HERZLICH WILLKOMMEN
GUTEN ABEND

Ich hoffe, Sie hatten ein gutes Mittagessen.
Ich bin Nupur. Ich war ein Austauschstudent in Deutschland.
Das ist meine Präsentation

Master’s in Design (M.Des.) in Interaction Design, IDC, IIT Bombay

Exchange student for Winter semester 2016-17, IAD, TU Darmstadt under DAAD scholarship

Conceptualisation of an automotive interface for self-controlled privacy in a connected car

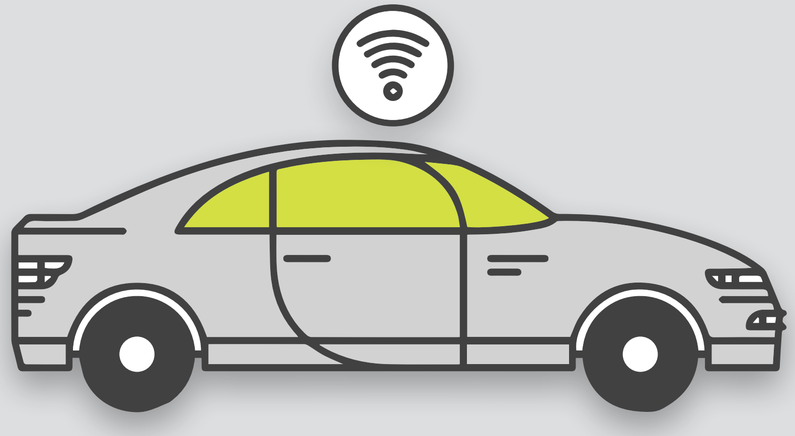
Agenda

INTRODUCTION

Introduction

A connected car - a vehicle able to optimise its own operation and maintenance as well as the convenience and comfort of passengers using onboard **sensors** and **Internet** connectivity.

(McKinsey, 2014)



Introduction

Privacy - ability of individuals to decide when, what, and how **information** about them is disclosed to others.

Privacy principles demand that systems **minimise personal data collection**

(Duri et al., 2002)

Introduction

A modern connected car has

Telematic systems (vehicular information such as fuel efficiency, recently visited destinations, routes travelled)

Infotainment systems (non-vehicular information such as voice calls, text messages, emails, social networking)

(Jaisingh, El-Khatib, & Akalu, 2016)

NEED FINDING AND TASK

Need finding

Connected vehicles send data to :

- Vehicle manufacturers
- Workshops
- Insurance companies
- Third party apps

https://www.sedafa-projekt.de/konsortium.php

Image source: http://www.mycarmydata.eu/

Need finding

This mass of accumulated data allows many new applications and business models

This poses new risks and major data protection problems.

https://www.sedafa-projekt.de/konsortium.php

SeDaFa Projekt

The need is identified by the ongoing SeDaFa Projekt (Selbstdatenschutz im vernetzten Fahrzeug), or “Self protection in a connected vehicle”

It is a collaboration of :

- **Vehicle manufacturers** (Volkswagen & Daimler)
- **Security system providers** (Accessec GmbH & Fraunhofer SIT)
- **Research Universities** (IAD, TU Darmstadt & University of Hohenheim)
- **Legal bodies for data protection** (ULD)

All these bodies are working towards finding a common solution for data protection of the motorists

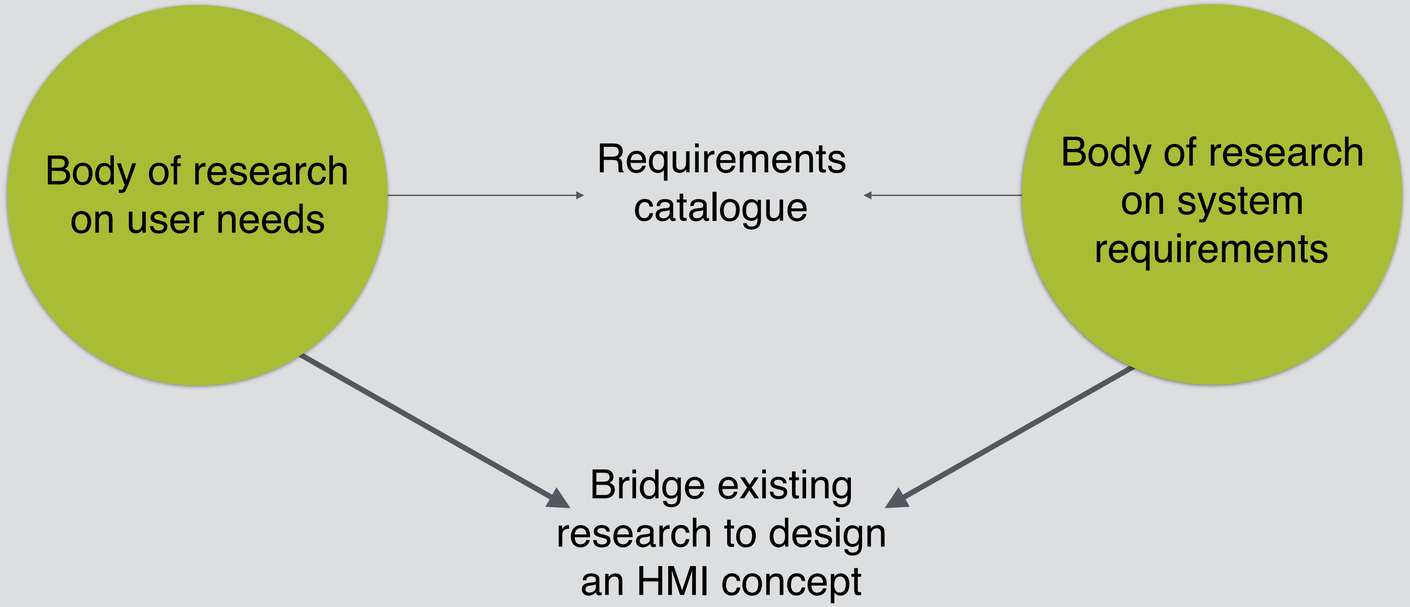
https://www.sedafa-projekt.de/konsortium.php

Motivation

“There is a clear disconnect in what is being tracked and what citizens are willing to accept when it comes to car data. Not only strong data protection, but informed consent and free choice of service providers need to be addressed.”

Thierry Willemarck, FIA Region I

Research gap



Task

Need for a concept that can let the user **control their privacy** and also review what is being shared, e.g. car interface

Project tasks defined:

- Development of a privacy HMI in the car
- For the use cases: Before driving/parking position, during driving and remotely controlled(smartphone)
- Consideration of the demands of driving situation

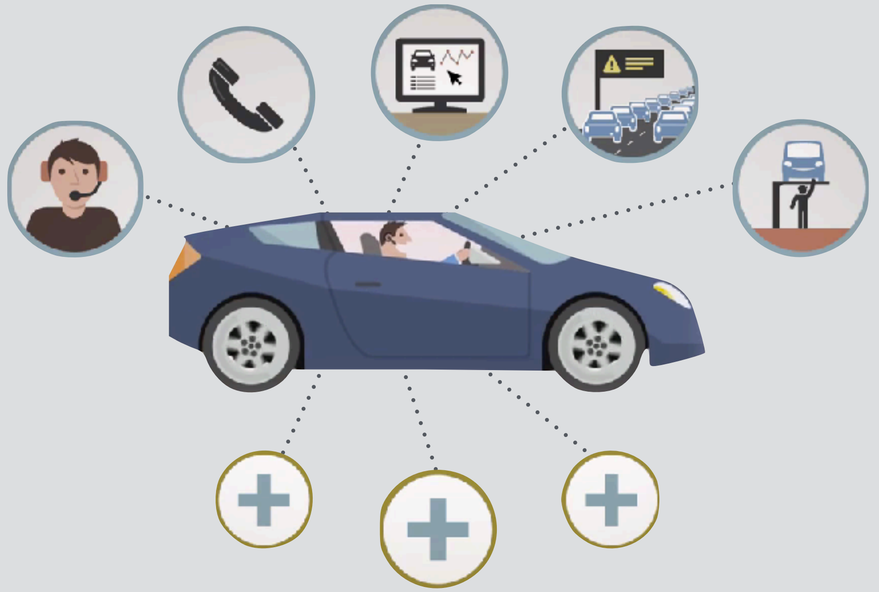
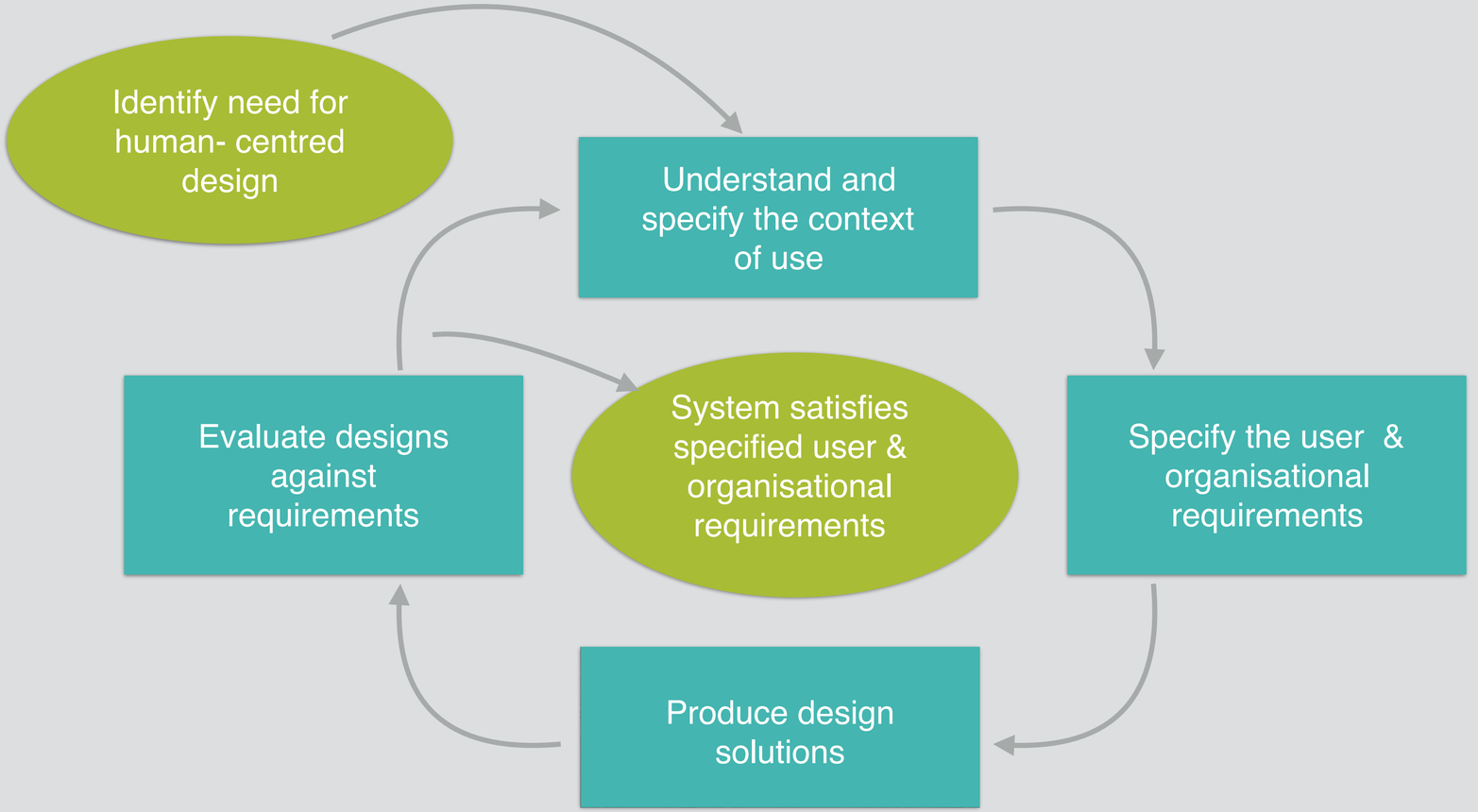


Image source: http://www.mycarmydata.eu/

METHODOLOGY

Methodology : User centred design ISO 13407



Methodology

Part A Overview

Literature review about NHTSA guidelines for distractions while driving and guidelines for automotive interface

Literature study of existing user data about their concerns related to connected cars/ autonomous cars, privacy concerns, user intentions

Formulation of a “Requirements catalogue” based on the literature

Methodology

Part B Overview

Persona, Brainstorming, Information architecture and wireframes

User testing

Iterations and final UI

Methodology (Part A)

1. Norms on Vehicular interface design

Studies from sources :

- NHTSA Driver Distraction Guidelines to promote safety by discouraging the introduction of excessively distracting devices in vehicles.
- E DIN EN ISO 15008, E DIN EN ISO 15005: Dialog management principles, visual presentation and auditory presentation of information in the vehicle HMI
- Hua & Ng, 2010- Speech recognition interface and principles for using speech commands

Methodology (Part A)

2. User opinion on privacy in connected cars

Studies from sources :

- FIA Region 1 Report “My car My data” - The FIA represents the interest of these members as motorists, public transport users, pedestrians and tourists.
- Zimmermann M, 2016 - Study conducted in IAD - The intelligent vehicle as a data leak? The status quo of data security in cars from the user’s point of view
- SeDaFa Project report, 2016

Methodology (Part A)

3. Requirements catalogue

A catalogue was created with 54 requirements to be fulfilled by the design concept
Requirements for Interface design and Dialogue management (Snippets):

NHTSA-2010-0053

The maximum device response time to a device input should not exceed 0.25 second

ISO 15005:2002(E)

The particular input required to reach the intended goal should be made obvious to the driver.

ISO/DIS 15008

Typefaces selected should not be too narrow or too wide. The proportion should be between 65 – 80 %

Methodology (Part A)

3. Requirements catalogue

User Centred requirements (Snippets):

FIA Region 1, 2016

The user should decide if they want to share their data.

Zimmermann M, 2016

The kind of party recieving the data externally should be revealed to the user

Sedafa Project, 2016

Per default, each datum has to be labeled as "not agreed on".

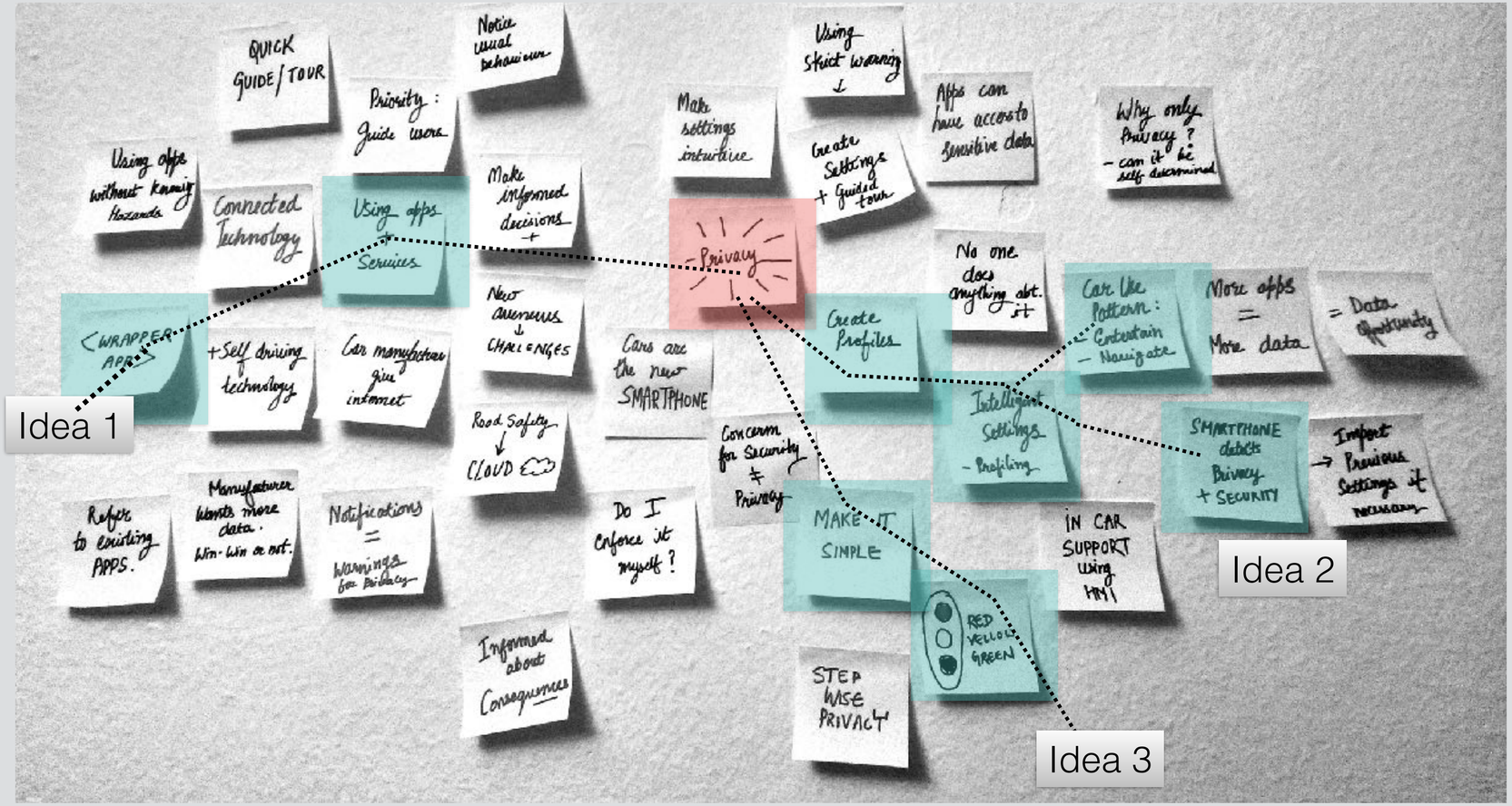
Methodology (Part B)

4. User persona based on the user studies

Methodology (Part B)

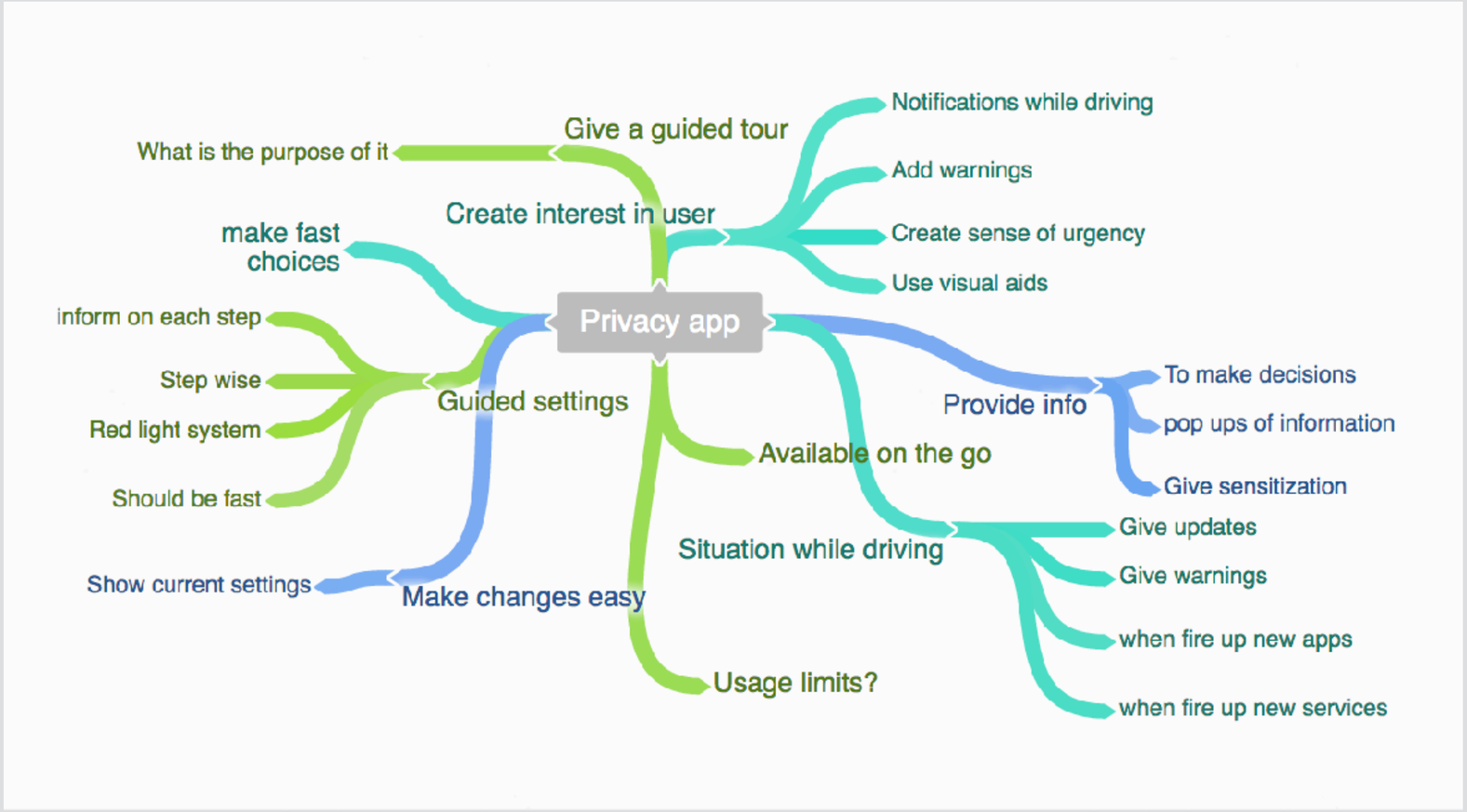
5. Brainstorming for keywords

Methodology (Part B)



Methodology (Part B)

6. Mind mapping for generating ideas for the app : Idea 3

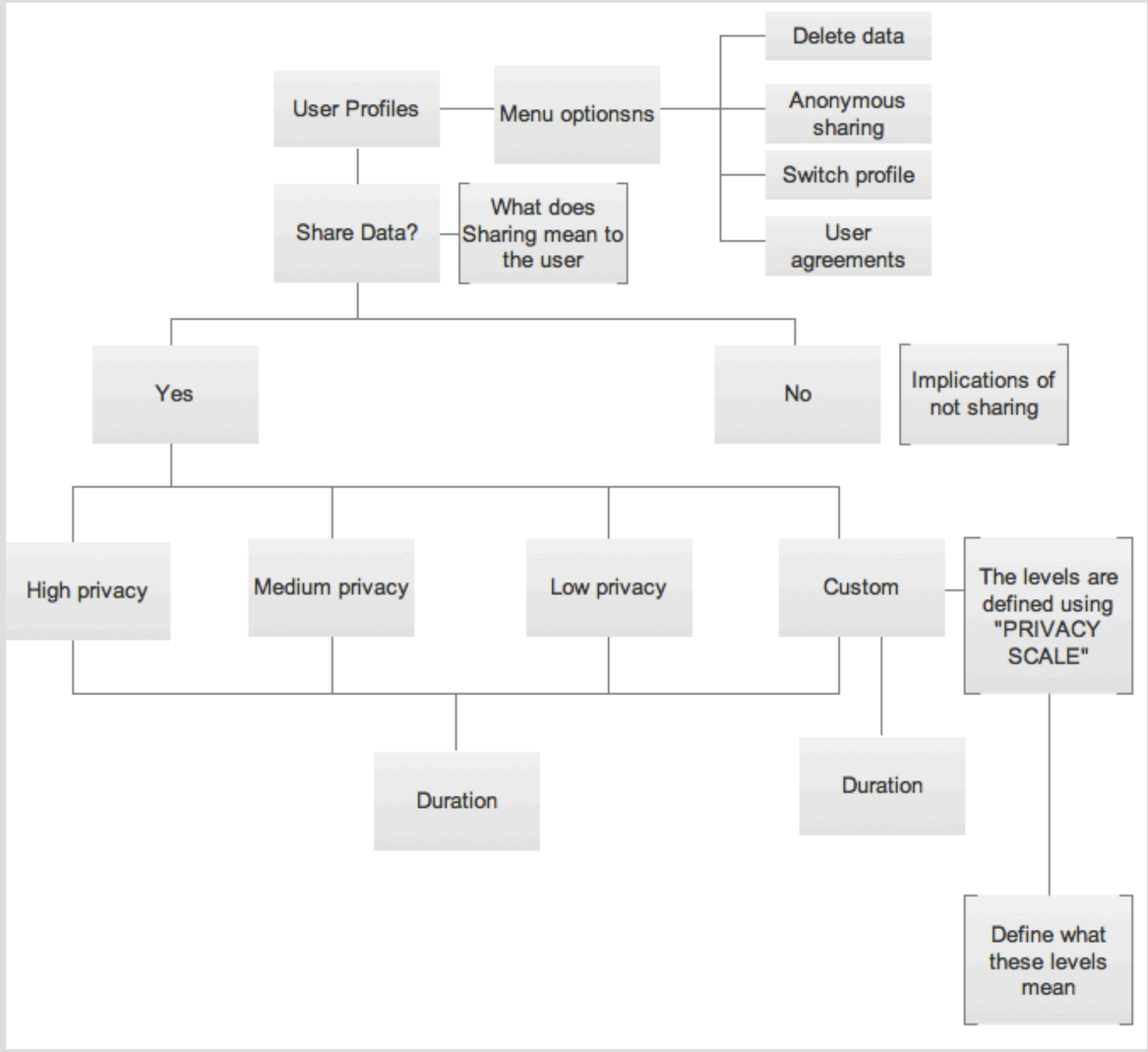


Methodology (Part B)

7. Information Architecture

Visualise how all the elements relate to one another, structure and organise information

(UX Booth, 2015)



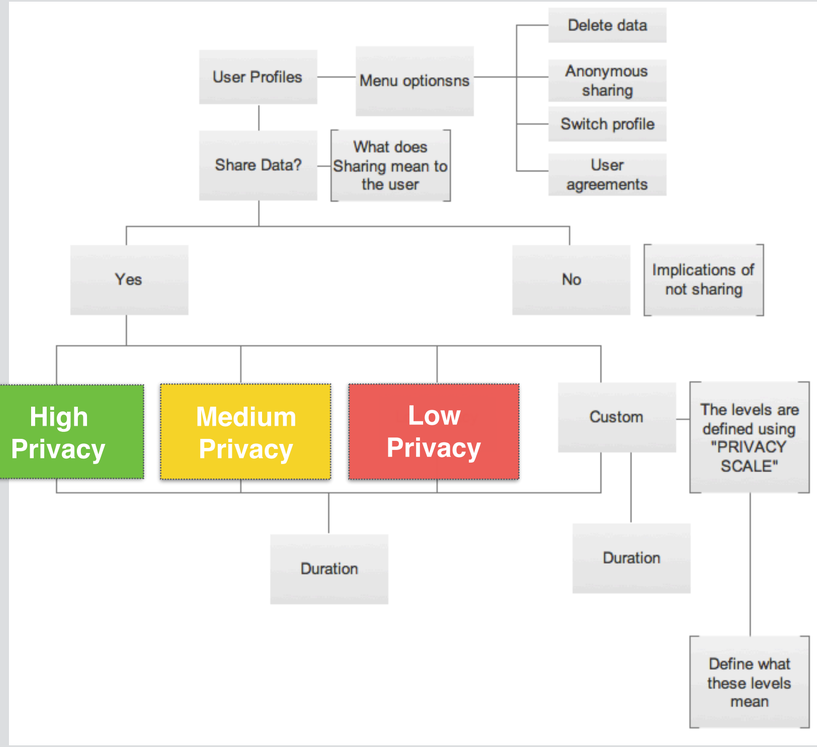
Methodology (Part B)

7. Information Architecture

Concept for a “Privacy Scale”

Scale defined by parameters such as:

- Type of application (emergency apps, music etc.)
- Credibility and trust-worthiness of the application manufacturer
- Amount of data collected by the app and for which functions
- Frequency of data collected
- Type of data collected



Methodology (Part B)

8. Paper prototype 1

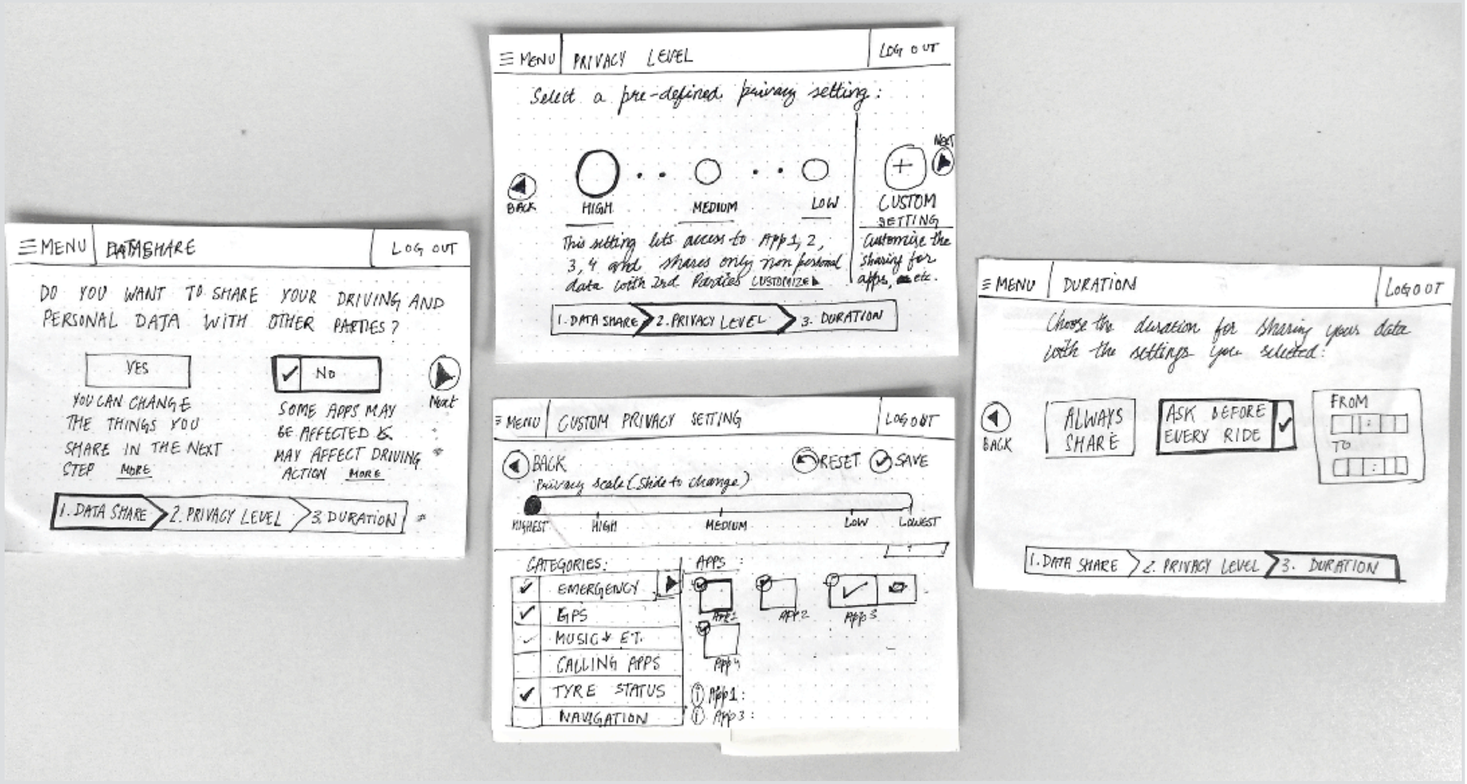
- Simple paper prototypes
- Allocation of space on every page
- The distribution of content
- How content is prioritised
- What functions are available
- Helped understnad the user flow
- Decided to go against mobile sized version first

(Allabarton, 2016)

Methodology (Part B)

8. Paper prototype 2

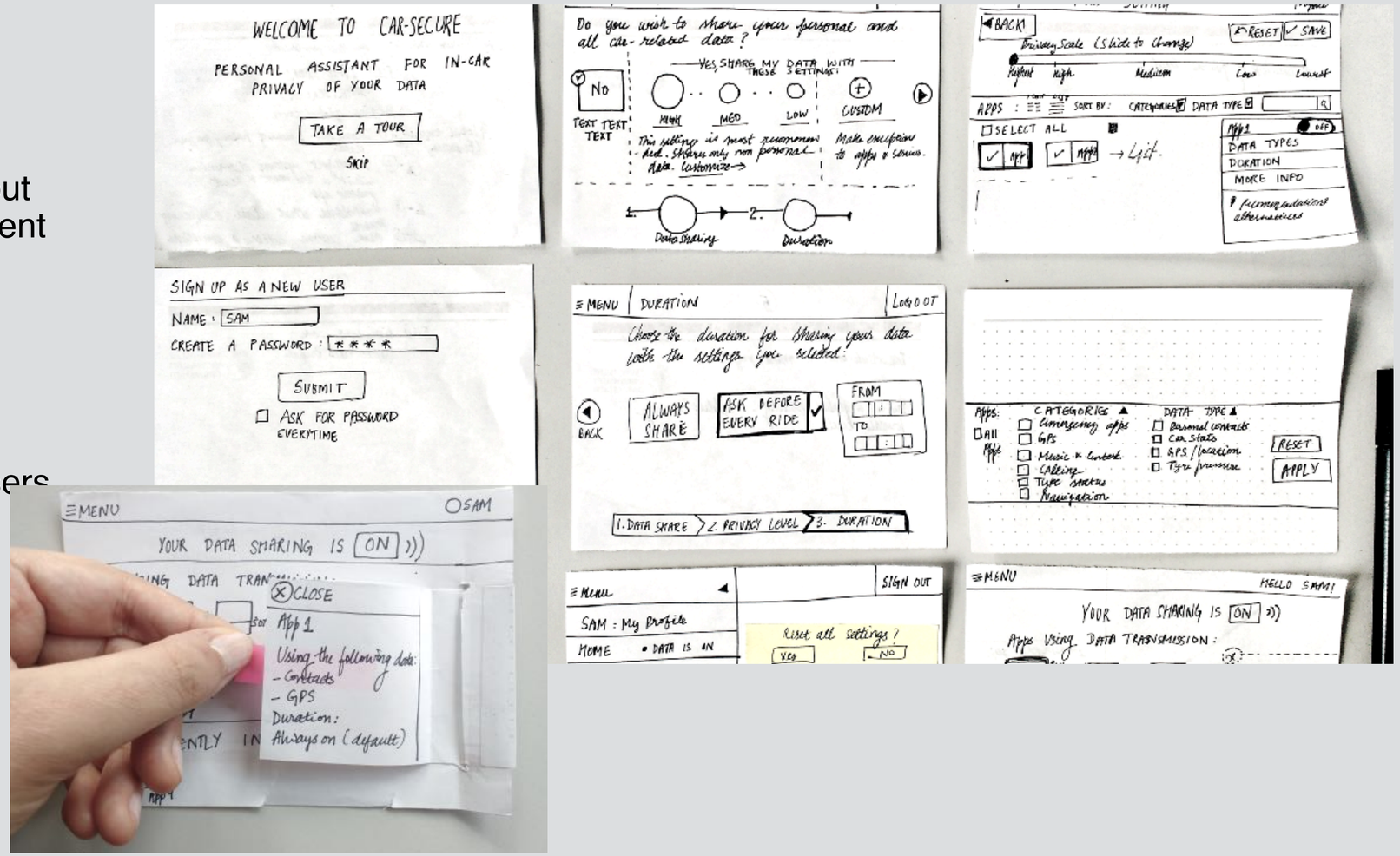
- Created prototypes of the size of the final screen
- Allocated a 3 step process for guiding the user
- The steps could be further minimized upon testing with colleagues



Methodology (Part B)

8. Paper prototype 3

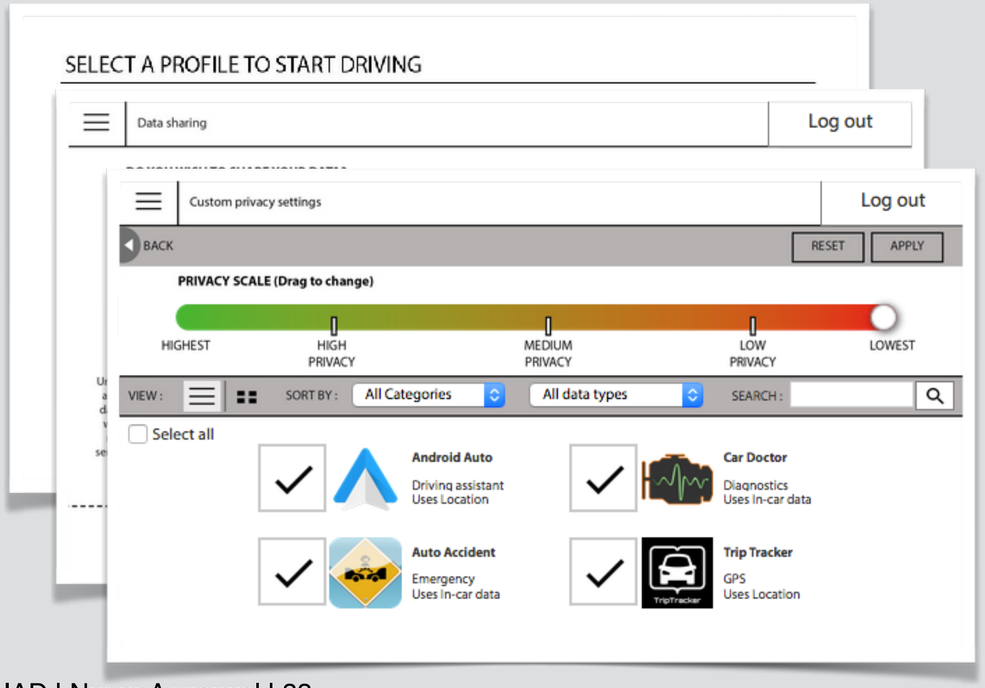
- Created a detail of the custom settings, still need to be tested but the paper prototype is not sufficient to explain it
- Also made a 3 step into 2 step process
- Tested the flow with available users in an unstructured interview.



Methodology (Part B)

9. Digital prototypes

- Replicates the exact functionality that the real application would do
- Simulates functions for the sake of testing with users
- Clickable dummy created with prototyping software



Methodology (Part B)

10. User testing Protocol

- Digital wireframes installed on a touch screen laptop
- 5 users were selected at random, One-on-one testing
- Within the age groups of 25 to 40, only germans,
- 45 min - 1 hour for every participant
- The method used was "Think-aloud" test.It means that the users are asked to talk through their actions out loud as they are making them.
- Given 4 tasks to complete, followed by a semi structured interview

Methodology (Part B)

10. User testing Observations

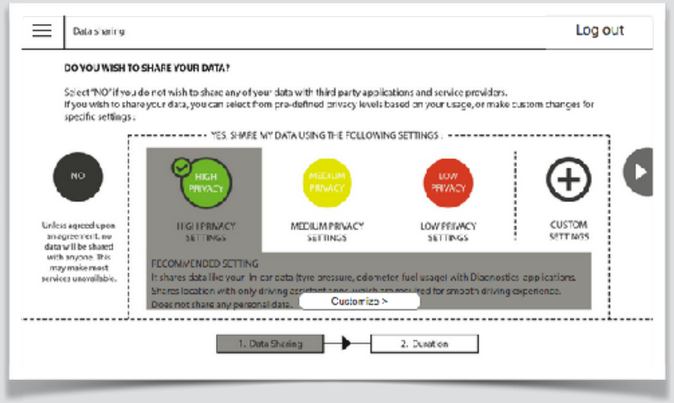
- Hints to improve the concept design
- Lists specific issues faced by all 5 users

Task	PT01	PT02	PT03	PT04	PT05
Pre-tasks	Tell the user when they are using for the first	Tell the user when they are using for the first	Tell the user when they are using for the first	Taking too much time to read the tour	Selects "ask for password". Make the ask for
	Tour taking too much time,	Make it more intuitive to select the user profile.			
Task 1	Make "no" more visible on the homepage,	Separate the homepage from the next-next-	Need to make duration more clear	Easily done	Thought custom was also for duration but was
	Put an option of duration in the menu, natural	The user thought they can go to the next into			
	Go to duration if the user selects an option and	Put an option of duration in the menu, natural			
		Make it easier to go to the duration option			
Task 2	On the homepage when no is selected,	Easy to do for the user since thry already read	Reading takes too much time	Selects medium, its right. Selects them without	Goes to custom directly
	Thinks it should be always on - since i already				Doesnt use the presets
	Selects High setting. Right answer was				
Task 3	Confustion between highest and high. Can	Need to have customise/ select the privacy level	Re-reading the presets- thinking something is	Select preset and then go to custom	Goes to custom directly
	Can put a small demo about the move in privacy	can we show already how these pre-sets	The hih-med-low on the privacy scale are not	Alternatives to scrolling - find out	
Task 4	Can have an option for alphabetic apps	Making exception - tell that to the user	Thinks that emergency apps shoiuld be in	Thinks it is 'high' - then doesnt find it in high	Goes to custom directly
	Expects emergency apps to be on the top			Selects apps only from scrolling	

Methodology (Part B)

10. User testing Observations

- Taking too much time to read the tour
- On the homepage when no is selected, users don’t know that clicking on the levels will give you more info (information structuring)
- Make "no" more visible on the homepage, difficult to spot (visual design)
- Need to have customise/ select the privacy level and then if you go to custom, you have already the settings shown there (information structuring)



RESULTS

Results

Clickable prototype (UI)

Interface is designed for the scenarios:

- Non-driving situation

Clickable prototype : http://zs0bad.axshare.com/#c=2

Results

Clickable prototype (UI) Test

A test was conducted while designing the user interface to decide what information is to be presented to users by providing two screenshots of the interface and asking them about the concerns for the two situations.

User	1	2	3	4	5
Age	33	26	29	24	24
gender	M	F	F	F	M
Driving license?	yes	Yes	Yes	No	Yes
Driving experience	10 years	10 years	11 years	1 year	5 years
Wifi in board/ Mobile mirroring/ None	Mobile Mirroring	None	Mobile Mirroring	None	Mobile Mirroring
Level of automation (0,1,2)	0	0	0	1	0
Overview options	Apps which are already sharing data should be on the top, Indicate type of App	No category required, tell type of data used, and tell privacy score and how it came	Display core data being used only, and privacy score	Display privacy rating	Category is important, and the privacy rating should be colored
Full view options	The order and individual settings of data types are good. Should be on the top	reason of sharing is mostly clear, no need for that	Show trust info first, Duration is not clear	All is clear	Didn't understand purpose. Can be explained better

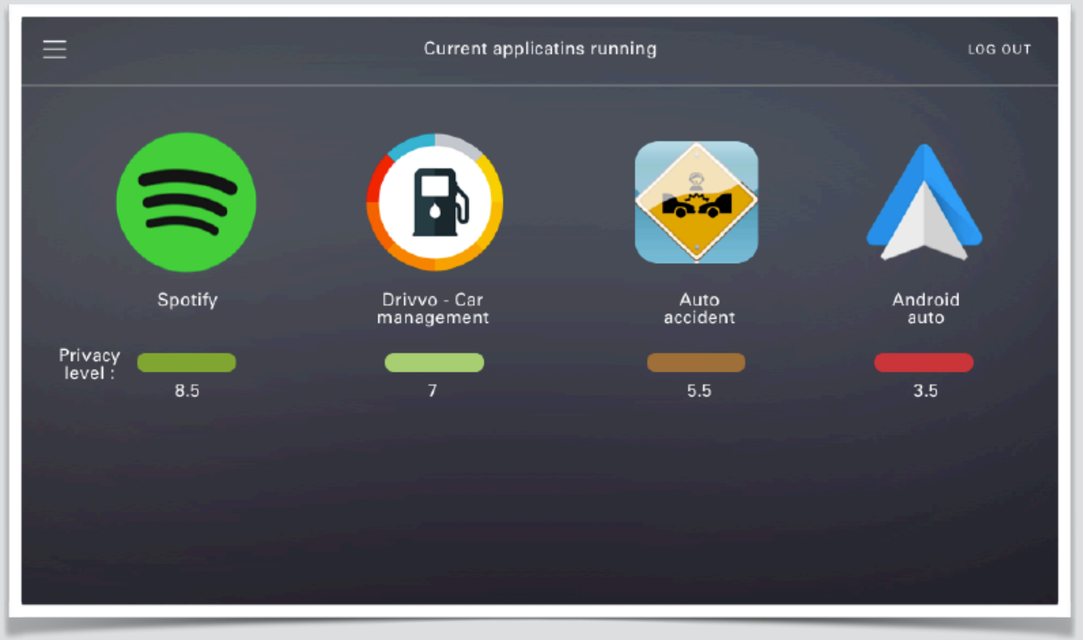
Results

Clickable prototype (UI)

Interface is designed for the scenarios:

- Driving situation

Icons for the status bar to depict current situation

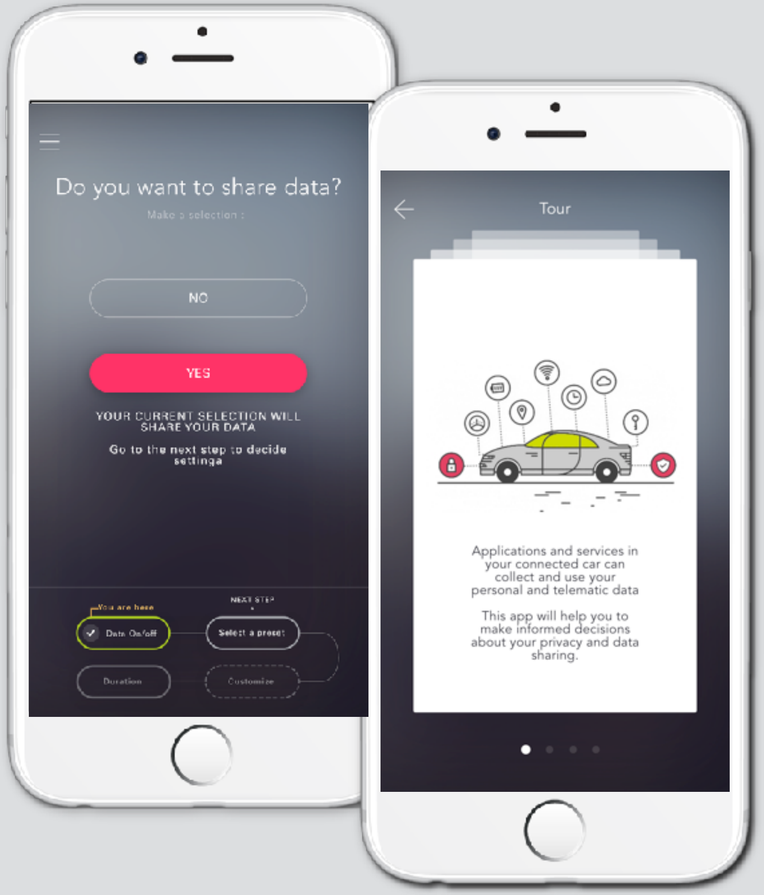


Results

Mobile prototype (UI)

Interface is designed for the scenarios:

- Smartphone application



CONCLUSION

Next steps

- The methodology used can be improved by using more testing and continuous iteration, as described in the Human-centred process, until the product reaches all the requirements. The immediate need : carry out a driving simulated test to check driving situation

- Current testing revealed a lot of hints for improving the design and making it robust, like making it a guided step wise process.

- More user testing is required for confirming with the requirements which are not tested for yet.

Conclusion

- The project presents a great opportunity to look at privacy of a connected car, as it is going to be of an issue as more and more sensors surround the car

- The project is now in the development phase for implementation, with the help of the partners like Volkswagen.

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THANKS FOR YOUR ATTENTION

QUESTIONS?