Teams

Attending - SD, GC, ZH, BW, SW, CW, YT

Apologies - N/A

AGENDA

[1] Matters arising from the prototypes, the new work/email prototype in particular.

[2] Task 3 - contents, approach and delegation.

[3] Finishing a first-effort document for Friday, 1st May: design, content, delegation.

[4] AOB.

MINUTES

[1] Matters arising from the prototype designs and the new work/email prototype.

GY's email app

SD - could we include file sharing or remote desktop functions?

BW - colours: there is too much blue. Slide 31 - can it be made more obvious how the various columns are controlled independently of one another? This would help executives who have a large number of email folders.

SD - Alternative to an email app alone, we could prototype the *Works* app and, in its home screen, include file share, remote desktop and a data analytics platform.

CW - agreed that a *Works* prototype with its own home screen and function icons would be a good feature for the project.

SD - can generate a quick and dirty prototype.

SW - how do make a screen or slide's content look as though it is setting *in* the design, rather than *on top of* it?

[2] Task 3 - contents, approach and delegation.

SW will complete the summary of the non-user evaluation trials.

SD & SW will liaise about this Task and draft it for Friday.

SD - designers should read the evaluations and incorporate the findings into their reiterations for Friday and more so before the final deadline if needed.

[3] Preparing the first-effort document for Friday, 1st May.

BW - regarding User Requirements, what are we to do where Gary and Cath's advice differs? (SW is going to email Cath Harvey about this.)

[4] AOB.

SD - Individual reports: remember that they are submitted on the same day as the group project. Don't get caught out by the deadline.

SW - will post Cath's advice from an email about the individual submissions.

CW - We should state our progress in public on the Teams Chat tab, so that everyone can see what is happening in the project overall.

SW - feel encouraged to discuss items with individuals as needed. SD, GY & CW will need to discuss the refinement of the *Works* prototype.

BW - will need to ask us about the URs.

SD will keep us informed of the requirements of the marking criteria and other related documents.

SW - SD is to manage us this week and hold us to completing a draft of all parts of the project document.

Meeting Minutes and Gantt Charts (j)

BW - we must - in the report - use the user-centred design iteration cycle that Cath cited in many of her lectures.

SD - From now on we must begin including our citations from the literature, including ISOs.

CW - I have plenty of references for design from the graphic design lectures I attended.

SW - I have plenty of literature related to the Psychological bases of much in the UI design field.

SW - Next meeting will be on Tuesday, 5th May on *Teams*. This will be an editorial meeting during which we can discuss what in the project to reject, reduce or improve.

[ENDS]

NOVUS Minutes: Tuesday, 5th May, 2020 at 2 p.m. on MS Teams

Attending - SD, GC, ZH, BW, SW, CW, YT

Apologies - N/A

AGENDA

- [1] Reflections on being a member of team NOVUS up to the submission of Draft 1.
- [2] Matters arising from Draft 1.
- [3] Thoughts on working with a rolling schedule and draft until hand-in.
- [4] AOB.

MINUTES

- [1] Reflections on being a member of team NOVUS up to the submission of Draft 1.

All team members have been pleased with their experience of the project.

SW - Are there good project management methods we could use in a similar case in future?

BW - Agile Scrum, with its stand-up meetings and “blockers” (impediments) is useful in software. It might suit this kind of project. Online-only working has added complications. Gantt charts are also good, and we did make use of them

SD - Our method ended up being de facto Agile, to an extent.

BW - The user-centred design cycle ended up being our approximate structure.

- [2] Matters arising from Draft 1.

SD - The designers must write commentary for the prototype designs, including justifications. Cath clearly requires this, judging by her feedback.

Meeting Minutes and Gantt Charts (j)

BW - we must make sure that the justifications are coherent.

SD - and they must be linked to the user requirements.

SD - we need more references: start with Cath's in the lecture slides.

SW - include all relevant literary references because they point to one's broader knowledge even if there isn't space to include it all.

GY - I can do justifications for the email prototype.

SW - will email Cath to see if the URs can be included as images rather than text, thus expanding the word count.

CW - the document stands at 7,021 words, excluding appendices and user requirements.

BW - the UR priorities will be completed this week.

[3] Thoughts on working with a rolling schedule and draft until hand-in.

SD - second draft must be handed in by Saturday evening, so that Claire can format it on Sunday.

BW - needs to complete URs, prioritisations, individual reflection, design commentary and relevant references.

SW - will see if Cath has a preferred reference style.

SD - CW's hardware designs needs ISO references.

CW - don't wait for the deadline: get work to be as soon as possible so that I don't have to format everything together.

[4] AOB.

GY - is to help SW with Task 3; SD will input also.

Next meeting: 11 a.m. on Friday, 8th May, on MS Teams.

[ENDS]

NOVUS Minutes: Friday, 8th May, 2020 at 11 a.m.: MS Teams

Attending - SD, GC, ZH, BW, SW, CW, YT

Apologies - N/A

AGENDA

- [1] Matters arising from the user requirements.
- [2] Schedule for the final days of the project.
- [3] The executive summary and overview.
- [4] AOB.

MINUTES

- [1] Matters arising from the user requirements.

BW - Twenty-seven user requirements completed in a second draft. The Moscow approach to the priorities is complete, which seemed more appropriate here than the Kano approach. Moscow seemed a little blunt at times because it uses only four categories, so there's not a lot of differentiation there. DOI numbers for journal articles have been provided.

BW - Also, many of the ISOs in this area deal with the effects of screen-use on drivers rather than on passengers.

CW - I will adjust the format, colour, font etc. of the user requirements as needed.

- [2] Schedule for the final days of the project.

BW - My references are ready for the appendix

Meeting Minutes and Gantt Charts (j)

SW - All material to Claire by Saturday night, so that she can make any format changes on Sunday.

SW - On Monday, we can all read through the document and write points of feedback in the Teams Chat.

SW - Tuesday, SD will upload the project [after the 11 a.m. meeting].

[3] The executive summary and overview.

SD - I am happy overall with the project and the Summary.

SW - Task 3 is being finished; I will delegate some proofreading and editing to GY and SD.

[4] AOB.

BW - Following Cath's latest feedback, we should chart the collaborative process of the designs. For example, my climate control app was changed on the back of features of designs by GY and SD.

BW - We should upload all original design drawings.

CW - They should go in the appendix.

SW - most of Cath's advice refers to Task 3; SD can continue to hold us to the marking criteria, as he has done so far.

CW - For presentation, it would be good to have twenty-eight rather than twenty-seven user requirements.

BW - I have three other user requirements prepared: Reliability (non-functional), Clock and Video-calling (both functional).

Next (final) meeting: Tuesday, 12th May at 11 a.m. on Microsoft Teams.

[ENDS]

NOVUS Minutes: Tuesday, 12th May, 2020 at 11 a.m.: Microsoft Teams

Attending - SD, GC, ZH, BW, SW, CW, YT

Apologies - N/A

AGENDA

- [1] Matters arising from Task 1.
- [2] Matters arising from Task 2.
- [3] Matters arising from Task 3.
- [4] Miscellaneous matters arising from project material and processes.
- [5] Matters arising from the individual reflective reports and peer reviews.
- [6] AOB.
- [7] Reflections on Group L; next steps.

MINUTES

- [1] Matters arising from Task 1.

Work to edit or correct this will be divided by authorship, generally. CW - priorities chart to the appendix. SD - will merge the value proposition.

- [2] Matters arising from Task 2.

BW - Design commentaries are still required on some items.

SD - These are good so far, ensure that there are references to the user requirements.

BW - some of my climate change button colours need adjusting.

Meeting Minutes and Gantt Charts (j)

[3] Matters arising from Task 3.

SW, SD and GY - will complete the final edit this afternoon: attention on citing the URs and ISOs.

[4] Miscellaneous matters arising from project material and processes.

BW - References and bibliography items need to be listed alphabetically.

CW - The word count is 7,955.

CW - Labelled the appendices, by letter, during the meeting.

SW - Will add a style guide if there is time remaining.

BW - Led a quick run through Cath's latest general feedback.

[5] Matters arising from the individual reflective reports and peer reviews.

BW - How have non-evaluators discussed the evaluations in the IRR?

SW - Focus on process not the technical content, which is the domain of the main project document.

[6] AOB.

CW - Defined a schedule of revisions for today in task order, so that we might finish by the evening.

BW - will follow each stage and proof-read.

SW - The aim is to upload the project tonight or early tomorrow (Wednesday).

[7] Reflections on Group L; next steps.

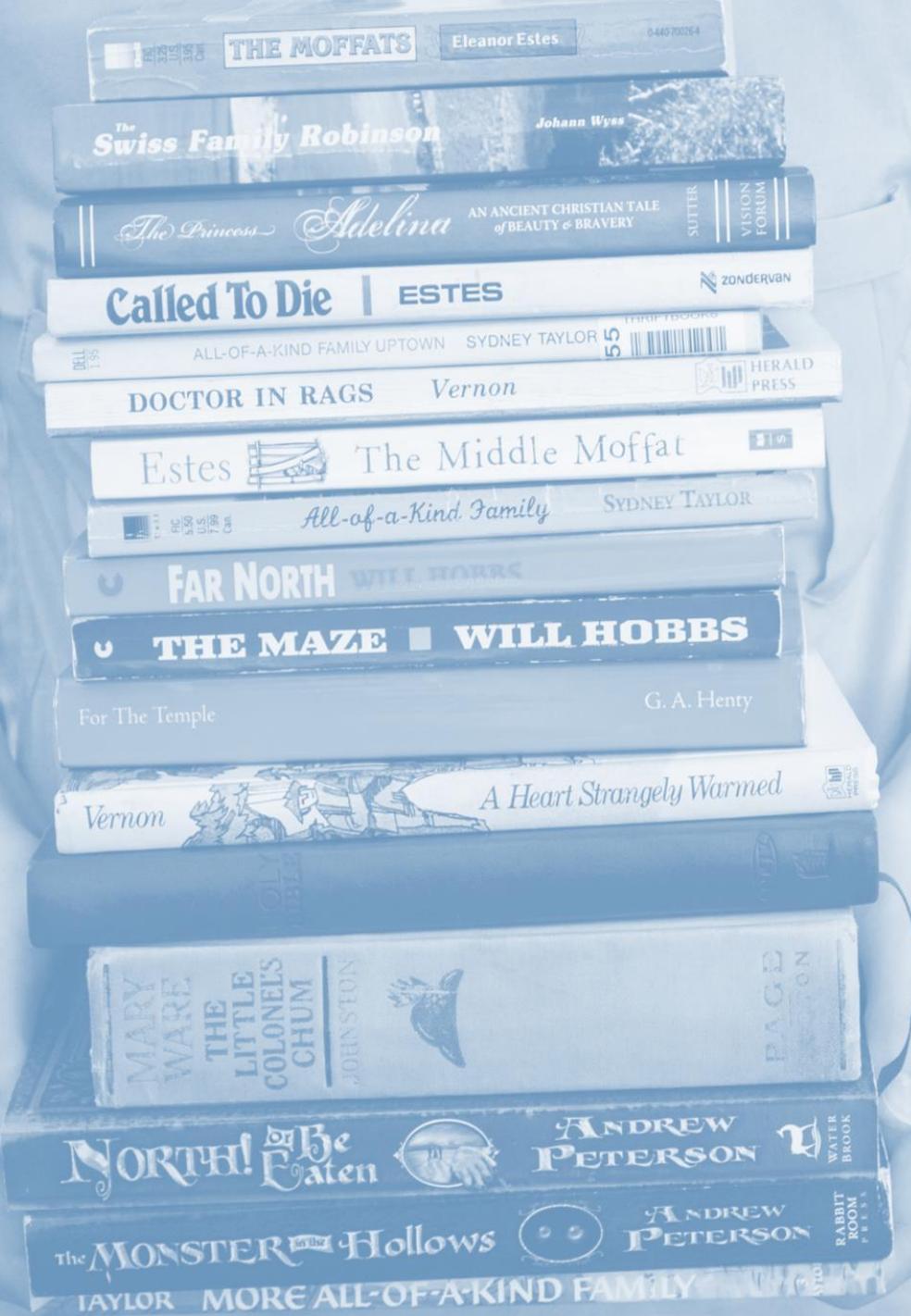
SW - Thank you and well done, everyone. Great effort! J May we all have learnt skills of use in the future. . .

Next meeting? None

[ENDS]



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